

# Meter without feet

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## 1 Introduction

Many, if not all, societies make use of language to produce verbal art, and many verbal art traditions distinguish between prose and poetry. Poetry, by one common linguistic definition, is artistic discourse which is divided into lines (Fabb & Halle 2008:1, Hanson & Kiparsky 1996:289). In most poetic genres, the division into lines and the internal organization of lines are governed by linguistic factors -- meter, parallelism, or both.

Meter, in particular, has played a starring role in linguistic theories of poetry. Because most verse forms familiar to linguists involve an alternating pattern of strong and weak syllables, these approaches have seen rhythm as the defining property of meter, from the earliest works in linguistic metrics (Halle & Keyser 1966, 1971) to today (see e.g. Fabb & Halle 2008; Kiparsky 2006, 2009; Blumenfeld 2015, 2016). Yet the poetic traditions of the world also include many forms which partially fix the phonological form of the text -- for example, by constraining the length of lines -- but do not create rhythm.

These non-rhythmic poetic forms raise two questions for linguistic metrics. First: do rhythmic and non-rhythmic poetic forms arise from the same underlying structure; or, put another way, should the theory of meter also generate non-rhythmic forms? Second: are rhythmic meter and non-rhythmic poetic forms related to the phonology of ordinary language in the same way?

This paper addresses these questions with data from my own fieldwork on *dàì*, a poetic form associated with the Tukanoan language *Máíhiki*, and from descriptions of other non-rhythmic poetic forms. Like familiar rhythmic meters, *dàì* and other non-rhythmic genres require the poetic text to conform to an abstract prosodic template. But while rhythmic meter regulates both prosodic size and the position of prosodic prominences at the level of the foot, non-rhythmic meters constrain size and prominence at different levels of the prosodic hierarchy, or constrain size while neglecting prominence (or vice versa). Despite this dissimilarity, I show, rhythmic meters and non-rhythmic meters like *dàì* can be generated by the same set of parameters. Additionally, non-rhythmic meters are grounded as firmly as rhythmic meters in the phonology of non-artistic language -- supporting the hypothesis, fundamental to generative metrics, that general phonology and meter come from a common source.

The remainder of this paper is organized as follows. §2 provides a review of the two main strands of linguistic literature on poetics. In §3, I draw on this literature and on published descriptions of non-rhythmic poetic forms of Europe, the Americas, and the Asia-Pacific region to formulate a typology of poetic forms which generates both rhythmic and non-rhythmic meter using only two sets of parameters -- regulation of prosodic size and regulation of prominences. Next, I employ

concepts from this typology to provide, in §§4-5, a detailed description of the formal properties of the Máihīki *dài* genre, and to argue that the meter of *dài* -- which constrains size at the level of the prosodic word, but prominence at the level of the poetic line -- shows that the size and prominence parameters of meter are independent. §6 then provides a formal analysis of the meter of *dài* in parallel Optimality Theory (OT), and §7 illustrates that comparable OT analyses can account for the other described aperiodic meters. §8 concludes with implications of this analysis for theories of meter and its relationship to general phonology.

## 2 Literature review

Linguistic approaches to verbal art fall into two categories: ethnopoetics, which blends into linguistic anthropology, and generative metrics, which is more closely allied with linguistic theory. This section provides a brief overview of ethnopoetics in §2.1 and of generative metrics in §2.2. In §3, it then reviews descriptions of aperiodic meters -- a type of meter which is common in poetic traditions of the Americas, documented mostly by ethnopoetics researchers, but relatively uncommon elsewhere.

### 2.1 Ethnopoetics

The ethnopoetics tradition is closely associated with the work of linguistic anthropologists Dennis Tedlock (1977; 1978) and Dell Hymes (1958; 1981, a.o.). Research in ethnopoetics has focused almost exclusively on the poetic traditions of indigenous American societies, per the title of an important set of essays in the field, *Native American discourse: poetics and rhetoric* (Sherzer & Woodbury 1987). Though many American cultures have indigenous poetic and musical traditions, ethnopoetics scholars have given much greater attention to forms of verbal art that are not explicitly lineated -- for example, traditional narrative (Bright 1984; Woodbury 1987) and chants by ritual specialists (Sherzer 1990) -- than to lineated poetry and song. In fact, much ethnopoetics literature centers on the task of identifying lines in discourses which do not, on first glance, seem to be lineated; Sherzer (1982) and Kroskrity (1985) are two examples. Linguistic-anthropological descriptions of American genres which are clearly lineated, such as Hinton's (1984) description of Havasupai songs, have tended to draw more on ethnomusicology than on this tradition.

### 2.2 Generative metrics

Generative metrics is a parallel enterprise to generative phonology, established and practiced by phonologists such as Magnuson & Ryder (1970, 1971), Halle & Keyser (1966, 1971), Kiparsky (1977), and Hayes (1989) (or see Blumenfeld 2016 for a recent review). It is motivated by the hypothesis that meter can reveal phonological principles which are active in a language (and consequently, present in the language faculty) but difficult to observe in its general phonology. Concretely, generative metrics seeks to model meters in the terms of formal phonology and to account for their diversity through an exclusively phonological theory. As part of this goal, practitioners of generative metrics assume that meter and general phonology, both in a particular language and cross-linguistically, draw on the same source and therefore operate over the same phonological units. Because of this view, labeled the 'Development Hypothesis' by Fabb (2010) and the

'Grounding Hypothesis' by Blumenfeld (2015), generative metrics treats only the constituents of the non-poetic prosodic hierarchy -- mora, syllable, foot, and word -- as possible metrical primitives (Hanson & Kiparsky 1996:289). Poetry-specific prosodic constituents, such as lines and half-lines (used in Celtic and Germanic alliterative meters), are created by rules or constraints which group smaller constituents together. Consequently, lineation is usually considered to be a 'conventional,' non-phonological property of poetry, rather than a part of meter proper (Kiparsky 2009:924, citing Chen 1980 and Kiparsky 2006).

Another important characteristic of generative metrics is that it views rhythmicity as the defining characteristic of poetic meter (Blumenfeld 2016:415). Authors in the field often acknowledge that some poetic forms have non-rhythmic prosodic templates, and describe these forms, as well as rhythmic forms, as 'meter' (Hanson & Kiparsky 1996:n15, Kiparsky 2009). Nevertheless, all generative theories of meter -- even those, such as Fabb & Halle (2008), which treat lineation rather than rhythmicity as the defining characteristic of meter -- have focused exclusively on foot-based rhythmic meters.

The generative metric focus on rhythm is problematic because foot-based rhythmic meters are found almost exclusively in the poetic traditions of Europe and Asia. Although such meters may be attested in the Americas -- Havasupai song meter (Hinton 1984:87-88), for example, can be analyzed as loose iambic tetrameter -- most indigenous American poetic forms exemplify a different type of meter, which constrains the prosodic size and/or prominence of constituents in a poetic text without involving feet or rhythm. Some meters of Europe and Asia, as well as at least one from the Pacific, also belong to this type. Following Hanson & Kiparsky (1996:289), I label the non-foot-based type of meter 'aperiodic meter,' and the rhythmic foot-based type 'periodic meter.' In the following section, I review some attested aperiodic meters.

### 3 Aperiodic meters

'Meters,' for the purposes of this section, are defined as abstract prosodic templates imposed on the text of a verbal art form (poetry, song, chant, and so on). By 'abstract,' I mean that the template imposed on one constituent cannot be based on phonological properties of another constituent in the text (cf. Blumenfeld 2016:423). For example, imagine a hypothetical poetic form in which odd-numbered lines may be any length and have any pattern of prosodic prominences, but even-numbered lines must match the preceding odd-numbered line in length and prominence pattern. Under this definition, such a form would not be metrical because the template imposed on the even-numbered lines is based on the prosody of the odd-numbered lines. The form would be more accurately described as requiring a prosodic form of parallelism between lines.

I also limit the definition of meter to prosodic templates because, as Blumenfeld (2016) observes, there are no known forms which regulate segmental content -- i.e. alliteration or rhyme -- and meet the definition of 'abstract' given above. It is an open question, on the other hand, whether there are poetic forms that impose an abstract but non-phonological template on the text. For example, Havasupai song imposes very rigid, fully abstract constraints on the morphological form of lines (Hinton 1984:92-96); the genre's phonological template, Hinton argues, may be epiphenomenal on these morphological requirements. While poetic forms that primarily regulated morphology would be close kin to metrical poetry, for continuity with the metrics literature, I exclude such forms from the definition of meter used here.

### 3.1 Pure size meters

Aperiodic meters fall into two broad categories: size meters and prominence meters. Size meters constrain the prosodic size of one or more constituents in the text. The best-known examples of pure size meter come from classical Japanese poetry. Haiku and senryū, the most famous Japanese meters, constrain the size of the entire poetic text to exactly 17 morae arranged in lines of seven, five, and seven syllables. Other traditional meters permit longer texts, but still require either five or seven syllables in each line (Miner et al. 1985:21-22). Some medieval European poets, writing in late Latin and early Romance vernaculars, also employed in pure size meters requiring 10 or 12 syllables per line. These meters developed from classical Latin meter, which regulated the number of syllables per line and the position of heavy syllables, after the loss of vowel length in descendants of Latin (Duffell 2008:39-43). Likewise, Marianne Moore and Elizabeth Daryush, two Modernist poets, wrote pure size meters in English with 10 or 12 syllables per line (Hobsbaum 1996:76-83). Size meter is known in traditional poetics as 'syllabic verse.'

Outside of Europe, the literature describes two examples of orally composed pure size meters: *karintaa*, associated with the Arawak language Nanti (Michael 2004), and *tom yaya kange*, a form used by speakers of Ku Waru and several closely related languages in the Eastern Highlands region of New Guinea (Rumsey 2007, 2010). *Karintaa* restricts the line to exactly seven morae. The size constraint of *tom yaya kange* requires that the line contain a fixed number of prosodic positions -- five in the style analyzed by Rumsey, but six, seven, or eight in other styles (Rumsey 2010:44). In a perfectly metrical line of this genre, each prosodic position is filled by a single phonological word, except that the final prosodic position may be filled by a breath (Rumsey 2010:45). *Tom yaya kange* is not the only meter described in the poetics literature which counts words -- Jakobson proposed a similar analysis for one Czech meter -- but as Rumsey (2010:50) explains, it is the only word-counting meter that does not have a competing non-word-based phonological analysis.

Pure size meters display two important parameters of variation: which prosodic constituent they count, and which prosodic constituent they constrain. On the former parameter, *karintaa* and the Japanese size meters count morae, Indo-European size meters count syllables, and *tom yaya kange* counts phonological words. The example of *tom yaya kange* illustrates that the identity of the counted constituents is not deterministically derived from the phonology of the language. There is abundant evidence for syllables in the prosodic system of Ku Waru (Rumsey 2010:43-44, citing Merlan & Rumsey 1991:324), but *tom yaya kange* meter counts phonological words instead. Likewise, word stress in Nanti operates on syllables, but *karintaa* counts morae instead (Michael 2004:253-254).

On the latter parameter, size meters also vary in which constituents are controlled for size. Modernist size meters, Japanese meters, and *karintaa* are the simplest here: they constrain only the size of the line, and not the size of any prosodic constituent below the line. Because these meters do not have any constituents resembling poetic feet, analysis of them must treat the line as a metrical primitive. *Tom yaya kange* and medieval Romance meters have additional complications. In medieval Romance size meters, there are obligatory caesurae -- phrase or prosodic word breaks -- after the fourth syllable in 10-syllable meters and after the sixth syllable in 12-syllabic meters (Duffell 2008:45). Two size constraints must therefore be at work in this genre. One, lower-level, constraint requires the hemistiches, or parts of the line separated by the caesura, to contain four or six syllables, depending on the meter. The other, higher-level, constraint requires the line to contain exactly two hemistiches.

*Tom yaya kange* presents a different interaction of multiple size constraints, more reminiscent of periodic meter. The five-beat style of this genre, as described by Rumsey (2010), permits two types of lines: lines which contain exactly five phonological words, and lines which contain four phonological words followed by a final breath. The metricality of the second type of line means that one cannot describe the meter as simply counting phonological words. Instead, Rumsey (2010) analyzes the meter as constraining the line to contain five prosodic positions, each of them but the last obligatorily filled by a single phonological word.<sup>1</sup> The first of these is a line-level constraint, like those found in the Japanese meters. The second is a constraint on the size of sub-linear prosodic constituents, like the constraints on foot size in periodic meters.

We can typologize size meters using three parameters, modeled on the parameters developed by Hanson & Kiparsky (1996) in their description of periodic meter. One parameter sets the the poetic molecule -- which prosodic constituent is constrained for size; another, the poetic atom -- which constituents are counted; and the last, the number of molecules per minimal poetic constituent (line, or in non-lineated genres such as haiku, text). I assume that the possible poetic molecules and atoms include all of the levels of the universal prosodic hierarchy, mora < syllable < foot < word, followed by three poetry-specific constituents dominating the word: sub-linear constituent (such as hemistich) < line < text. While generative metrics never assumes the existence of constituents larger than the word, these constituents are essential for the analysis of all of the forms which I have reviewed above. I do not assume that all meters have settings for all of these parameters. In §5.5 below, for example, I argue that *dàì* meter constrains the size of prosodic words in terms of number of morae (atoms), but does not constrain the number of prosodic words (molecules) per line. These parameters and assumptions are formalized in §6.

### 3.2 Pure prominence meters

Prominence meters constrain the number or position of prosodic prominences -- stresses, high tones, or long vowels -- in the text. They are known in traditional poetics as 'accentual verse.' There is only one clear example of a pure prominence meter, with no regulation of constituent size, in the literature: Fitzgerald's (1998) description of Tohono O'Odham traditional songs. This genre lacks size constraints, permitting lines of any length (Fitzgerald 1998:14-15). It does, however, display two restrictions on the location of prosodic prominences in the line. Stress is absolutely banned from two prosodic positions in the line, the second syllable and the final syllable; and adjacent stresses are banned in all positions (Fitzgerald 1998:18). Fitzgerald analyzes these restrictions as reflecting that the O'Odham song line is composed of trochaic feet in which the strong position must be filled by exactly one stressed syllable, and the weak position may be filled by any number of unstressed syllables. The feet are therefore constrained in the number and position of prominences -- like feet in periodic meters -- but are not constrained for size.

Besides Tohono O'Odham, there are two cases of Germanic meter that can be analyzed as pure prominence meter, but where this analysis is subject to dispute. First, Hayes & MacEachern (1998) treat the meters of English folk verse, which require either three or four total stresses per line, as pure prominence meters, neglecting feet in their formal analysis. Since English folk meters display a high-ranking constraint against lapse between stresses, though, their lines have a strong tendency to converge in length and to display an alternating pattern of stressed and unstressed

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<sup>1</sup>Rumsey labels the prosodic positions 'feet;' I call them 'prosodic positions' here to distinguish them from feet in rhythmic meters, which have a fixed pattern of metrical prominences as well as a fixed size.

syllables. This leads Kiparsky (2006:9) to treat the folk meters as examples of the periodic meters iambic trimeter and iambic tetrameter.

Second, the meter of *Beowulf*, representative of Old English and Germanic alliterative meters in general, may also be interpreted as a pure prominence meter. One traditional analysis of the meter of this poem, first suggested by Sievers (1885), is that each line is divided into two half-lines, defined by alliteration and by the presence of a caesura. Each half-line contains a maximum of two stressed syllables, but can contain any number of unstressed syllables on the same side of the caesura (Russom 1990:5). If this analysis is correct, this is a pure prominence meter, as it regulates only the number of stresses, not the total number of prosodic constituents, per line. Russom (1990:25-32), however, argues that *Beowulf* also displays size constraints on half-lines. On his account, the meter of *Beowulf* is a periodic foot-based meter in which the phonological word is the 'atom' of the foot (as in *tom yaya kange*). Prominence constraints are also, by definition, active in periodic meters, which constrain both the number and the position of prominences within each poetic foot.

Although pure prominence meters are much less common than pure size meters, it is still possible to typologize periodic and aperiodic prominence meters using four parameters. One parameter sets the identity of the prominence atom, determining which type of prosodic prominence the meter will regulate: stress, tone, or syllable weight. As with size, the identity of the prominence atom is not deterministically set by the phonology of the language. For example, Latin is a stress language and classical Greek is a tone or 'pitch-accent' language, but both used meters where the prominence atom was syllable weight.

The second parameter sets the size of the prominence molecule, or the poetic constituent within which prominence is constrained. This is the half-line in the traditional analysis of *Beowulf*, and the foot in Tohono O'Odham meter and periodic meter. As in the size parameters, I therefore assume that all possible levels of the universal prosodic hierarchy are possible molecules for the prominence molecule parameter.

The third and fourth parameters respectively constrain the number of prominences within the prominence molecule and the position of prominences. These two parameters must be independent, since some periodic meters -- for example, the sprung meter of Gerard Manley Hopkins (Kiparsky 1989:324) -- constrain the number of prominences in a foot independent of their position, creating rhythmic clashes and lapses. These parameters, like the size parameters, will be assigned formal representations in §6.

### 3.3 Combining size and prominence

Meters can combine size and prominence constraints in two logically possible ways. They can constrain size and prominence over the same constituent -- in the terms introduced above, displaying size molecules and prominence molecules of identical size -- or they can constrain them over different constituents. Meters which constrain size and prominence over the same constituent are potentially, but not necessarily, periodic. For example, the alexandrine, a Latin-derived meter best known from classical French poetry (Duffell 1999, 2008), is an aperiodic meter which combines size and prominence. Its size constraints require the line to have exactly 12 syllables and to display a caesura after the sixth syllable. This caesura divides the line into two half-lines, or hemistiches, of six syllables each. The prominence constraints then require a stress on the last syllable of each hemistich. Stresses are permitted at other positions in the hemistich, but do not

typically form a rhythmic sequence of prominences analyzable as feet (Duffell 2008:44-45). The hemistich, then, is the domain of the prominence constraints and of one set of size constraints, those which require each hemistich to have six syllables; the line is the domain of another set of size constraints, which require each line to have two hemistiches. In periodic meters, on the other hand, the prominence constraints and at least one set of size constraints take the poetic foot as their domain.

The literature contains no examples of meters which constrain size and prominence over different constituents. In the following sections, however, I argue that the meter of *dàì* belongs to this unattested category: it constrains size at the level of the prosodic word, but prominence at the level of the line.

## 4 Background on *dàì*: the language, data, and genre

*Dàì* is a verbal art form associated with Máíhĩki, the Western Tukanoan language of the Máíhuna ethnic group. Máíhuna, known in older literature by the pejorative Spanish terms *Orejón* and *Coto*, are an indigenous people who traditionally occupied the interfluvial zone between the Napo and Putumayo rivers in northeastern Peruvian Amazonia. The Máíhĩki language is severely endangered, with 75-100 speakers, all born before 1965, in an ethnic population of ~500. Traditional verbal art forms are critically endangered: perhaps 10 older men command the *dàì* genre.

### 4.1 Corpus

Data in this paper is drawn from my fieldwork with two speakers of the Northern dialect of Máíhĩki, Adriano Ríos Sanchez and Federico Lopez Algoba, over a total of five months in 2014 and 2015 in the town of San Antonio del Estrecho, located on the Putumayo River. Adriano and Federico were born on the Algodón River, a tributary of the Putumayo, in the late 1940s, and learned the Máíhĩki song tradition as young men from their older male relatives. They have the capacity to compose new songs in the tradition as well as to perform songs learned from others.

During the fieldwork, I recorded from the two singers 21 songs in the *dàì* genre, as well as several songs in a first-fruits festival genre (§4.2). The consultants then helped me to annotate the songs with line-by-line narrow phonetic transcriptions, paraphrases in spoken Máíhĩki, and free translations into regional Spanish, in which both of them are fluent. I collected the spoken-register paraphrases by asking the consultants, after transcribing each line, *básá hĩkàkè mání, kímà hĩkàdžì?* 'if you were just talking (i.e. not singing), how would you say it?.' The paraphrases which they gave in response formed the basis both for their Spanish translations of the texts -- they found it impossible to translate song text directly into Spanish -- and for my view of certain morphemes found in song as referentially bleached. The 21 recordings analyzed here contain 254 song lines and are, collectively, 37 minutes 42 seconds long.

In comparison of song with spoken registers of Máíhĩki, I draw on (a) general documentary fieldwork on the language by Lev Michael, Christine Beier, Stephanie Farmer, and myself between 2010-2015, and (b) a ~120,000-word morphologically parsed corpus of the language, recorded and processed primarily by me between June 2013 and July 2014.

## 4.2 Sociocultural context of the genre

Máfhīki speakers lexically distinguish two genres of songs: men's songs, the performance of which is referred to with the verb root *dàì-*, and women's songs, referred to with the verb root *òò-*. In this study, I refer to these genres using the present-tense nominalizations of these verbs, /*dài-i/* *dài* and /*òo-i/* *òì*. *Dài* and *òì* are gendered in that (a) only men may compose *dài*, and only women *òì*, and (b) the lyric subject of *dài* is always male, that of *òì* always female. Nevertheless, it is acceptable and not unusual for women to perform *dài* and for men to perform *òì*. To my knowledge, *dài* and *òì* have never been performed with dance or instrumental accompaniment.

*Dài* are first-person lyric poetry. The lyric subject is always a male shaman (*dábì*). He relates his conflicts and alliances with his *bétfi* 'familiar spirit,' a supernatural being who provides him with magical power; with other shamans; and with their familiar spirits. In traditional times, *dài* were performed mainly at ceremonies in which men ingested plant hallucinogens, but some men also performed them (and still do) outside of this context -- sometimes as a display of seniority to younger men, sometimes simply as artistic expression. Despite the association of *dài* with shamanism, men's knowledge of *dài* is not related to their knowledge of other shamanic practices, and none of my Máfhuna interlocutors believe that *dài* performances have magical effects.

*Òì* are also first-person lyrics, similar in supralinear and linear structure to *dài*. Their content relates the thoughts and non-supernatural experiences of the lyric subject or describes the natural world. This genre is significantly more endangered than *dài*: I have heard and recorded only a handful of *òì*, and have never met a speaker who claimed to know the genre well.

Beyond *dài* and *òì*, there is a third, unnamed genre: songs associated with the manioc and peach palm first-fruits festivals. First-fruits festival songs resemble *dài* in that the lyric subject is always male. In addition, performance of these songs can be described with the verb *dàì-*. First-fruits songs, however, were performed to dance, rattle, and percussion accompaniment, and have temporally longer lines and a much faster tempo than *dài*. Because of these differences and many others, I consider first-fruits songs a distinct genre from *dài* and do not describe them further here.

## 4.3 Phonology and morphology of spoken Máfhīki

Understanding *dài* meter requires understanding three aspects of the prosody of spoken Máfhīki: the tonology of roots (qua morphologically underived words), the tonology of derived words, and the Minimum Word Requirement. This section describes these topics for Northern Máfhīki, the dialect spoken by the two song consultants. Farmer (2015:18-26) describes the same phenomena in the Western dialect, which has significant morphological differences from the Northern dialect but is mutually intelligible with it.

### 4.3.1 Surface tone facts

I begin with the tonology of roots. Northern Máfhīki displays content-word roots of three categories: nouns, verbs, and adverbs. Roots of all categories can appear in isolation; for verbs, this marks the imperative. The vast majority of roots are bimoraic. In isolation, all bimoraic roots



display one of three tone melodies: LL, HH, or HL. There are no LH roots. (1) exemplifies the root melodies with a minimal triplet of verb roots.

- (1) Melodies on roots
  - a. HH: *dóá* 'wash'
  - b. HL: *dóà* 'be tall, be long'
  - c. LL: *dòà* 'paddle'

In derived words consisting of a noun or adverb root followed by suffixes, the root surfaces with the same tone that it bears in isolation, and all suffixes surface as L (2a,b) -- except in the case that the root is LL (2c-e). If the root is LL and the affixal string consists of only one mora, then that mora surfaces as L, creating an LLL word (2c). On the other hand, if the root is LL but the affixal string consists of two or more morae, then the first mora to the right of the root surfaces as H, and the remaining morae surface as L, as shown in (2d, e).

- (2) Melodies on derived words consisting of noun root plus suffixes
  - a. HH + 1 $\mu$  suffix: *máí-rè* (people-NON-SJ) 'people (accusative)'
  - b. HL + 1 $\mu$  suffix: *mái-rè* (sun/moon-NON-SJ) 'sun/moon (accusative)'
  - c. LL + 1 $\mu$  suffix: *bàì-rè* (meat-NON-SJ) 'game animal (accusative)'
  - d. LL + 2 $\mu$  suffix: *bàì-rákà* (meat-CLF:liquid) 'broth'
  - e. LL + 3 $\mu$  suffix: *bàì-rákà-tà* (meat-CLF:liquid-also) 'also broth'

Among derived words that consist of a verb root followed by suffixes, the minimal derived word consists of a verb root followed only by a subject agreement suffix (see §4.3.4 on subject agreement). These minimal derived verbs show the simplest verbal morphotonology. In them, the root surfaces with its tones in isolation and all morae of the inflectional suffix surface as L -- except, again, in the case that the root is LL and the suffix consists of at least two morae. In that case, as in nouns, the first mora of the inflectional suffix surfaces as H and the second as L. (3) illustrates.

- (3) Melodies on derived words consisting of verb root plus subject agreement suffix
  - a. HH + 1 $\mu$  suffix: *áí-kò* (eat-3.SG.F.PRS.DECL) 'she eats'
  - b. HL + 1 $\mu$  suffix: *néè-kò* (prepare-3.SG.F.PRS.DECL) 'she prepares'
  - c. LL + 1 $\mu$  suffix: *dʒòò-kò* (work-3.SG.F.PRS.DECL) 'she works'
  - d. LL + 2 $\mu$  suffix: *dʒòò-áò* (work-3.SG.F.PST.DECL) 'she worked'

There are many inflectional and derivational verbal suffixes other than agreement. These suffixes appear between the verb root and the obligatory subject agreement suffix. Tonally, most verbal suffixes behave like nominal suffixes. That is, they surface as L, except in the case that (a) the verb root is LL, (b) the first mora of the suffix is the first non-root mora in the word, and (c) the complete suffixal string contains at least four moras (though (c) is trivial for verbs because of their morphotactic requirements). In this case, as again in nouns, the first mora of the suffix will surface as H, as shown in (4c). Note that in (4), and all subsequent verb tone examples, the verb roots display the same tones as in isolation.

- (4) Melodies on derived words consisting of verb root, non-agreement suffix, and present tense declarative subject agreement suffixes

- a. HH: *kíá-hài-dzì* (tell-MOT:go.and-PL.PRS.DECL) 'we/y'all/they go and tell'
- b. HL: *táá-hài-dzì* (bury-MOT:go.and-PL.PRS.DECL) 'we/y'all/they go and plant'
- c. LL: *kòkò-hái-dzì* (cook-MOT:go.and-PL.PRS.DECL) 'we/y'all/they go and cook'

Two verbal suffixes, the clausal negative suffix *-ma* and the perfective suffix *-hō*, have exceptional tonal properties. Like the tonally typical suffixes shown in (4), these suffixes appear between the verb root and the subject agreement suffix. Unlike them, they surface with H tone regardless of the melody of the root. Furthermore, if they are immediately followed by a *present or past tense, declarative mood* subject agreement suffix, they spread their H tone to all morae of the suffix (although, morphotactically, it is unusual for *-hō* to be followed by a subject agreement suffix). (5) exemplifies the H-spreading behavior of *-ma* and *-hō* with words which bear *-ma* followed by a present tense, declarative mood subject agreement suffix.

- (5) Melodies on derived words consisting of verb root, *-ma* negative, and present tense declarative subject agreement suffixes
  - a. HH: *áí-má-dzì* (eat-PL.PRS.DECL) 'we/y'all/they do not eat'
  - b. HL: *néè-má-dzì* (prepare-PL.PRS.DECL) 'we/y'all/they do not prepare'
  - c. LL: *dzòdò-má-dzì* (work-PL.PRS.DECL) 'we/y'all/they do not work'

*-ma* and *-hō* can surface as H and spread H only to immediately adjacent subject agreement suffixes. Moreover, they can only *surface* as H when the verbal word includes a present or past tense, declarative mood subject agreement affix. Different behavior obtains when the word includes any interrogative mood subject agreement affix; a future declarative subject agreement affix; or any of the language's numerous nominalizing and subordinating affixes. In verbs which contain these suffixes, *-ma* and *-hō* behave like typical verbal suffixes. They surface as L -- except if the mora of the affix is the first mora following an LL root, in which case it surfaces as H -- and, regardless of whether they are surface L or surface H, they have no effect on the tone of following morphemes. (6) illustrates this behavior with combinations of the negative and a present tense, interrogative mood subject agreement suffix.

- (6) Melodies on derived words consisting of verb root, *-ma* negative, and present tense interrogative subject agreement suffixes
  - a. HH: *áí-mà-dzì* (eat-PL.PRS.INT) '(why) aren't we/y'all/they eating?'
  - b. HL: *jàà-mà-dzì* (steal-PL.PRS.INT) '(why) aren't we/y'all/they stealing?'
  - c. LL: *dzòdò-má-dzì* (work-PL.PRS.INT) '(why) aren't we/y'all/they working?'

Compounds display different tonal behavior than either non-compound nouns or verbs. Compounding is extremely productive in Máíhīki, and it is possible to compound together two noun roots, two to four verb roots, or a verb stem followed by a noun root. In a nominal compound or a verb-noun compound, the first root element appears with the same tone found in isolation. All non-first elements, however, behave exactly like nominal suffixes (2) or typical verbal suffixes (4). That is, they surface as L, except that the first mora of a non-first compound element surfaces as H if it is the first mora following an LL root in a word of at least four morae. For reasons of space and relevance, I do not discuss the tone behavior of verb-verb compounds here.

### 4.3.2 Underlying tones

We can group the word class- and morpheme class-specific tone phenomena above into two categories. In one category of morphological constructions, all morphs which are not the first (i.e. root) morph in the prosodic word surface as L, except that the mora immediately to the right of an LL root surfaces as H if at least one mora follows. The constructions belonging to this category are: all nouns, including noun-noun compounds, verb-noun compounds, and nominalizations; all adverbs; verbs in the future declarative; all verbs in the interrogative; and all subordinate verbs.

The other category of constructions consists of verbs in the present and past declarative. In these constructions, two affixes, *-ma* and *-hō*, surface as H and spread their tone to subject agreement affixes, but all other affixes behave as in the other category of constructions. Following Inkelas & Zoll (2005), I term this category of constructions the present/past declarative cophonology. The other, much larger category of constructions is the default cophonology.

With these terms in hand, we can analyze the surface facts very simply as follows. The three surface tone classes of roots represent three underlying tone classes: surface HH is underlyingly HH, surface LL is underlyingly LL, and surface HL is underlyingly toneless. All nominal suffixes are underlyingly toneless, and so are all verbal suffixes except for *-má* and *-hó*, which are underlyingly H. In the present/past declarative cophonology, *-má* and *-hó* are allowed to retain their high tones. In the default cophonology, they are not, because the tones of all morphs that are not first in the prosodic word are deleted.

Toneless morphs -- whether underlyingly toneless or toneless because their tones have been deleted -- surface with an H on the first mora just in the case that this creates an HL sequence that is separated from the left edge of the word only by root material. Otherwise, they surface with L due to default tone assignment. This generalization, in combination with the claim that suffixes other than *-má* and *-hó* are toneless, captures the behavior of these suffixes following roots of each class. They are L following HH roots to create an HL sequence over the second root mora and first suffix mora, and H following LL roots, where another L mora follows, to create an HL sequence over the first and second suffix morae. Toneless suffixes are L following surface HL roots because the root melody achieves the HL target, and L following surface LL roots when no additional mora follows because becoming H would not achieve this target. The generalization also captures the behavior of surface HL roots. These are analyzed as underlyingly toneless because the word-level HL effect is sufficient to generate their melody.

One way to summarize this analysis is to say that the language has lexical tone on roots and a handful of suffixes, and displays high-ranked faithfulness to root tones and (in one cophonology) to suffix tones. Surface tones on all other elements, on the other hand, result from word-level processes that (a) aim to create an HL sequence aligned to the left edge of the prosodic word and (b) assign default L tone. Farmer & Michael (submitted:30-35) model this analysis in Optimality Theory using a high-ranked ALIGN-L(HL,Word) constraint to achieve both the quasi-obligatoriness of the HL sequence and its attraction to the left edge of the prosodic word.

### 4.3.3 Prosodic minimality

Like most Tukanoan languages, Máihiki displays a bimoraic Minimum Word Requirement (MWR). The only words of the Northern variety that escape the MWR are three monomoraic singular

personal pronouns: *dʒì* 1SG, *mì* 2SG, and *í* 3SG.M. (In the Western variety, only *dʒì* and *mì* are monomoraic; the correspondent of *í* is bimoraic, *ũ*.)

In addition to the bimoraic MWR, the language also exhibits a bimoraic (C)V(C)V template for roots. I am aware of only one verb root that fails to conform to the bimoraic template, *dè̀d̀dʒì* 'be delicious' (< *dè̀d̀* 'be good'). Although noun and adverb roots display more variation in size, most trimoraic and larger nouns and adverbs either (a) appear to be diachronically derived from morphologically complex words or (b) are onomatopoeic (for example, many three- and four-mora bird names are imitations of bird cries). Trimoraic and larger roots always display tone patterns that would be licit on morphologically derived words of the same moraic size.

Máíhiki has relatively little derivational morphology other than compounding. As a result, there is a close relationship between canonical root size, the morphotactics of each word class, and the most token-frequent sizes of words in that class in non-poetic speech. Since most noun roots are bimoraic, the most frequent nominal affixes are monomoraic, and nouns typically have zero to one affixes, most tokens of (non-compound) nouns are bimoraic or trimoraic. Likewise, since almost all verb roots are bimoraic, the most frequent verbal affixes are monomoraic, and verbs typically have exactly one affix, most tokens of (non-compound) verbs are trimoraic. There is no evidence of a prosodic maximality constraint.

#### 4.3.4 Morphosyntactic profile

As the morphology discussed in §§4.3.1-4.3.3 suggests, the morphological profile of Máíhiki is fusional, with some head- and some dependent-marking properties. Finite verbs obligatorily bear affixes that fusionally expone the subject features of person, number, and noun class; tense; and interrogative vs. declarative sentential mood. Nonfinite verbs bear affixes that expone a reduced number of subject features, without tense or mood. In Northern Máíhiki, the perfective affix *-hō* typically replaces subject agreement in finite verbs; it does not replace the agreement affixes on nonfinite verbs. Most nouns are obligatorily affixed with noun classifiers, which appear on demonstratives, pronouns, numerals, and relative clauses in addition to referential nouns. Nouns that appear in non-subject syntactic roles also bear the non-subject case marker *-re*, modulo extensive differential object marking (Farmer 2015:93-97); this indicates a nominative-accusative alignment.

The information-structurally least marked constituent order, and the only constituent order in embedded clauses, is SOV. In discourse, however, the constituent order is very free. The order of constituents within the noun phrase is less free. Most modifiers precede the noun, while relative clauses follow the noun. As in many Northwestern Amazonian languages, spontaneous discourse is hypotactic, displaying many more subordinate clauses than finite clauses. Song is especially hypotactic, with many songs in my corpus composed exclusively in subordinate clauses.

## 5 The form of *dà̀*

This section examines the properties of *dà̀* as a poetic form. I begin in §5.1 with a pretheoretical definition of the line in this genre. In the following three sections, I employ this definition to analyze aspects of the structure of *dà̀* at and above the level of the line. §5.2 shows that lines are organized into stanzas (couplets and tercets) by means of exact lexical parallelism. §5.3 and

§5.4 then turn to meter in the strict sense -- the internal prosodic structure of lines. §5.3 addresses the role of prominence in the meter of *dàì*, arguing that it displays a violable requirement for the alignment of phonological high tones with both edges of the line. §5.4 addresses size. This section demonstrates that *dàì* displays a novel type of size meter which regulates the size of prosodic words rather than the size of feet and/or lines.

Given these analyses of size and prominence effects, §5.5 then considers the place of *dàì* within the typology of meters defined in §3. It suggests that *dàì* fills two gaps in this typology. First, *dàì* constrains size and prominence over different constituents -- the prosodic word for size, the line for prominence. Second, the meter constrains size over a sub-linear constituent, the prosodic word, while neglecting the size of lines.

## 5.1 Lineation

All *dàì* performances are divided into lines. Three attributes identify the line as a unit: the line begins, and may also end, with a sequence of free-word vocables; it ends with a breath; and it displays specific tone sequences at each edge. I discuss the free-word vocable and breath component of the definition of line in this section, and the tone component in §5.3.

All lines are syntactically and semantically coherent units, with no enjambment of clauses across line boundaries. Although there is no lexical item translatable as 'line' in Máíhiki, the lineation of *dàì* was clearly salient to my consultants. They quoted and reperformed sections of song only in complete lines, and they frequently corrected me on misplaced line boundaries.

The distribution of vocables is crucial in defining the line. *Dàì* display two types of vocables: free-word vocables and vocable affixes. Free-word vocables are a closed class of five items which display the prosodic behavior of independent words. All free-word vocables in Máíhiki obey the phonotactic constraints governing roots in the language (§4.3.1, 4.3.3). Consequently, free-word vocables are phonologically well-formed words. Vocable affixes are a closed class of two items, *-ma* and *-mani*, which display the morphological and prosodic behavior of affixes (§4.3.1).

Free-word vocables occur exclusively at the beginning and end of the line. The great majority of lines in the corpus, 187 of 254 (74%), begin with a sequence of free-word vocables, then continue with a string of referentially contentful words, some of which may bear vocable affixes. In (7a), which exemplifies this type of line, the initial string *hũ̀ négì nées déè nées* is made up of free-word vocables, while the remainder of the line consists of referentially contentful words, some with vocable affixes. In 47 (19%) of the lines in the corpus, almost all of them in Federico's performances, the phrase of referentially contentful words is then followed by a sequence of free-word vocables, so that free-word vocable sequences bookend the referentially contentful words of the line. (7b) provides an example of this type of line. Finally, the corpus also contains six lines which have a final sequence of vocables but no initial sequence of vocables.

(7) Lines with initial free-word vocables, free-word vocables underlined

a. Line with an initial sequence of free-word vocables

*hũ̀ négì nées déè nées* *dzáémà ákwémìà míàbì tóémà dzádzákì dzòòhě́ í*

*hũ̀ négì nées déè nées dzáé -ma ákwé -mìa -mìa -bi tóémé*

POET *B.caapi* -POET fruit -CLF.PL:unit -CLF.PL:unit -CLF:unit fall

*-ma dzádzá -ki yòò -hĩ í*

-POET go.out.light -SUB.NF 'do' -3SG.NF.PRS 3SG.M

Paraphrase: *dzáákwèmià tómedzázákì dzòòhì*  
 'The fruits of *Banisteriopsis caapi* fall and (their lights) go out' (ARS, cca 1:26)

- b. Line with initial and final sequences of free-word vocables, bookending referential words

*hũ tēē négì déē tēē négì négì nēē déē nēē m̀rém̀à h̀t̀m̀ánì ǹk̀ák̀ò, ǹs̀ém̀ànì k̀át̀m̀ánì*  
*ǹk̀ák̀òr̀è, ǹs̀ém̀ànì k̀át̀m̀ánì ǹk̀ák̀òr̀è, tēē négì négì nēē déē nēē*

*hũ tēē négì déē tēē négì négì nēē déē nēē m̀ -ré -m̀à h̀t̀t̀ -mánì ǹk̀á*  
 POET 2SG -NON-SJ -POET hand -POET stand

*-k̀ò ǹs̀é -m̀ànì k̀át̀t̀ -mánì ǹk̀á -k̀ò -r̀è ...*

-SUB.F grab.PLACT -POET hide -POET stand -SUB.F -NON-SJ ...

*tēē négì négì nēē déē nēē*

POET

Paraphrase: *m̀ h̀t̀t̀r̀è ǹk̀ák̀ò, ǹs̀ék̀át̀t̀ǹk̀ák̀ò*

'When, grabbing and grabbing with your hands, you (familiar spirit) hide standing up'  
 (FLA, fc2 1:57)

While free-word vocables occur only at line edges, it is not obligatory for every line to begin with a sequence of free-word vocables. 41, or 16%, of the lines in the corpus consist only of referentially contentful words, as in (8a). Similarly, 19 lines, or 7% of the corpus consist only of free-word vocables, like (8b). Both of these types of lines make it impossible to use the onset of a sequence of free-word vocables as the sole criterion for identifying a line break. For lines like (8a), the placement of free-word vocables is uninformative because there are none; for lines like (8b), because there is no principled way, absent reference to other criteria, to establish the boundary between the end of a line consisting only of vocables and the beginning of a line with an initial vocable sequence.

(8) Lines where free-word vocable placement is uninformative

- a. Line consisting only of referentially contentful words

*dzádzásàni hàr̀ùk̀ì ỳò̀òk̀í̀r̀è jíàm̀à h̀é̀á̀k̀ì*

*dzádzá -sani hàr̀ù -ki ỳò̀ò -ki -re jíà -ma -h̀é̀á*  
 go.out.light -MOT:go.and sit -SUB.NF 'do' -SUB.NF -NON-SJ see -POET -PFV.PLACT  
 -ki

-SUB.NF

Paraphrase: *dzádzásàni hàr̀ùk̀ì ỳò̀òk̀í̀r̀è jíàk̀ì*

'When I see as (the light) goes and goes out, then drifts down' (ARS, cca 1:32)

- b. Line consisting only of free-word vocables

*tēē nēē déē nēē tēē négì déē nēē déē nēē*

(no referential content) (ARS, mnb 0:18)

In addition to free-word vocable sequences, then, line breaks must also be defined by reference to breaths. Controlling the rate of airflow over the course of a line is a significant part of ability in *d̀ài*, for performers are not permitted to inhale or pause during the performance of a line. Instead, they take a loud, very extended breath in at the close of each line. The units which

the consultants intuitively treated as lines -- that is, which they found appropriate to quote or reperform in isolation -- correspond exactly with the intervals defined by breaths.

The discussion of supralinear organization and prominence in §§5.2 and 5.3 below will adduce further evidence for the line as a crucial constituent in the parallelisms found in song and as a metrical constituent. Even prior to this evidence, though, the line can be informally defined based on the placement of free-word vocables and breaths as shown in (9).

(9) Initial definition of line

A line is an interval of song which:

- a. ends in a breath, and
- b. includes no sequences of free-word vocables which are both preceded and followed by referential words.

## 5.2 Supralinear organization

All song lines are arranged into either couplets or tercets (groups of three lines). Couplets and tercets are characterized by the use of exact lexical parallelisms and syntactic parallelisms between the referentially contentful words of the lines. (10) displays an excerpt of six lines from a song composed entirely in couplets. Phrases which constitute exact lexical parallelisms between the lines of each couplet are placed in parentheses; free-word vocables are omitted.

(10) Couplets with exact lexical parallelisms (ARS, cca 0:10-1:05)

Line 1. [22 $\mu$  vocables] (*dzáémà túkùmà ǔ̀k̀k̀*) (*sákámà míámà dzádzák̀*) (*dzòðh̀́ ǐ́*)  
When (the *B. caapi* star) (repeatedly leaps down, sheds light, and goes out) (POET)

Line 2. [12 $\mu$  vocables] (*dzáémà túkùmà ǔ̀k̀k̀*) (*sákámà míámà dzádzásà̀ǹ*) *hà̀r̀ù̀k̀k̀* (*dzòðh̀́ ǐ́*)  
*m̀r̀è̀é*  
When (the *B. caapi* star) (repeatedly leaps down, sheds light, goes and goes out,) as  
it settles on you (POET)

Line 3. [12 $\mu$  vocables] *m̀m̀* (*h̀́t̀m̀*) (*m̀á̀ǹà̀r̀è̀*) (*sákámà míámà dzádzák̀*) (*dzòðh̀́ ǐ́*) *m̀r̀è̀é*  
When on your arms (it repeatedly leaps down, sheds light, and goes out) (POET) on  
you

Line 4. [24 $\mu$  vocables] *m̀á̀m̀* (*túkùmà ǔ̀k̀k̀*) (*sákámà míámà dzádzák̀*) (*dzòðh̀́ ǐ́*)  
When the people's/our star (repeatedly leaps down, sheds light, and goes out) (POET)

Line 5. [12 $\mu$  vocables] (*dzáémà ákwém̀*) (*m̀íá̀b̀*) (*tómém̀*) (*dzádzák̀*) (*dzòðh̀́ ǐ́*)  
When (the fruits of *B. caapi*) (fall, their lights going out) (POET)

Line 6. [10 $\mu$  vocables] (*dzáém̀*) (*ákwém̀*) (*m̀íá̀b̀*) (*tómém̀*) (*dzádzák̀*) (*dzòðh̀́ ǐ́*)  
When (the fruits of *B. caapi*) (fall, their lights going out) (POET)

In the first and third couplets of (10), the first and second lines are nearly identical. In the first couplet, the referential-word portion of line 2 differs from line 1 only in that a different form of the verb *dzádzá* 'go out, be extinguished' is used and two contentful words are added; in the third couplet, composed of lines 5 and 6, the referential-word portions of the lines are completely identical. The only linguistic difference between lines 5 and 6, and the chief difference between lines 1 and 2, is the number and identity of the vocables appearing in the line-initial free-word vocable sequence. (11), to make these parallelisms explicit, redisplay the excerpt in (10) in schematic form.

(11) Couplets with exact lexical parallelisms, in schematic form (ARS, cca 0:10-1:05)

- A. *dzáémà tókùmà ìíkì* (A': *máímà tókùmà ìíkì*)
- B. *sákámà míámà dzádzákì*
- C. *dzòòhè í*
- D. *dzáémà ákwémà míábì*
- E. *tómémà dzádzákì*

Line 1. [22 $\mu$  vocables] A B C

Line 2. [12 $\mu$  vocables] A B *hàrùkì* C *mìrèé*

Line 3. [12 $\mu$  vocables] *mìmà hùtìmà mánàrè* B C *mìrèé*

Line 4. [24 $\mu$  vocables] A' B C

Line 5. [12 $\mu$  vocables] D E C

Line 6. [10 $\mu$  vocables] D E C

While exact parallelism between the lines of a couplet is common in the corpus, it is not obligatory, as lines 3 and 4 of the excerpt illustrate. This couplet displays exact parallelism only for the verb phrase, *sákámà míámà dzádzákì*, and the line-final poetic formula *dzòòhè í* (and it is for this reason that these phrases are parenthesized separately from the noun phrase in lines 1 and 2). The initial noun phrase is not lexically or syntactically parallel between lines 3 and 4. Likewise, the initial phrase in line 3 is not parallel with any earlier phrase in the song, although the initial phrase in line 4 is syntactically parallel with the initial phrases of lines 1 and 2.

This reflects another feature of the supralinear organization of *dàì*. Even in couplets that do not display exact lexical parallelism between lines, typically only the first line introduces phrases which are not lexically or syntactically parallel with earlier lines. The second line, rather than introducing non-parallel phrases, then is either parallel with some preceding line outside the couplet, as with line 4 of (10), or consists of repetitions of a new 'part-line,' or unit of parallelism, introduced in the first line.

Furthermore, even the new part-lines introduced in the first line of a couplet tend to display some measure of parallelism with earlier part-lines. For example, line 5 of (10) introduces a noun phrase, *dzáémà ákwémà míábì*, and a verb phrase, *tómémà dzádzákì*, which have not previously appeared in the song. Although some of the lexical material in these phrases is new, both of them display syntactic parallelism and partial lexical parallelism with an earlier part-line consisting of a phrase of the same syntactic category. The noun phrase is a compound with the root *dzáé* 'B. *caapi*' as the first component, like the initial noun phrase of lines 1 and 2; the verb phrase is a serial verb



with the root *dzádzá* 'be extinguished' as the final component, like the contentful verb phrases in all of lines 1-4. Note that these parallelisms, as well as the parallelisms in line 1-4, operate on syntactic constituents such as roots (in line 5), nominal compounds, and verb phrases. The genre never creates parallelism through repetition of a string that is not a syntactic constituent, such as a nominal classifier followed by a verb root.

Lexical and syntactic parallelism is a crucial feature of this genre. Much as meter constitutes a poetry-specific overlay on the phonology of a language, parallel structures like those found in *dàì* represent an additional, poetry-specific set of constraints on its syntax and suprasentential organization. It is appealing to formalize the important role of parallelism by revising the definition of line given in (9) to include the criterion that parallelisms operate across lines, rather than other constituents. Not all lines in the corpus, though, participate in parallelism. For example, lines which consist entirely of free-word vocables, such as (8b), cannot be described as lexically or syntactically parallel with lines that contain referential words. Likewise, it is impossible to evaluate the first line of a song as participating or failing to participate in parallelism.

I therefore treat parallelism as a property of well-formed lines rather than as a criterion for lineation. In (12) and subsequent modifications of it, (a) gives the exceptionless definition of line and (b) states the metrical requirements on lines, which are exceptional (since *dàì* performances, like all poetry, include lines that are not perfectly well-formed).

(12) Definitions of line and well-formed line

- a. A line is an interval of song which:
  - i. ends in a breath, and
  - ii. includes no sequences of free-word vocables which are both preceded and followed by referential words.
- b. In a well-formed line:
  - i. All words can be parsed into part-lines, defined as phrases which are lexically or syntactically parallel with at least one other phrase token in the song.

Under the definition of line in (9), the median song in the corpus is 10 lines long. The shortest song is 6 lines long, and the longest is 25 lines.

### 5.3 Meter: Prominence

Both edges of the line as defined in (9) and (12) display a characteristic tonal contour. The left edge of the line tends to align with a lexical HL sequence, and the right edge with an LH sequence, as in (13). Both the HL and the LH sequences must be realized over two morae, in keeping with the ban on contour tones on monomoraic vowels in the phonology of spoken Máìhiki.

(13) Line with initial HL and final LH

*hũ tēē déè nēè m̀nì m̀nì ásókì dzòòh̃́ ǐ*

<i>hũ</i>	<i>tēē</i>	<i>déè</i>	<i>nēè</i>	<i>m̀nì</i>	<i>-rè</i>	<i>-mà</i>	<i>h̃̀kà</i>	<i>-kì</i>	<i>m̀nì</i>	<i>m̀nì</i>	<i>m̀nì</i>
POET		2SG	-NON-SJ	-POET	speak	-SUB.NF	intoxicate.SEQ	intoxicate.SEQ	hit.SEQ		
<i>ásó</i>		<i>-kì</i>	<i>yòò</i>	<i>-h̃̀</i>	<i>ǐ</i>						
make.perceive		-SUB.NF	'do'	-3SG.NF.PRS	3SG.M						

Paraphrase: *mìrè mánì mánì ásókì*

"When (*íkò*, a hallucinogen derived from *Brunfelsia* spp.) intoxicates you, strikes (you), makes (you) perceive (visions)" (ARS, ac# 0:28)

212 (83%) of the lines in the corpus have an initial HL sequence. The alignment of HL contours with the left edge of the line is epiphenomenal, however, on two more general facts. First, 73% of lines in the corpus begin with a free-word vocable, and all free-word vocables are HL. This is responsible for the line-initial HL in (13). Second, the phonology of spoken Máihiki displays a high-ranked constraint which causes HL sequences to align with the left edge of the prosodic word (§4.3.2; Farmer & Michael submitted: 30). Even in the case that a line begins with a referential word, the activity of this constraint means that the word, and therefore also the line, is very likely to display an HL sequence by the third mora.

155 (61%) of the lines in the corpus have a final LH sequence. This raw number is depressed by the fact that, because all free-word vocables are HL, it is not possible to create a final LH sequence in a line that ends with a sequence of free-word vocables (19% of lines in the corpus). Excluding lines that end with free-word vocables, 75% of lines in the corpus display line-final LH. Note that, despite the absence of strictly line-final LH in lines ending with free-word vocables, 14 of the 47 such lines in the corpus display an LH sequence over the final two morae before the free-word vocables, suggesting that the final LH target is still present in lines with a final free-word vocable sequence.

While the alignment of HL sequences with the left edge of the line echoes the phonology of spoken Máihiki, the alignment of LH sequences with the right edge of the line is bizarre by comparison to all non-poetic phonology. The lexical phonology of the spoken language displays a conspiracy against LH sequences: LH never occurs word-finally, is never the underlying melody of a root, and can never appear over a single morpheme (root or affix) (§4.3.1; Farmer & Michael submitted:28, 36). The postlexical phonology can generate word-final LH in only one environment, namely when a trimoraic /LL-Ø/ word immediately precedes a pause or another LL-initial word. This environment is never the source of line-final LH in song.

The alignment of LH sequences with the left edge of the poetic line, therefore, can only be understood as a genre-specific -- that is, metrical -- prominence requirement. (14) modifies a portion of the definition of line from (12) to include the line-final LH requirements. Since the corpus contains lines that do not end in LH, this requirement is a constraint on well-formed lines rather than a criterion for identifying lines.

(14) Definitions of line and well-formed line

b. In a well-formed line:

- i. All words can be parsed into part-lines, defined as phrases which are lexically or syntactically parallel with at least one other phrase token in the song.
- ii. The final two morae are LH.

Given the ban on word-final LH in the spoken phonology, there are only two logically possible ways that singers can meet the meter's requirement for line-final LH. One is to end the line with an L-final word followed by a monomoraic H word. This option does not necessarily violate the spoken language's phonology, since L-final words and monomoraic H words exist in the spoken register. The other LH-creating strategy is to end the line with material that is not lexically LH, but apply some phonological process which changes that material to LH. This option inherently

violates the spoken language's phonology, since it must involve either the creation of a word-final LH (if the two morae that gain the LH belong to the same word) or change of an underlyingly L monomoraic word to H.

Both of the possible strategies for creating line-final LH -- appending a monomoraic H word to the end of the line, and applying poetry-specific phonological processes -- are attested in the corpus. I discuss the two strategies, in this order, below.

### 5.3.1 Line-final LH formed with L-final word and *í*

As mentioned above, it is logically possible to create a line-final LH without creating a word-final LH by ending the line with an L-final word followed by a monomoraic H word. Monomoraic words are extremely scarce in the lexicon of Máihiki, however, because of the language's bimoraic minimum word requirement (§4.3.3; Farmer 2015: 20). The only words in the language which escape the MWR are the monomoraic singular pronouns, and only one of these, *í* ~ *ni*, is lexically H. Consequently, all cases of line-final LH occurring over two words in the corpus involve the use of an L-final word followed by *í*. There are no examples in the corpus in which other referentially contentful words are altered to be monomoraic and H and used in line-final position.

Uses of *í* to create a line-final LH contour fall into two classes. In 43 of the 53 line-final uses of *í* in the corpus, *í* appears as part of the poetic collocation *dzòðhè í* 'he does (it)'. This collocation, which is used only line-finally, creates an LH over the final, lexically L mora of *dzòðhè* and the single, H mora of *í*. (15), repeated from (13), provides an example of the line-final use of *dzòðhè í*. The remaining 10 line-final uses of *í* create an LH contour over the final, lexically L mora of a contentful word other than *dzòðhè* and the H mora of *í*. (16) provides an example of a use of *í* to create line-final LH without the *dzòðhè í* collocation.

- (15) Line-final LH created by poetic collocation *dzòðhè í*  
*hî tée déè nées mîni mání ásókì dzòðhè í*

*hî tée déè nées mî -rè -mà hîkà -kì mîni mání ásó*  
 POET 2SG -NON-SJ -POET speak -SUB.NF intoxicate.SEQ hit.SEQ make.perceive  
 -kì yòð -hè í  
 -SUB.NF 'do' -3SG.NF.PRS -3SG.M

Paraphrase: *mîrè mîni mání ásókì*

'When it (a hallucinogen derived from *Brunfelsia* spp.) intoxicates you, strikes (you), makes (you) perceive (visions)' (ARS, ac# 0:28)

- (16) Line-final LH created by collocation of other L-final word and *í*  
*hî tée négì négì déè nées mááhàimà sàkò sàkòrèbà hîkàkì títimání dzádzákì í*

*hî tée négì négì déè nées máá -hài -mà sàkò sàkò -rèbà hîkà -kì*  
 POET red -CLF:property -POET splinter splinter -real talk -SUB.NF  
 títi -mání dzádzá -kì í  
 catch.on.fire -POET go.out.light -SUB.NF 3.SG.M

Paraphrase: *mááhàisàkò títdzádzákì*

'When it (vessel piloted by familiar spirit) has its red splinters (i.e. blowgun darts, source of magical power) burst into flame and (then) go out' (ARS, gec 2:00)

In the spoken register, *í* and *dʒòðhè í* are referentially contentful: *í* is the 3SG.M pronoun, and *dʒòðhè í* is a potentially complete sentence meaning 'he does (it), he works on (it)'. I have therefore represented these elements as referentially contentful in the glosses of (15) and (16). Yet in both of these examples, *í* and *dʒòðhè í* are omitted from the speaker's spoken-register paraphrase of the line, given below the gloss. Additionally, the speaker's Spanish translations of these lines contain nothing corresponding to *(dʒòðhè) í*. The absence of this material in both monolingual paraphrase and translation suggests that, even though line-final *(dʒòðhè) í* is string-identical to referentially contentful material, it does not contribute referential content in song. Line-final *(dʒòðhè) í* also appears in song in contexts where the 3SG.M pronoun would be semantically infelicitous, for example in discourses where there is no previously mentioned or salient 3SG.M referent -- further evidence that it is bleached of referential content.

These facts suggest that line-final *(dʒòðhè) í* and the phonologically identical referential phrase represent different lexical entries. Line-final *(dʒòðhè) í* is a string which is inserted solely to fulfil the metrical requirement for a line-final LH sequence. Like free-word vocables that are homophonous with roots, it has indexical content, indexing that the discourse participates in the *dàì* genre, but no referential content. And again like a free-word vocable, line-final *(dʒòðhè) í* is subject to syntactic restrictions arising from the poetic form -- it must be line-final -- but not to the semantic and syntactic restrictions which apply to referential words, including the referential phrase *(dʒòðhè) í*. Because of these similarities, in §6 I treat line-final *(dʒòðhè) í* as a free-word vocable rather than as a special poetic use of the homophonous referential phrase.

### 5.3.2 Line-final LH formed by poetry-specific phonological processes

Performers can also use phonological strategies, as well as the lexical strategy of line-final *(dʒòðhè) í*, to create line-final LH. Two poetry-specific phonological processes derive line-final LH: high tone insertion, and simultaneous reduplication of the line-final mora and insertion of a high tone. Combined, these phonological strategies are responsible for 102 (66%) of the 155 line-final LH tokens in the corpus, while collocations with *í* create 53 tokens (34%).

H insertion applies to a line-final mora which (a) immediately follows an L tone generated by the spoken language phonology within the same prosodic word, (b) has no underlying tone, and (c) does not belong to a root. A mora in this environment must realized as L in the spoken language's phonology. H insertion deletes (or blocks the assignment of) the mora's spoken-phonology L tone and assigns it an H instead. (17) exemplifies the process. In the spoken language phonology, the second mora of the bare non-subject form of the 1.SG pronoun *dʒìrè* must be L, but in (17), it is realized as H to create a word-final LH contour.

(17) Line-final LH created by H insertion

[10 $\mu$  vocables] *ákì dábíjànàmàjà bákìnàbì dʒìré*

*ákì dábí -jàjà -màjà báá -kì -nà -bì dʒì -ré*  
 foreigner sorcery -CLF.PL:pointed -DIM.INM.PL have -CLF:M -ANM.PL -INFO 1.SG -NON-SJ

Paraphrase: *ákì dábíjànàmàjà bákìnàbì dʒìré*

'To me, those who have the blowgun darts of non-indigenous/non-Tukanoan people' (ARS, ene 0:39)

In some cases of H insertion, the poet reduplicates the line-final mora in addition to inserting a poetic H. The first mora in the base-reduplicant sequence is realized as L, and the second as H. This process occurs in the final word of (18), realized as *mìrè* in the spoken phonology but [mìrèé] in this line-final use in song.

(18) Line-final LH created by line-final mora reduplication with H insertion

[12 $\mu$  vocables] dzáémà tókùmà ǐkì sákámà míámà dzádzásàni hàrùkì dzòòhǐ í mìrèé

dzáé -mà tókù -mà ǐ -kì sáká -mà míá -mà dzádzá  
*B.caapi* -POET star -POET say -SUB.NF jump.PLECT -POET shed.light -POET go.out  
 -sàni hàrù -kì dzòò -hǐ í mì -rè -é  
 -MOT:go.and sit -SUB.NF do -3.SG.NF.PRS 3.SG.M 2.SG -NON-SJ -POET

Paraphrase: dzáé tókù sákámìàdzádzásàni hàrùkì dzòòhǐ mìrè

'When (the *B. caapi* star) (repeatedly leaps down, sheds light, and goes and goes out,) as it sits on you' (ARS, cca 0:22)

The environment of mora reduplication with H insertion is the same as the environment of regular H insertion, except that there is no requirement for an L tone immediately preceding the mora targeted by the process. This requirement is relaxed because the reduplication can create a line-final LH even if the mora preceding the target is H. For example, the word 'when he/it comes,' /dái-ki/, is HHL [dáikì] in the spoken register. In song, this word cannot be targeted by H insertion without reduplication because the penultimate mora is not L. But it can be targeted by H insertion with reduplication, yielding the form [dáikǐ], because the first mora in the base-reduplicant sequence is L, satisfying the requirement for an L on the penultimate mora of the line.

Hs due to H insertion, both with and without reduplication, are anchored firmly on the line-final mora. They never affect the preceding tones of the word, even when the mora preceding the inserted H is underlyingly toneless and is realized as L solely due to the assignment of default L tone. For example, the word /maa-hěã-kai-ki-re/ 'when, to (someone's) benefit, (sth) repeatedly falls short' contains no underlying tones. It is realized in spoken phonology as [máãhěãkàikìrè], with the root /maa/ assigned an initial H tone as the result of a word-level prosodic process, the first mora of *kai* receiving a high tone because of a morphologically specific allotony governed by the preceding morpheme, and the remaining morae assigned L tone by default (Farmer & Michael submitted:14). As the final word in a line (at ARS, ene 0:58), however, it is realized as [máãhěãkàikìrè], with an inserted H appearing on the final mora. This shows that the poetic H must be associated with the final mora as soon as it is inserted. Otherwise -- if the poetic H was inserted into the autosegmental tier following the H of *-kái* but without a ready-made association with the moraic tier -- it would associate either with one of the morae of *kai* or (if blocked by the idiosyncratic tonal behavior of that morph) with the underlyingly toneless mora of *ki*, following left-to-right tone association principles. In a stratal model, poetic H insertion must also be ordered after the assignment of default Ls, since its requirement for an L preceding the line-final mora can be satisfied by default L as well as by underlying L. Because of this, I assume in §6 that poetic H insertion belongs to a poetry-specific parophonology, akin to postlexical phonology, which applies to the output of spoken language lexical phonology to produce poetry-appropriate forms.

## 5.4 Meter: Size

While the meter of *dàì* is not periodic, it resembles periodic meters in that it constrains both size and prominence. §5.2 described the meter's prominence requirements, which apply at the level of the line. In this section, I describe the meter's size requirements and argue that they apply at the level of the prosodic word. The size constraints in this meter therefore fill an unpredicted gap in the typology of non-periodic size meters proposed in §3.

I begin with the size of lines. All periodic meters and many non-periodic meters, such as haiku and *tom yaya kange* (Rumsey 2010), regulate the prosodic size of lines. Periodic meters regulate line size by regulating the number of feet permitted per line, while non-periodic size meters count the number of non-poetry-specific prosodic units -- morae for haiku, prosodic words for *tom yaya kange* -- per line. Unlike both kinds of size meter, *dàì* does not constrain the size of lines. It is licit and common for adjacent lines, including couplets, to have significantly different mora and word counts. (19) provides an example of a couplet illustrating this generalization.

(19) Couplet with lines of mismatched size (ARS, ycz 1:09)

Line 1 *hũ̀ nêè nêgì tēè déè nêè (dzáémà bàimà máibì) (dzáémà ókómà sàgùrè) (gã̀kì kákámà dáìkì)*

*hũ̀ nêè nêgì tēè déè nêè dzáé -ma -bai -ma máí -bì dzáé*  
 POET *B.caapi* -POET -CLF:people -POET people -INFO *B.caapi*  
 -ma -ókó -ma -sagu -re *gã̀* -kì káká -ma -dai  
 -POET -water -POET -CLF:fork -NON-SJ grab -SUB.NF enter -POET -MOT:come.and  
 -kì -H  
 -SUB.NF -POET

'When *B. caapi* people come enter, holding in their hands the forked *Psychotria viridis* (lit. *B. caapi* water),'

Line 2 *hũ̀ nêè nêgì tēè déè nêè (dzáémà ókómà sàgùrè) (gã̀kì kákámà dáìkì)*

*hũ̀ nêè nêgì tēè déè nêè dzáé -mà -ókó -mà -sagu -rè *gã̀**  
 POET *B.caapi* -POET -water -POET -CLF:fork -NON-SJ grab  
 -kì káká -mà -dái -kí  
 -SUB.NF enter -POET -MOT:come.and -SUB.NF

'When they come enter, holding in their hands the forked *P. viridis*,'

By the definition in (14), both lines of (19) are well-formed, beginning with an HL sequence over the initial free-word vocable, and ending with an LH and a breath (not shown in the transcription). The couplet is also well-formed in relation to the supralinear organization, displaying exact lexical parallelism in which line 2 repeats a subset of the parallel units in line 1. The size of the lines, on the other hand, is not matched. Including the vocables, the first line of (19) contains 39 morae in 15 prosodic words, while the second contains 30 morae in 12 prosodic words. Excluding the vocables does not make the lines evenly sized. Nor can one identify constraints on line size operating above the level of the couplet, as in haiku. This genre simply does not constrain the maximum size of lines, and it constrains the minimum size of lines only insofar as a certain prosodic size is necessary to comply with the parallelism and prominence requirements (which, epiphenomenally, compel every line to contain at least 4 morae).

Rather than constraining the size of lines, the meter of *dàì* constrains the size of a non-poetry-specific constituent: the prosodic word. In a prototypical *dàì* lyric, all referentially contentful

words, across all of the lines, contain exactly the same number of morae. The number of morae per word is constant throughout a song and is either three or four. Returning to (19), for example, every referentially contentful word in the couplet consists of exactly three morae. In fact, the entire nine-line song from which this excerpt is drawn contains only six tokens of referential words which are not exactly three morae: five words of two morae and one word of four (which displays mora reduplication to derive line-final LH).

The dominance of three-mora words in the song from which (19) is drawn does not reflect bias in the language's lexicon, since Máihiki has relatively few underived trimoraic words. Instead, it reflects that the author of (19) has altered the words of the song, most of which are not underlyingly trimoraic, to fit the trimoraic requirement of the meter through use of the vocable affix *-ma*, which both adds morae and alters the location of prosodic word breaks (Skilton in press:17-19). Without the tokens of *-ma*, (19) would consist of three-, four-, five-, and seven-mora referential words, as shown in (20).

(20) (19) without vocable affixes

Line 1. [12 $\mu$  vocables] *dzáébàì*<sub>4</sub> *máìbì*<sub>3</sub> *dzáèòkòsàgùrè*<sub>7</sub> *gáìkì*<sub>3</sub> *kákádàikì*<sub>5</sub>

Line 2. [12 $\mu$  vocables] *dzáèòkòsàgùrè*<sub>7</sub> *gáìkì*<sub>3</sub> *kákádàikì*<sub>5</sub>

(21) provides a parallel example to (19) and (20) from a song composed in a four-mora meter. (21a) shows the line as actually performed by the poet, with augmentation of the referential words by vocable affixes and non-referential uses of referential morphs, as well as a poetry-specific splitting of the classifier *-ako* from the root which it classifies. With these processes, every word of the line consists of exactly four morae. (21b) then shows the line stripped of the poetic devices. Without them, the line contains only two four-mora words.

(21) Line in four-mora meter

a. Line as performed

[20 $\mu$  vocables] *sìjòísí*<sub>4</sub> *yèbèhùrù*<sub>4</sub> *ákògàmà*<sub>4</sub>, *sìjòísí*<sub>4</sub> *yèbèhùrù*<sub>4</sub> *ákògàmà*<sub>4</sub>, *tóméyèbè*<sub>4</sub>  
*sánimání*<sub>4</sub> *níkákòrè*<sub>4</sub>, *tóméyèbè*<sub>4</sub> *sánimání*<sub>4</sub> *níkákòrè*<sub>4</sub>

sìjò- ísí yèbè -huru -ako -ga -ma ... tómé yèbè  
yellow- sun flash.lightning -CLF:zone -CLF:fem -FOC -POET ... fall flash.lightning  
sání -mani níká -ko -re  
go -POET stand -SUB.F -NON-SJ

'When she of the time of the yellow sun and lightning (epithet of spirit) stands (there) as lightning goes and falls,' (FLA, fc2 1:02)

b. Line without poetry-specific elements

*sìjòísí*<sub>4</sub> *yèbèhùrù*<sub>4</sub> *ákò*<sub>6</sub> *sìjòísí*<sub>4</sub> *yèbèhùrù*<sub>4</sub> *ákò*<sub>6</sub> *tóméyèbèsání*<sub>6</sub> *níkákò*<sub>3</sub> *tóméyèbèsání*<sub>6</sub> *níkákò*<sub>3</sub>

Of the 21 songs in the corpus, nine are clearly in three-mora meter, six are clearly in four-mora meter, and six appear to be in four-mora meter but contain a sufficient number of hypermetrical words that I am uncertain of their classification. All of the clearly three-mora songs, as well as all of the songs that I am unable to classify, are performed by Adriano. All of the clearly four-mora songs are performed by Federico.

While the meter of *dàì* primarily constrains the size of prosodic words, it may also regulate the size of larger sub-linear constituents. In most songs, the part-lines -- the phrases repeated across and within lines to create parallelism -- tend to consist of the same number of prosodic words,

typically three. Because of the meter's restriction on the size of prosodic words, this means that all of the part-lines also consist of the same number of morae. For example, the song excerpted to illustrate parallelism in (10) contains a total of seven referentially contentful part-lines repeated at least once (excluding *dzòðhè í*), listed in (22).

(22) Part-lines in ARS, cca; partially repeated from (11)

1. *dzáémà túkùmà ííkì* 'the *B. caapi* star'
2. *sákámà míámà dzáádzákì* 'when it repeatedly leaps down, sheds light, and goes out'
3. *mámà túkùmà ííkì* 'the people's/our star'
4. *dzáémà ákwémìà míábì* 'the fruits of *B. caapi*'
5. *tómémà dzáádzákì* 'when it falls and goes out'
6. *dzáádzásàni hàrùkì dzòðkírè* 'when, going and going out, it settles'
7. *nìàmà hḕ̀̀kì* 'when (I) see (it)'

Five of the seven part-lines, all but 5 and 7, consist of exactly three prosodic words. In four of these -- 1, 3, 4, and 6 -- the third prosodic word has little or no referential contribution. In 4, the third prosodic word, *míábì*, consists of a repetition of the classifier from the preceding word, *ákwémìà*, and a non-referential use of the alternative focus affix *-bi*. This word is morphotactically unacceptable in the spoken register and, given that the part-line also contains another use of the classifier *-mia*, contributes no additional referential content to it. In 6, the third prosodic word is a referentially light use of the aspectual verb *dzòð*. While this construction is acceptable in the spoken register and is preserved in the poet's spoken-register paraphrases, the poet's translations suggest that this word does not alter the meaning of the part-line relative to similar lines which lack a token of *dzòð*. Finally, in part-lines 1 and 3, the poet did not preserve the final word, *ííkì* 'that which is called,' in any of his spoken-register paraphrases of the lines, indicating that it too is referentially light. In all of these part-lines, then, the poet augments phrases which contain only two referentially contentful words with a third word that is referentially light.

This augmentation suggests that poetic form, rather than referential meaning or coincidence, motivates the match in prosodic word count between the part-lines in (22). It does not, however, indicate whether parallelism or meter is responsible for the match. An analysis focusing parallelism would state that this genre's parallelism applies on two levels. At the level of line, the parallelism requires lines to be composed of repeating part-lines; at the level of the part-line, it requires part-lines to be syntactically and lexically parallel with one another. This analysis would account for the match in prosodic word count between the part-lines as an effect of a parallelism rule requiring part-lines to be identical in prosodic word count. Conversely, an analysis focusing meter would treat part-lines as metrical constituents, analogous to half-lines in alliterative meters such as the meter of *Beowulf*. It would then state violable constraints on the number of morae per prosodic word and the number of prosodic words per part-line.

A parallelism account of part-lines' match in prosodic word count has the advantage of also explaining non-prosodic similarities between part-lines, such as syntactic parallelism (e.g. between part-lines 1 and 3 and 2 and 6 above), lexical parallelism (e.g. the use of the verb root *dzáádzá* 'go out' in part-lines 2, 4, and 6 above), and parallelism in the number and position of vocable affixes. A metrical account does not capture any of these generalizations. Since the parallelism approach both accounts for more phenomena and minimizes the number of poetry-specific phonological constituents, I assume, for the purposes of the Optimality Theory analysis in §6, that the phenomenon in (22) is due exclusively to parallelism and does not represent part of the genre's abstract meter.



(23) states the constraints on the size of prosodic words, and the requirement for parallelism between part-lines, as a new clause in the definition of line, most recently given in (14). Both of these are restrictions on the form of the *song*, rather than of the line: for (i), because establishing parallelism between part-lines requires reference to multiple lines and does not require parsing the line, and for (ii), because restricting mora counts within a line does not entail restricting them across an entire song.

(23) Definition of line and well-formedness constraints on lines

c. In a perfectly well-formed song:

- i. All part-line types are lexically or syntactically parallel to at least one other part-line type.
- ii. All prosodic words consist of exactly the same number of morae.

## 5.5 Classifying the meter of *dài*

In §3, following Hanson & Kiparsky (1996), I distinguished two types of poetic meters, periodic and aperiodic. Periodic meters, following Hanson & Kiparsky's definition, require the poetic line to be composed of a fixed number of feet. They also constrain each foot to contain a fixed number of timing units (morae or syllables) and a fixed pattern of prosodic prominences. All other meters are aperiodic. Given the definition of meter proposed in §3, only two kinds of aperiodic meter are logically possible: size meter and prominence meter. Attested size meters regulate the size of metrical constituents, such as lines or feet, in terms of either morae, as in haiku and *karintaa*, or larger prosodic constituents such as words, as in *tom yaya kange*. Prominence meter regulates the number or position of prosodic prominences within the line, as in the Tohono O'Odham meters described by Fitzgerald (1998), or within sub-linear prosodic constituents, such as half-lines in Old English alliterative meters. Periodic meter differs from these types in that it regulates both size and prominence.

Where does the meter of *dài* belong in this typology? It is a meter which, like periodic meters, regulates both size and prominence: size because it constrains the prosodic size of words (§5.4), and prominence because it requires a line-final LH sequence (§5.3). *Dài* meter differs from periodic meters, though, in that it regulates size and prominence at different levels of the prosodic hierarchy. Periodic meters constrain both size and prominence at the level of the foot. *Dài* meter constrains prominence at the level of the line -- like the foot, a poetry-specific constituent -- but size only at the level of the prosodic word. While some other aperiodic meters, such as alexandrines and the meter of *Beowulf* (on the pre-Russom analysis), also regulate both size and prominence, the literature contains no examples of aperiodic meters which, like *dài*, constrain size and prominence for different constituents.

While periodic meters require size and prominence constraints that operate on the same constituents, the review of aperiodic meters in §3 shows that this coincidence of size and prominence domains is not a metrical universal. The existence of pure size and pure prominence meters indicates that the metrical mechanisms which constrain size and prominence are separate: that is, it is possible for size constraints to be active when prominence constraints are not, and vice versa. The meter of *dài* further indicates that, even where both size and prominence constraints are active in a meter, it is not necessary for them to operate at the same level of the prosodic hierarchy. In other words, the size and prominence constraints are both separate and independent.

The strongest form of this hypothesis is that the size molecule parameter and the prominence molecule parameter have no relationship -- that it is possible for any setting of the size molecule parameter to co-occur with any setting of the prominence molecule parameter. This predicts that, for instance, a verbal art form could regulate size at the level of the line but prominence at the level of the prosodic word (the inverse of *dàì*). I will explore these predictions, and whether they are typologically desirable, in §7.

## 6 Deriving *dàì* meter

This section proposes two formal analyses of the meter of *dàì* -- one using an Optimality Theoretic grammar to derive metricality via markedness constraints, and the other in the metrical grid theory of Fabb & Halle (2008), which treats metricality as faithfulness of the text to an abstract grid representation. In §6.3, I then argue that the markedness/grammar analysis of *dàì* meter is more consistent with the 'Development Hypothesis' (Fabb 2010) than the faithfulness/representation analysis.

(24) states the generalizations about the meter of *dàì* from §5 which the two analyses to follow will seek to capture. These generalizations are written for the three-mora style, but all but (a) are the same for the four-mora style. (24) does not include generalizations about parallelism, since parallelism is excluded from the definition of meter in §2.

- (24) Generalizations about the meter of *dàì*
- a. All referentially contentful prosodic words must consist of exactly three morae.
  - b. The line must end in an LH tone sequence.
  - c. A line may contain any number of morae and any number of prosodic words.
  - d. A line may contain any pattern of L and H tones prior to the line-final LH sequence.

Generative metrics offers two ways to formalize periodic meters. Early works such as Halle & Keyser (1971) and Kiparsky (1977) treat meter as arising from rules which require all syllables in a line to be parsed into feet, and all feet to conform to rules governing headedness (in the terms used here, prominence) and number of syllables (here, size). In OT, these rules are rewritten as markedness constraints. The markedness constraints are then combined with faithfulness constraints -- enforcing faithfulness to the lexical form of the text, not to the meter -- to derive meter, for instance in Getty's (2002) OT analysis of the meter of *Beowulf*. On the other hand, some more recent authors, such as Hayes & MacEachern (1998), Fabb & Halle (2008), and Blumenfeld (2015), have treated meter as arising from an abstract prosodic template, formalized as a grid. OT implementations of this theory, such as Blumenfeld (2015), then derive meter from faithfulness constraints that enforce identity between the metrical grid and the prosodic shape of the text.

On first look, it might appear that faithfulness analyses are more suitable for aperiodic meters, since they do not treat stress-based feet as the basic unit of meter. But for aperiodic meters which do not regulate line length, such as *dàì* meter and the Tohono O'odham song meter described by Fitzgerald (1998), it is in fact impossible to formulate a faithfulness analysis without seriously distorting the concept of the metrical grid. To illustrate this, I will now derive the generalizations in (24) using first a markedness, and then a faithfulness analysis.

## 6.1 *Dàì* meter as markedness

I propose to capture the first two generalizations in (24) with the five constraints in (25). The first two constraints, MINWORD and MAXWORD, capture generalization (24a) concerning the size of prosodic words. The third and fourth constraints, OBLIG(LH,Line) and ALIGN-R(LH,LINE), account for generalization (24b), on the line-final LH contour. I assume that the constraints in (25) belong to a phonological stratum which operates on the output of the poetry-specific phonological and morphological processes described in §5 -- in the terms of Blumenfeld (2015), the paraphonology and paramorphology -- and returns only an evaluation of the candidate line as metrical or unmetrical. This entails that the input to the grammar given in (26) already includes free-word vocables, vocable affixes, line-final poetic formulae, and so on.

### (25) Markedness constraints for *dàì* meter

- a. MINWORD: Referentially contentful words consist of no fewer than three morae. Assign one violation per mora that a referentially contentful word falls short of three morae.
- b. MAXWORD: Referentially contentful words consist of no more than three morae. Assign one violation per mora that a referentially contentful word exceeds three morae.
- c. OBLIG(LH,Line): The line contains at least one LH contour. Assign one violation if not.
- d. ALIGN-R(LH,Line): The LH contour is aligned with the right edge of the line. Assign one violation if not.
- e. FAITH: The output is identical to the input. Assign one violation per segment or tone different in the output and the input.

Turning to the constraint ranking, OBLIG(LH,Line) and ALIGN-R(LH,Line) are unviolated. (Although the corpus contains lines which lack a line-final LH, these lines show no apparent pattern to account for the absence of line-final LH. I assume them to be imperfectly metrical.) Violations of MAXWORD are allowed in the service of creating a line-final LH contour, for example in cases of H insertion with mora reduplication. Provided that line-final poetic *í* is treated as a vocable and not a referential word -- a choice motivated by its syntactic distribution and bleached semantics, discussed in §5.3.1 -- MINWORD is never violated to satisfy the requirement for a line-final LH contour.

This does not itself provide evidence for a high ranking of MINWORD, however, since the lexicon contains no bimoraic LH words and no monomoraic H words other than *í*. The absence of subminimal words used to create line-final LH can therefore support either a high ranking of MINWORD or a high ranking of FAITH. It is independently necessary to rank FAITH high in order to avoid deletion and epenthesis, other than the structured forms of H tone epenthesis produced by the paramorphology, in the service of OBLIG(LH,Line). I therefore rank FAITH highest and leave MINWORD ranked low, with MAXWORD. This leads to the constraint ranking in (26).


### (26) Ranking of constraints in (25)

FAITH >> OBLIG(LH,Line), ALIGN-R(LH,Line) >> MAXWORD, MINWORD

(27) shows that this grammar produces no violations for an attested line with line-final LH over the formula *dʒòòhí í*, (27a). A candidate version of the line which deletes the final *í* in the formula

and alters the text to produce line-final LH by H insertion instead, (27b), is eliminated due to its two violations of FAITH -- one for the deleted mora of  $\acute{í}$ , and another for the inserted H. This candidate does not violate any of the markedness constraints, and as such it is a metrical line of *dàì*, but it is not a possible output for this input from the parophonology and paramorphology. A similar candidate, (27c), deletes the final  $\acute{í}$  and does nothing to create a new line-final LH. This candidate is eliminated due to its violation of FAITH, but even absent FAITH, it is not an acceptable line of *dàì* because of its violation of OBLIG(LH,Line). Likewise, candidate lines which delete vocable affixes, such as (27d), are eliminated here by FAITH and also rendered unmetrical by violations of MINWORD.

(27) Evaluation of line ending in formula *dzòdòhè í*

	FAITH	OBLIG(LH,Line)	ALIGN-R(LH,Line)	MAXWORD	MINWORD
dzáémà túkùmà ííkì sákámà míámà dzádzákì dzòdòhè í					
a.  dzáémà túkùmà ííkì sákámà míámà dzádzákì dzòdòhè í					
b. dzáémà túkùmà ííkì sákámà míámà dzádzákì dzòdòhí	**!				
c. dzáémà túkùmà ííkì sákámà míámà dzádzákì dzòdòhè	*!	*			
d. dzáémà túkù ííkì sákámà míámà dzádzákì dzòdòhè í	*!				*

Now consider the line in (28) and its evaluation in the tableau in (29). This line is composed in three-mora meter, but the final word is four morae due to H insertion with reduplication.

(28) [24 $\mu$  vocables] *dzáémà gósákì dzáémà gósákì ónìmà étámà dáìkè*


dzáé -mà gósá -kì dzáé -mà gósá -kì ónì  
*B.caapi* -POET 'think' -SUB.NF *B.caapi* -POET 'think' -SUB.NF feel.strong.emotion.SEQ  
 -mà étá -mà -dái -kì -í  
 -POET move.in.circle -POET -MOT:come.and -SUB.NF -POET

Paraphrase: *dzáé gósákì, ónì étádàikè*

'When, perceiving the *B. caapi* (i.e. in visions), I wander about mourning' (ARS, aca 0:17)

Due to the line-final word, this line as performed incurs one violation of MAXWORD (29a). A candidate version of this line which deletes the final mora completely, (29b), incurs first a violation of FAITH, which causes it to lose in this evaluation, and a violation of OBLIG(LH,Line), which renders it unmetrical relative to any input. The candidate which both deletes the final mora and inserts a new H on the final mora of *dáìkí*, (29c), performs strictly worse in this evaluation than (29b) because it incurs an additional violation of FAITH, but incurs no violations of the markedness constraints. Likewise, the candidate which deletes the final mora and inserts a line-final token of the vocable  $\acute{í}$ , (28d), also incurs two violations of FAITH but no violations of the markedness constraints.

(29) Evaluation of line ending in 4-mora word

	FAITH	OBLIG(LH,Line)	ALIGN-R(LH,Line)	MAXWORD	MINWORD
dʒáémà gósákì dʒáémà gósákì ónímà étámà dáìkìí					
a.  dʒáémà gósákì dʒáémà gósákì ónímà étámà dáìkìí				*	
b. dʒáémà gósákì dʒáémà gósákì ónímà étámà dáìkì	*!	*			
c. dʒáémà gósákì dʒáémà gósákì ónímà étámà dáìkìí	*!*				
d. dʒáémà gósákì dʒáémà gósákì ónímà étámà dáìkì í	*!*				

The performance of the losing candidates (29c) and (29d) on the markedness constraints, relative to the winning candidate, raises an apparent paradox. The constructed lines (29c) and (29d) incur zero violations of the markedness constraints, indicating they are licit lines of the genre (and in fact, very similar lines to c and d occur later in the song from which this line is drawn). The real line (29a), on the other hand, incurs a violation of MAXWORD because it contains a four-mora word. Candidate (a) therefore wins over (c) and (d) only because FAITH enforces identity to the input of the evaluation, which is defined as identical to (a).

Is this tautological? No: in order to maintain a separation between meter proper and metrically-driven paraphonology and paramorphology, the input must be identical to the line as performed. The only alternative to this use of FAITH is to abandon modularity, including all of the paraphonology and paramorphology in the same grammar as the meter. The paradox shows only that -- since (c) and (d) are in some sense more metrical than (a) -- some of the operations in the paraphonology and paramorphology, such as the H insertion with reduplication that produces the line-final four-mora word in (a), must be driven by factors other than meter.

## 6.2 *Dàì* meter as faithfulness

To derive an analysis of the meter described in §5 as faithfulness to a metrical grid, one must begin by defining the metrical grid. Metrical grids are a type of bracketed grid (Hayes 1989) constructed by superimposing two or more prosodic templates, defined for different levels of the prosodic hierarchy, on one another (Fabb & Halle 2008; Blumenfeld 2015). The metrical grid therefore simultaneously implements size constraints, created by the number of metrical positions in the lowest level of the template, and prominence constraints, created by the bracketing rules and the alignment of the higher levels with the lower level.

These properties of the metrical grid create two problems for a grid-based analysis of *dàì* meter. First, traditional metrical grids have a fixed size, and lines of *dàì* do not. This means that the grid representation will need to include some mechanism for expanding the size of the line, whether through recursively defined constituents or through the inclusion of optional constituents. Second, metrical grids narrowly defined (e.g. by Blumenfeld 2015) allow the meter to regulate only the prosodic prominences that occur in the spoken language phonology: secondary word stress at the second grid level, primary word stress at the third, and so on. The prominence portion of *dàì* meter, on the other hand, regulates a prosodic sequence that never occurs in the lexical phonology of the spoken language. Consequently, to model this meter, it is necessary to use a type of metrical grid in which at least some of the levels are not tied to the prosody of the spoken language. The grid theory of Fabb & Halle (2008), which derives all non-first levels of the grid from abstract bracketing rules, is the strongest contender. Fabb and Halle's theory has the additional advantage, for the purposes, that it does not require constraints on the size of the line.

Following Fabb & Halle (2008), then, one can begin to formalize the generalizations in (24) using the grid principles in (30). Because Fabb and Halle's approach is rule-based, the principles in (30b) are stated as rules rather than Optimality Theoretic constraints.

- (30) Metrical grid rules for *dàì* meter, following Fabb & Halle (2008)
- a. Project each mora belonging to a referentially contentful word as an asterisk on Gridline 0.
  - b. Bracketing:
    - i. Gridline 0: Starting just at the right edge, insert a right parenthesis, form ternary groups, heads right.
      1. Ungrouped asterisks and incomplete groups are not permitted.
      2. All heads must be followed by a word boundary.
    - ii. Gridline 1: Starting just at the right edge, insert a right parenthesis, form exactly one binary group, head R.
      1. Ungrouped asterisks are permitted.
      2. The mora projecting to Gridline 2 must be H. The preceding mora must be L.

(30) first states the rule, modified from Fabb & Halle (2008:12), for projecting the lowest level of the metrical grid, Gridline 0, from the line (30a). (30b) then gives the principle for bracketing the morae, represented as asterisks, that are projected onto Gridline 0. Morae are bracketed into ternary groups with heads to the right (anapests). The sub-rule that heads must be followed by a word break is based on Fabb and Halle's rules for caesurae (see e.g. Fabb & Halle 2008:140). It combines with the anapestic parse to derive the restriction on the size of prosodic words. Above the lowest level of the grid, the Gridline 1 bracketing rule forms exactly one headed prosodic constituent on this line. Because the final mora of the Gridline 2 constituent is the only mora to project onto Gridline 2, (30d) can then state the line-final LH requirement in relation to the structure on Gridline 2, following Fabb and Halle's treatment of tone-based prominence requirements in Chinese and Vietnamese meters (Fabb & Halle 2008:257-260). It is important to note that the Gridline 1 rule departs from Fabb and Halle's requirement that all metrical grid rules be iterative; this problem is discussed in §6.3.

(31) shows the metrical grid projected by a real line, reproduced from (19a), per the rules in (30).

(31) Metrical grid of a line, following Fabb & Halle (2008)

Line	dʒáémà	báimà	máíbì	dʒáémà	ókómà	sàgùrè	gǎìkì	kákámà	dáikí
Gridline 0	* * *)	* * *)	* * *)	* * *)	* * *)	* * *)	* * *)	* * *)	* * *)
Gridline 1	*	*	*	*	*	*	*	*	*)
Gridline 2									*

The line in (31) contains only three-mora words, so it is evaluated as perfectly metrical by these rules. By comparison, the bracketing of Gridline 0 will crash, resulting in unmetrality, if the line contains any referentially contentful words which are not exactly three morae. Since the bracketing is not sensitive to the requirement for line-final LH, it will crash even if the unmetrically sized word is line-final and instantiates line-final LH, as in (28). Relatedly, because under (30a) nonreferential words do not project onto Gridline 0, these rules will treat a line that ends in a formulaic use of (*dʒòðhì*) *í* as lacking line-final LH and therefore unmetrical.

It is possible to resolve both of these problems at once by (a) amending the projection rule to include formulaic (*dʒòðhì*) *í* and (b) amending the Gridline 0 bracketing rule to allow a single

degenerate foot, consisting of one mora, at the right edge of the line (following the analysis of line-final degenerate feet in sprung meter suggested by Fabb & Halle 2008:87). (32) states versions of (30a) and (30b) amended to this effect.

(32) Amended metrical grid rules for *dàì* meter

- a. Project each mora belonging to a referentially contentful word or a poetic formula as an asterisk on Gridline 0.
- b. Bracketing:
  - i. Gridline 0: Starting just at the right edge, insert a right parenthesis, form ternary groups, heads right.
    1. Ungrouped asterisks are not permitted.
    2. An incomplete group is permitted just in the case that it is unary and occurs at the right edge of the line.
    3. All heads must be followed by a word boundary.

### 6.3 The markedness analysis and the Development Hypothesis

Generative metrics begins from the idea that poetry is grounded in the same principles as non-poetic language, and specifically that meter can be analyzed using precisely the same tools as the prosody of spoken language. Fabb (2010) refers to this presupposition as the 'Development Hypothesis,' the term that I use here, while Blumenfeld (2015) has more recently called it the 'Grounding Hypothesis.' The Development Hypothesis, in turn, arises from the general generative principle of minimalism, the preference to posit the smallest possible number of rules (or constraints) and units of analysis that can account for the data at hand. Because of this origin, the strongest possible form of the Development Hypothesis would hold that meters should be analyzed with reference only to the constituents of the prosodic hierarchy that appear in non-poetic language, and that poetry-specific constituents such as lines are not primitive units of analysis. While Fabb & Halle (2008:4) defend this form of the Development Hypothesis and avoid reference to lines to the greatest extent possible, other work in generative metrics does accept the line as a metrical primitive (Getty 2002; Golston & Riad 2005). It is this modified version of the Development Hypothesis that I will evaluate here.

For two reasons, the markedness analysis proposed in §6.1 is much more internally consistent, and consistent with the modified Development Hypothesis, than is the metrical grid analysis in §6.2. First, the markedness analysis supports the Development Hypothesis because all of the constraints in this analysis are analogous to constraints which are independently needed to account for non-poetry-specific phenomena in the world's prosodic systems. The two constraints used to derive the restriction on the size of phonological words, *MINWORD* and *MAXWORD*, are common constraints used to enforce prosodic minimality and maximality requirements in non-poetic phonology (see Broselow 1982 and many others for *MINWORD*, DeLacy 2008 for *MAXWORD*). In §6.1, these constraints are written to apply only to referentially contentful words, and not to free-word vocables. While free-word vocables are an unusual word class, this stipulation in the constraints is an ordinary part-of-speech effect, analogous to markedness constraints or phonotactic restrictions applying only in specific word classes.

Finally, *OBLIG(LH,Line)* is drawn from the family of *OBLIGATORINESS* constraints posited by Hyman (2006:231) to account for the obligatoriness of word stress in stress languages and of

high tone in some 'pitch-accent languages.' Hyman (2006:241-242) suggests, for example, that OBLIG(H,Word) be used to account for the obligatory appearance of at least one high tone per prosodic word in the Bantu languages Safwa and Kinga. ALIGN-R(LH,Line), likewise, comes from the family of ALIGN constraints used to derive the position of stress feet, specific tone sequences, and other kinds of metrical prominences relative to the edges of prosodic or morphological domains. ALIGN-HEAD-L, for example, is a standard constraint used to compel words to begin with the primary stress foot (Gordon 2011:147). The only differences between the constraints used to derive the prominence meter and OBLIG and ALIGN constraints used to model non-poetic phonology is that the metrical constraints refer to a poetry-specific constituent, the line.

Second, the grid analysis in §6.2 is internally inconsistent and fails to make the Development Hypothesis-related generalizations of the markedness analysis. As mentioned in the discussion of (30), the grid analysis violates a presupposition of Fabb and Halle's theory of meter by introducing a non-iterative rule for the bracketing of Gridline 1. Because the length of lines in this genre varies widely, the only alternative to the non-iterative rule for Gridline 1 is to introduce an unbounded number of additional gridlines which iteratively parse the asterisks of Gridline 1 and subsequent gridlines into right-headed binary feet (iamb) until a gridline which contains only one asterisk, and therefore cannot be further parsed, is reached. This solution, however, violates both the architecture of Fabb and Halle's theory and the abstractness requirement in the definition of meter, since it makes the number of gridlines -- that is, the metrical parsing procedure -- contingent on the number of words in the line.

Additionally, the grid analysis derives this genre's word size constraints artificially, by parsing (non-anapestic) lines into anapests, then inserting a caesura following each foot. This procedure is extremely problematic for the Development Hypothesis, since anapests are a foot type which is only questionably attested in stress accent systems (Hayes 1989:380) and caesurae are a poetry-specific device that have no equivalent in the phonology of non-poetic language. Because the line's mora count is its only attribute visible to the grid rules, the grid theory simply cannot derive the generalization that the genre -- like the prosody of non-poetic language -- regulates the size of words rather than feet. The grid theory is also inconsistent with the Development Hypothesis in that it can model constraints on the position of prosodic prominence, here the line-final LH, only in relation to foot structure. As a consequence, the grid theory cannot capture any similarity between this genre's requirement for line-final LH and (for example) H obligatoriness phenomena in the general phonology of other Tukanooan languages, such as Barasana (Gomez-Imbert 2001:371).

The grammar used in §6.1 is therefore more consistent with the Development Hypothesis in a general sense: it uses representations and constraints which are already needed for non-poetic phonology, and captures the similarities between meter and the prosody of non-poetic language. In addition, the grammar in §6.1 is also consistent with the Development Hypothesis in a language-specific sense, for all constraints in the grammar are transparently related to constraints that are relevant to the non-poetry-specific prosody of Máfhiki. The poetic MINWORD constraint differs from the language's general Minimum Word Requirement only in that the poetic MINWORD sets a trimoraic minimum, while the general Minimum Word Requirement sets a bimoraic minimum. The OBLIG(LH,Line) constraint is inverse to a high-ranked, though violable, constraint in the general phonology which requires at least one HL tone sequence on all prosodic words (Farmer & Michael submitted:35), and the ALIGN-R(LH,Line) constraint is likewise inverse to a high-ranked constraint which aligns HL sequences with the left edge of the prosodic word (Farmer & Michael submitted:30).

This inversion in the identity and alignment of the obligatory tone sequence creates a striking



aesthetic difference between *dài* and all other discourse genres in the language. In the terms of Hanson & Kiparsky's (1996: 14) theory of metrical choice, the inversion means that *dài* meter, relative to other possible meters for Máihiki, performs well on INTEREST, a constraint which rewards divergence between metrical and non-metrical language. Conversely, the relative similarity of poetic MINWORD and the general Minimum Word Requirement, together with the genre's rich lexicon of genre-specific morphology, means that it is relatively simple for poets to match the text of *dài* to the meter. *Dài* meter therefore also performs well on Hanson and Kiparsky's FIT, a constraint which rewards meters that make a large proportion of the vocabulary usable in verse.

## 7 Markedness analyses of other aperiodic meters

Following the analysis of *dài* meter in §6.1, this section proposes markedness-based analyses of several other forms of aperiodic meter discussed in §3. §7.1 posit parametric definitions of the constraints producing size meter and uses them to derive the pure size meters of *karintaa* and the English Modernist poets; classical Japanese verse; and *tom yaya kange*, in that order. §7.2 then gives an analogous set of parametric definitions for the constraints producing prominence meter, and shows that they can produce both the pure prominence meter of Tohono O'Odham, as described by Fitzgerald (1998), and -- with minimal changes -- a periodic trochaic meter.

### 7.1 Size meters

In the simplest possible pure size meter, exactly one prosodic constituent type is constrained for size, and the required size is the same for all constituent tokens in the text. This is the case in several of the pure size meters discussed in §3.1: Nanti *karintaa*, the size meters of English Modernist poets, and early medieval Romance meters. These genres all regulate the size of the line, and set the same target size for every line of the text. Their meters can be modeled using only two constraints, MINLINE and MAXLINE. Both of these constraints will be set to the target size of the line in each genre, expressed in terms of that genre's basic prosodic constituent, such as the mora in Nanti or the syllable in Modernist size meters. For example, (33) gives the MINLINE and MAXLINE constraints for the ten-syllable meter of most of Daryush's syllabic poems.

- (33) MINLINE and MAXLINE constraints for Daryush's pure size meter
- a. MINLINE: Assign one violation for every syllable by which the line falls short of 10 syllables.
  - b. MAXLINE: Assign one violation for every syllable by which the line exceeds 10 syllables.

We can state general definitions of the family of constraints that produce size meters by replacing the form-specific terms of the constraint definitions in (33) with the names of the parameters which those terms represent, as in (34). Following the typology of size meters proposed in §3.1, the size molecule parameter determines which constituent of the poetic prosodic hierarchy is constrained for size; the size atom parameter, which constituent is used to measure the size of the molecule.

- (34) Parametric definitions of size meter constraints

- a. MINMOLECULE: Assign one violation for every SIZE ATOM by which the SIZE MOLECULE falls short of  $n$  SIZE ATOMS.
- b. MAXMOLECULE: Assign one violation for every SIZE ATOM by which the SIZE MOLECULE exceeds  $n$  SIZE ATOMS.

In the maximally simple size meters discussed above, only one pair of MINMOLECULE and MAXMOLECULE constraints is active, and the constraints count every atom in the text. This creates a text with a single metrical norm and no permitted variance from it. Most meters that include a size component, though, permit some systematic form of variance. This variance can be introduced in exactly two ways: by varying the metrical target across molecules, or by ignoring some atoms in the metrical count.

The first method for increasing the variance of size meter is to impose different target sizes on different constituent tokens in the text. For example, the *chōka*, a classical Japanese meter, requires all odd-numbered lines to consist of five morae, and all even-numbered lines, as well as the (odd-numbered) last line of the poem, to consist of seven morae (Miner et al. 1985:22). The simplest way to formalize size requirements that are indexed to line numbers is to posit two sets of MINLINE and MAXLINE constraints. One set, MINLINE<sub>1</sub> and MAXLINE<sub>1</sub>, is evaluated only for odd-numbered lines; the other, MINLINE<sub>2</sub> and MAXLINE<sub>2</sub>, only for even-numbered lines. (35) displays the MINLINE and MAXLINE constraints for *chōka* under this analysis.

(35) MINLINE and MAXLINE constraints for Japanese *chōka*

- a. MINLINE<sub>1</sub>: If the line is odd-numbered and not the last line of the poem, assign one violation for every mora by which the line falls short of five morae.
- b. MAXLINE<sub>1</sub>: If the line is odd-numbered and not the last line of the poem, assign one violation for every mora by which the line exceeds five morae.
- c. MINLINE<sub>2</sub>: If the line is even-numbered or is the last line of the poem, assign one violation for every mora by which the line falls short of seven morae.
- d. MAXLINE<sub>2</sub>: If the line is even-numbered or is the last line of the poem, assign one violation for every mora by which the line exceeds seven morae.

The formalization of line number-indexed meters in (35) is reminiscent of cophonology approaches to morphologically conditioned phonology (Inkelas & Zoll 2005). Like cophonology theory, it has the weakness that no aspect of the theory requires the odd-numbered line constraints and even-numbered line constraints to resemble one another. Thus, for example, there is nothing in this theory to preclude a hypothetical poetic form in which odd-numbered lines consist of 10 syllables and even-numbered lines consist of four prosodic words. Although the literature describes very few line number-indexed meters -- effectively, only the classical Japanese meters and the meters of a handful of English Modernist poems -- this likely means that line number-indexed constraints overgenerate.

The other way of increasing the complexity of pure size meter is to include extrametricality, defined broadly as exclusion of some constituents from the metrical count. Extrametricality appears in the *tom yaya kange* style described by Rumsey (2010), which permits two kinds of lines: lines consisting of exactly five prosodic words, and lines consisting of four prosodic words followed by a breath. In the former kind of line, the final prosodic word is generally a monosyllabic vocable (Rumsey 2010:45). Vocables do not appear line-internally. This division between an initial

content-word and a final vocable portion of the line, together with the optionality of the final vocable (in Rumsey's terms, the possibility of replacing the vocable with a breath), strongly resembles the division in *dàì* between the bookending, non-size-restricted free-word vocable portions of the line and the central content-word portion.

Given the analysis of *dàì* above, this suggests a model of the *tom yaya kange* line as underlyingly consisting of four prosodic words, with breaths and monosyllabic vocables always extrametrical -- that is, never counted by the size constraints. (36) gives the MINLINE and MAXLINE constraints for this analysis. \*2VOC and ALL-VOC-RIGHT then derive the generalizations that a line contains no more than one vocable and that the vocable must appear line-finally. (An alternative analysis could write the restrictions on the number and position of vocables into the definition of the *tom yaya kange* line, as was done for *dàì* in §5.1 above.) Since all of these constraints are unviolated in the data displayed in Rumsey (2007, 2010), they cannot be ranked.

(36) MINLINE and MAXLINE constraints for *tom yaya kange*

- a. MINLINE: Assign one violation for every prosodic word by which the line falls short of four referentially contentful prosodic words.
- b. MAXLINE: Assign one violation for every prosodic word by which the line exceeds four referentially contentful prosodic words.
- c. \*2VOC: The line contains a maximum of one vocable. Assign one violation for every vocable exceeding one.
- d. ALL-VOC-RIGHT: Vocables are allowed only at the right edge of the line. Assign one violation for every syllable which separates the right edge of a vocable from the right edge of the line.

The extrametricality of vocables in *tom yaya kange* and *dàì* is fundamentally different from extrametricality in European meters. Extrametricality in European periodic meter is contingent on the prosody of specific lines. It obtains when the line is strictly hypermetrical (contains more syllables than permitted by the meter) and, in order to resolve the hypermetricality, some syllables are not scanned or are scanned as one with the preceding syllable, a process known as resolution. The extrametricality proposed for *tom yaya kange* and *dàì*, on the other hand, is an invariant property of the word class of vocables. Regardless of whether the line that contains a vocable is hypermetrical or perfectly metrical, the vocable in these genres is never counted by size constraints.

French alexandrines, a European aperiodic form, represent an intermediate point between contingent and lexically specific extrametricality. In this genre, 'mute e' -- word-final orthographic [e], which is pronounced in poetry but not pronounced in non-poetic spoken French -- is permitted to occur line-finally even when it results in a strictly hypermetrical line. Other syllables are not permitted in this position. Because mute e is counted as a syllable line-internally, this is not lexically specific extrametricality, but because it (and no other syllable) is permitted to form a hypermetrical line, it also cannot be analyzed as contingent extrametricality. Fully contingent extrametricality is thus unattested in aperiodic size meter.

## 7.2 Prominence meters

The simplest prominence meter described in the literature is the prominence portion of the meter of French alexandrines, which requires exactly one stress at the right edge of each hemistich.

This is extremely similar to the prominence portion of the meter of *dàì*. Both types of right-edge-marking prominence meter can be derived with just two constraints, one from the OBLIG family and one from ALIGN-R: OBLIG(LH,Line) and ALIGN-R(LH,Line) for *dàì*, OBLIG(Stress,Hemistich) and ALIGN-R(Stress,Hemistich) for alexandrines. One can imagine notionally simpler prominence meters -- for example, a hypothetical variation on the alexandrine requiring at least one stress per hemistich, but permitting the stress in any position -- but there are no examples of such meters in the literature, perhaps because they would be too difficult to distinguish from non-poetic speech.

Given the similarity between the prominence meters of alexandrines and of *dàì*, it is now possible to proceed to a parametric definition of non-foot-based prominence meter. In the terms of the parameters for prominence meter proposed in §3.2, the first argument of each of the two constraints given above, OBLIG and ALIGN, sets the prominence atom; the second argument sets the prominence molecule. The number of prominences within the prominence molecule is set within the OBLIG constraint, and the position of the prominences within the ALIGN constraint. (37) gives the abstract definitions of these constraints.

(37) Parametric definitions of prominence meter constraints

- a. OBLIG(ATOM,MOLECULE): The PROMINENCE MOLECULE contains at least  $n$  PROMINENCE ATOMS. Assign one violation if not.
- b. ALIGN-X(ATOM,MOLECULE): The PROMINENCE ATOM is aligned with the RIGHT/LEFT edge of the PROMINENCE MOLECULE. Assign one violation if not.

The stress literature traditionally distinguishes between edge-marking stress systems and stress systems with iterative footing. This distinction, however, should not be imported into the analysis of prominence meter. Under the analysis represented by (37), edge-marking meters and iterative meters differ only in the size of the prominence molecule. This is the hemistich or a larger constituent for edge-marking meters, the foot for iterative foot-based meter. One cannot distinguish these types of meters based on iterativity, or in OT terms the ranking of PARSE-SYL, since edge-marking meters parse the text just as stringently into their prominence molecules -- there is no syllable in an alexandrine which does not belong to a hemistich, or mora in *dàì* which does not belong to a line -- as iterative meters parse it into feet.

With these definitions of the prominence meter constraints in hand, it is time to examine the literature's best example of a pure prominence meter, the meter of Tohono O'Odham songs (Fitzgerald 1998). The surface facts of this meter, also given in §3.2, are that lines may have any prosodic size; the second syllable and the final syllable of the line may not be stressed; and adjacent syllables may not be stressed in any position. Fitzgerald (1998) analyzes these facts as reflecting a loose trochaic meter ('loose' in this sense means that unstressed syllables are not parsed into feet unless required for foot binarity). She derives this meter using a pair of OT-style constraints, the Revised Edge Constraint and the Binary Foot Constraint (Fitzgerald 1998:29-30), and the standard generative metrics notation for foot-based periodic meter, in which each foot dominates a pair of abstract strong and weak positions that in turn dominate syllables of the line. Fitzgerald does not, however, provide a full OT derivation of a metrical line using these constraints.

It is easy to construct a minimal variation on Fitzgerald's analysis which employs standard constraints from metrical stress theory, such as FT-TYPE = TROCHEE, to produce the O'Odham song meter in parallel OT. Although these constraints are indispensable for stress systems, they obscure the fundamental similarity between 'edge-marking' and foot-based meters. In lieu of TROCHEE, I therefore propose three prominence constraints for the O'Odham song meter: OBLIG(Stress,Foot),



ALIGN-L(Stress,Foot), and MINFOOT. As shown in the definitions in (38), the OBLIG and ALIGN-L constraints are parallel to their counterparts in edge-marking meters, while the MINFOOT constraint is equivalent to prosodic minimality requirements or the constraints of size meters.

(38) Foot-building constraints for O'Odham song meter

- a. OBLIG(Stress,Foot): A foot contains at least one stressed syllable. Assign one violation if not.
- b. ALIGN-L(Stress,Foot): Any stressed syllable in a foot is aligned with the left edge of the foot. Assign one violation for every stressed syllable that fails to be aligned with the left edge.
- c. MINFOOT: A foot contains at least two syllables. Assign one violation per syllable that a foot falls short of two syllables.

The tableau in (39) shows that when these constraints are ranked together, trochees and dactyls incur no violations. As the spondee, iamb, cretic, and anapest candidates show, feet which include more than one stress or which include stresses in non-initial position are all eliminated by ALIGN-L(Stress,Foot) with no need for an additional foot maximality constraint. Degenerate feet are blocked by the foot minimality constraint, and feet with no stress by the OBLIG(Stress,Foot) constraint. Any foot of at least two syllables with initial stress, however, is licit -- trochees, dactyls, and longer feet all included. To restrict the foot to disyllabic size, a MAXFOOT constraint stating the disyllabic maximum could be added.

(39) Constraints in (38) permit only left-headed feet of at least two syllables

		OBLIG(Stress,Foot)	ALIGN-L(Stress,Foot)	MINFOOT
a.	Degenerate ( $'\sigma$ )			*!
b.	Dibrach ( $\sigma\sigma$ )	*!		
c.	Spondee ( $'\sigma'\sigma$ )		*!	
d.	 Trochee ( $'\sigma\sigma$ )			
e.	Iamb ( $\sigma'\sigma$ )		*!	
f.	 Dactyl ( $'\sigma\sigma\sigma$ )			
g.	Amphibrach ( $\sigma'\sigma\sigma$ )		*!	
h.	Anapest ( $\sigma\sigma'\sigma$ )		*!*	
i.	Cretic ( $'\sigma\sigma'\sigma$ )		*!*	

The constraints in (38) and (39) are not yet sufficient to produce the O'Odham meter because they do not include a requirement that all syllables be parsed into feet. I therefore add to the constraint ranking PARSE-SYL(Foot), defined in (40). PARSE-SYL is ranked below the foot-building constraints, since the opposite ranking (or omitting PARSE-SYL entirely) will permit candidate lines to have stressed syllables in banned positions as long as the illicit stressed syllable is not footed.

(40) PARSE-SYL(Foot): All syllables are contained in a foot. Assign one violation for every syllable that fails to be contained entirely in a foot.

(41-43) shows that the constraints in (38), ranked above PARSE-SYL(Foot), incur violations for all of several parses of a hypothetical five-syllable line with stress in the second position (41), in the final position (42), and two adjacent stresses not in these positions (43). These are all of the positions in which stress is not permitted in O'Odham song meter. (44) shows that the constraints assign no violations to schematic representations of acceptable O'Odham lines displayed in Fitzgerald (1998:exx. 11a, 11b, 14a).

(41) Constraints in (38) with PARSE-SYL assign violations to lines with stress in second position

		OBLIG(Stress, Foot)	ALIGN-L(Stress, Foot)	MINFOOT	PARSE-SYL(Foot)
a.	$\sigma(' \sigma \sigma)(' \sigma \sigma)$				*
b.	$(\sigma)(' \sigma \sigma)(' \sigma \sigma)$			*!	
c.	$(\sigma' \sigma \sigma)(' \sigma \sigma)$		*!		
d.	$(\sigma' \sigma) \sigma(' \sigma \sigma)$		*!		*

(42) Constraints in (38) with PARSE-SYL assign violations to lines with final stress

		OBLIG(Stress, Foot)	ALIGN-L(Stress, Foot)	MINFOOT	PARSE-SYL(Foot)
a.	$(' \sigma \sigma)(' \sigma \sigma)(' \sigma)$			*!	
b.	$(' \sigma \sigma)(' \sigma \sigma)' \sigma$				*
c.	$(' \sigma)(\sigma' \sigma)(\sigma' \sigma)$		*!*		*
d.	$(' \sigma \sigma' \sigma)(\sigma' \sigma)$		*!*		

(43) Constraints in (38) with PARSE-SYL assign violations to lines with two adjacent stresses

		OBLIG(Stress, Foot)	ALIGN-L(Stress, Foot)	MINFOOT	PARSE-SYL(Foot)
a.	$(' \sigma \sigma)(' \sigma)(' \sigma \sigma)$			*!	
b.	$(' \sigma \sigma)' \sigma(' \sigma \sigma)$				*
c.	$(' \sigma \sigma' \sigma)(' \sigma \sigma)$		*!*		
d.	$(' \sigma \sigma)(' \sigma' \sigma \sigma)$		*!		

(44) Constraints in (38) with PARSE-SYL assign no violations to real O'Odham song lines

		OBLIG(Stress, Foot)	ALIGN-L(Stress, Foot)	MINFOOT	PARSE-SYL(Foot)
a.	☞ ('σσ)('σσσσσσ)('σσσσσσ)('σσσσ)				
b.	☞ ('σσ)('σσσσσσ)('σσσ)				
c.	☞ ('σσ)('σσσσ)('σσσ)				

While the grammar in (44) assesses many attested O'Odham song lines as metrical, it also incorrectly predicts that lines without an initial stress are unmetrical. In fact, although Fitzgerald's figures show that the majority of lines in her corpus have initial stress, an O'Odham song line can contain, before the first stress, any number of unstressed syllables greater than one (Fitzgerald 1998:29). Fitzgerald's analysis, which also predicts that lines will have initial stress, does not provide an explicit solution to this problem. The simplest solution within the grammar proposed in (44) would be to revise the OBLIG(Stress, Foot) constraint so as not to evaluate the first foot of the line. This would lead to a parse of a line of the form  $\sigma\sigma'\sigma\sigma\sigma$ , such as Fitzgerald's (24c), as  $(\sigma\sigma)('\sigma\sigma)('\sigma\sigma\sigma)$ .

Finally, note that the grammar in (44) can be modified to produce a rhythmic trochaic meter -- without the dactyls and larger feet allowed by the constraints of (38) -- by adding a MAXFOOT constraint penalizing feet consisting of more than two syllables. Expanding the grammar further with MINLINE and MAXLINE constraints, both set to require a line with  $n$  feet, would then produce a periodic trochaic meter with lines of controlled length. This substantiates the claim from §3.2 that rhythmic meters arise from a specific combination of size and prominence constraints, and not from a fundamentally different structure than aperiodic meters.

## 8 Conclusion

To return to the question posed in §1: do rhythmic and non-rhythmic meters have the same underlying structure? This paper has argued that the answer is yes. It began by exploring the space of attested non-rhythmic meters in comparison to that of rhythmic meters. Scholars have described and theorized non-rhythmic meter much less thoroughly than rhythmic meter, and much of the scholarship on non-rhythmic meter is based on very small corpora (§2). Nevertheless, described non-rhythmic meters can be classified into two broad types, those which constrain prosodic size and those which constrain prosodic prominences (§§3.1-3.2). Rhythmic meter, as well as some European non-rhythmic forms such as the alexandrine, can be understood as meter which regulates both size and prominence over the same constituent (§3.3).

Size and prominence, though, are independent parameters, and it is possible for meter to regulate size over one prosodic constituent and prominence over another. I demonstrated this through the detailed description of *dàì* meter in Máfhīki in §§4-5. In these sections, I show that *dàì* unambiguously regulates size at the prosodic word -- achieving a target size of three mora per word through vocable affixation -- but prominence, in the form of LH sequences, at the level of the line. I then provided a formal analysis of *dàì* meter employing a set of Optimality Theoretic constraints that are regularly used to model stress and tone phonology in non-poetic language; some of these constraints are also relevant to the prosody of spoken Máfhīki (§6). The fact that such an analysis is possible illustrates that *dàì* meter, and by extension other aperiodic meters, has a similar relation to non-poetic phonology as has been proposed for rhythmic meters (Fabb 2010; Blumenfeld

2016). In §7, I adduced further support for this claim, and for the thesis that rhythmic meter is essentially a special case of aperiodic meter, by showing that equivalent Optimality Theoretic analyses are possible for several attested non-rhythmic meters as well as for periodic meter.

The approach to meter represented in §§6-7 has advantages and disadvantages in comparison to foot-based theories of meter. Its advantages are that (a) it provides one theoretical framework for both periodic and aperiodic meter, in accordance with the generative principle of minimalism, and (b) it makes the relationship between meter and the prosody of non-poetic language clear by employing only constraints that are motivated for non-poetic language (although it does refer to prosodic constituents that are specific to poetry). The theory's most significant disadvantage is that it is not constrained. It predicts that meters which a priori seem implausible -- for example, a meter which requires that every prosodic word in the line have an initial stress, that all words be exactly two syllables, and that the line contain exactly four words -- should be possible. And conversely, it gives no special status to rhythmic meter, the best-attested kind of poetic form, and includes no obvious device for inducing the kinds of contingent extrametricality that are ubiquitous in rhythmic meter.

How serious are these disadvantages of the theory of aperiodic meter? Given the state of the metrics literature, they are minor. Because a great deal is known about the space of (for example) natural stress systems, it is reasonable to reject theories of stress on the grounds that they generate unattested stress patterns. But for meter, because of the poverty of the descriptive literature on non-European forms, it is not necessarily appropriate to reject a theory because it overgenerates. Prior to the description of *dàì* meter offered in this paper, it would have been principled to say that a theory of meter which separated size and prominence overgenerated. As I have shown, though, that separation is an essential component of an adequate theory of aperiodic meter. Only with descriptions of more meters, and especially of more meters of non-European languages and languages without rhythmic stress, will it be possible to judge whether the theory proposed here is insufficiently restrictive -- or whether it, like the foot-based theory of meter, is also based on too small a sample to generate all of the real possibilities.



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