The Meter of Tohono O'odham Songs*

Colleen M. Fitzgerald

The University of Arizona®
Department of Linguistics

0. Introduction

The evaluation of poetry and songs has been essential to the progress of generative metrical\textsuperscript{1} theory. The bulk of work done in generative metrics focuses on English poetry (although Kiparsky (1968), Maling (1973), and Prince (1989) are some notable exceptions). Limitations of such a focus become evident when metricists make typological claims, as in Hayes (1989). Research on the meter of other languages is thus critical for a valid typology of meter and metrical rules. With such a goal in mind, I examine the meter of Tohono O'odham songs.

Tohono O'odham (henceforth TO; formerly Papago) is a Native American language of the Uto-Aztecan family spoken in southern Arizona. An examination of these songs provides a valuable test for theories of meter, such as that advanced in Hayes (1989). The songs comprise part of an oral tradition and represent an instance of meter which is Native American, rather than Indo-European. These two characteristics unite to produce a metrical system which differs from that of English poetry.

Here I give both a description and an analysis of the meter of previously unanalyzed Tohono O'odham traditional songs. The crucial problem is characterizing the line. Song lines are flexible in the number of syllables and stresses that they allow, but are not completely unconstrained. The positioning of stressed material is strictly regulated, as stresses are prohibited from appearing adjacent to another stress, or in the second and final metrical positions of a line. I argue for binary trochaic feet, built at left edges and wherever stressed syllables occur; stresses are further prohibited from appearing in weak position. The analysis has four results: 1) lines are flexible in some traditions, 2) binary feet, with constituency, are necessary, 3) poetic meter is shown to invoke morphology to satisfy constraints on the meter, and 4) metrical rules for left edges may be strict, contra Hayes (1989).

This study also has relevance beyond meter, specifically for phonological theory and the study of Native American literature. Recent work in phonology has focused on the nature of constraints, particularly work in Optimality Theory (McCarthy and Prince 1993, Prince and Smolensky 1993). Optimality Theory argues that constraints may be violable or undominated (and inviolable); here I show evidence from meter for two inviolable constraints which govern the meter (the Edge Constraint and the Binary Foot Constraint). To prevent violations, the morphology is systematically manipulated. The TO meter provides one example of how a constraint governed system in meter operates (see Hayes (1993) for specific discussion of relevant issues for meter and optimization).

\textsuperscript{*}Many people have given helpful comments along the way, including the participants of the 1993 WECOL. The following have responded to written versions of this paper: Ken Hale, Mike Hammond, Andrea Heiberg, Jane Hill, Leanne Hinton, Terry Langendoen, Peg Lewis, Diane Ohala, Pat Pérez, Gilbert Youmans and Ofelia Zepeda. Special thanks to Mike Hammond for extensive input on multiple drafts. Any errors are my own. For surface forms, I use the official orthography of the Tohono O'odham nation, which was developed by Albert Alvarez and Ken Hale. This orthography approximates a phonemic transcription. I modify the orthography slightly and mark primary stress, which is not represented in the official orthography.

\textsuperscript{1}The term 'metrical' is used in two ways: 1) 'A theory of phonology in which phonological strings are represented in a hierarchical manner, using such notions as segment, syllable, foot and word (cf. also prosodic phonology). Originally introduced as a hierarchical theory of stress, the approach now covers the whole domain of syllable structure and phonological boundaries' (Crystal 1991, 218). 2) The (linguistic) study of versification, as in poetry and songs. I use the second sense of this term, except when referring to the metrical grid of Hayes (1983, 1989).
This study is also germane to work on Native American literature, as it shows that oral literature, here the songs, may have a system of meter comparable to those found in written literature, such as the poetry of William Shakespeare. Hinton (1984, 1990) looks at the meter of Havasupai songs from a linguistic perspective. This paper takes a similar approach. This type of work furthers recognition of Native American songs, narratives, and speeches as a valid and important body of literature.

This paper is structured as follows. The first section gives the necessary background on the theory of meter. This is followed by background on reduplication and stress in Tohono O'odham and a description of the songs. The second section presents the analysis of the song meter discussed above. In the third section, I discuss implications of this analysis for the theory of meter proposed in Hayes (1989). Specifically, I examine his typological claims for metrical rules, and show that the typology must be expanded to account for the strict left edge meter presented here. Finally, I conclude the paper with a discussion of the importance of the study for metrical theory.

1.0 Background

This section provides the theoretical and descriptive underpinnings necessary for an analysis of the TO song meter. The first section briefly gives background on meter and generative metrics. This is followed with a discussion of the necessary descriptive facts, both of TO phonology and the songs. This is especially important to determine how to characterize this meter and, just as importantly, to determine how this meter can not be characterized. This section starts with a look at the relevant facts of TO phonology, then moves into background on the song format and the songs themselves.

1.1 Meter and Generative Metrics

Meter is a regular pattern of rhythm, where the pattern may be associated with one or more of several factors: quantity, stress, syllable count, and tone. Quantitative meter is a pattern based on the arrangement of heavy and light syllables, as in Greek or Latin verse. Stress, or accentual meter, uses stressed syllables as the basic unit; Old English poetry, such as Beowulf, is an example of this. A third pattern is characterized by a fixed number of syllables; this pattern is typical of Romance versification, as in the 12-syllable line of French Alexandrine verse. A fourth type results with the intersection of stress and syllable count, as in English iambic pentameter, which consists of a relatively fixed number of both stresses and syllables. Meter may also regulate verse on the basis of tone, as in the Chinese poetry examined in Chen (1979).

Generative meter takes as its basic premise that these styles reflect the unconscious use of language. One of the goals of generative metrics is to show the principles which underly the rule-governed behavior of language in meter. Likewise, that is the goal of this paper.

Work in the theory of meter has focused on what constitutes the proper representation of stress for meter. There are three current theories which each argue for a different representation of stress: tree-based, grid-based, and Arboreal Grid-based. Much of the debate in generative meter has centered on the metrical representation of the words (that is, language) to which the constraints refer. This paper does not address that debate; rather, I am concerned with what the representation of the line must be for the proper treatment of the meter.

Now I will give examples of grid and tree systems and explain some terminology, using English iambic pentameter as an example. Iambic pentameter is a line of poetry consisting of ten alternating stressless and stressed syllables. Each syllable constitutes a metrical position in the line, and these metrical positions may be restricted in what type of material they can contain. An iamb consists of a stressless syllable followed by a stressed one (W S). Strong positions are

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2 There is also free verse, where neither syllables nor stress are regulated.
3 Speaking generatively, that is. Actually, there is an additional theory proposed by Halle and Keyser (1971); see Kiparsky (1975) for arguments against it.
those which generally contain stressed syllables, although unstressed syllables are also allowed here. Weak positions, in contrast, are those which contain unstressed syllables; stressed syllables only appear in these positions under special circumstances. First, there is the tree-based theory of meter found in Kiparsky (1977), which represents a line of iambic pentameter as below:

(1)  
\[
\begin{array}{ccccccc}
W & S & W & S & W & S & W & S
\end{array}
\]

Trees represent prominence relations between two metrical positions, the S position is more prominent than the W. Additionally, t- also allow a representation of constituency; here two metrical positions are each constituents of a single unit, the foot. More hierarchical structure may be added, such that two feet comprise a unit.

A second representation of meter comes from the grid-based theory presented in Hayes (1983, 1989). Grids indicate stressed syllables with an "X" and stressless syllables with a "."; the height of the X column over a stressed syllable indicates its relative level of stress. In this theory, the underlying meter of a line of iambic pentameter is a grid, as below.

(2)  
\[
\begin{array}{cccc}
. & X & . & X & X & . & X
\end{array}
\]

Grids encode the level of stress and their local relations. Stress levels of syllables can only be compared where syllables are adjacent. The absence or presence of stress is also encoded, as is the stress level. However, the grid cannot represent constituency.

In this paper, I will use the grid-based representation for TO. I do so as a formal convenience, rather than as an argument that the grid constitutes the proper representation of the language. As I will show later in the paper, it is the tree-based theory of meter which is critical for representing TO meter.

1.2 Stress in Tohono O'odham

As this paper focuses on TO song metrics, a discussion of the stress system in TO is a prerequisite to examining the meter. For the purposes of this paper, I use only the primary stress in words. As Hill and Zepeda (1992) show, primary stress falls on the first syllable of a stem. This can be seen in forms from Hill and Zepeda (1992: 356, 367) in (3).

(3)  
<table>
<thead>
<tr>
<th>Underlying Form</th>
<th>Surface</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. /ma:ci/</td>
<td>má:c</td>
<td>'knowing'</td>
</tr>
<tr>
<td>b. /da:-da:ka/</td>
<td>dá:dk</td>
<td>'noses'</td>
</tr>
<tr>
<td>c. /da-dagasapa/</td>
<td>dádagšp</td>
<td>'pressing down with fingers repeatedly'</td>
</tr>
<tr>
<td>d. /ku:bisi-ce/</td>
<td>kú:bsc</td>
<td>'made smoky, dusty'</td>
</tr>
<tr>
<td>e. /si-da-dapa-ka/</td>
<td>s-dádpk</td>
<td>'smooth (plural)'</td>
</tr>
</tbody>
</table>

---

4Iambic pentameter also characterizes weak positions (W) as odd and strong positions (S) as even.
5With the addition of more hierarchical structure, trees may indicate other prominence relations as well. See for example, Kiparsky (1977) and Youmans (1989) for more discussion of these matters.
6Such structure is argued to be binary in Prince (1989).
7However, Hammond (1991) presents arguments for the Arboreal Grid based on the meter of Thomson. The Arboreal Grid theory of Hammond (1988) is an amalgam of tree and grid theory, representing both constituency and levels of stress. However, it also allows feet which are not binary. As I will show later, TO meter requires strict binarity of feet. For this reason, I assume a grid-based theory, rather than the Arboreal Grid.
8Primary stress is crucial for the characterization of the meter; however, it is not clear that the same is true for secondary stress.
The form in (3a) shows a monomorphemic form, which receives primary stress on the initial syllable. When words are reduplicated, as in (3b-c, e), primary stress falls on the prefixal reduplicant. Suffixes, as shown in (3d), do not affect stress assignment. The form in (3e) shows that the stative prefix, s-, does not receive stress. Other prefixes (e.g., third person pl. obj, ha-) do not receive stress. These facts are further shown in (4):

(4) | Surface | Gloss       |
----|---------|-------------|
 a. | gógs    | 'dog'       |
 b. | gógogs  | 'dogs'      |
 c. | néid    | 'seeing'    |
 d. | ha-ñéid | 'seeing (pl. object)' |
 e. | néñeid  | 'seeing (sg. object)' |
 f. | ha-ñéñeid | 'seeing them (pl. object)' |

1.3 The Song Corpus

This section gives background on the song corpus, the format in which I give the song data, and the specific phenomena of song lines. As we will see in the following subsections, the phonology of these songs is rather complex. I try to give song lines in a format which makes the song phonology more accessible. Also, while work such as Bahr (1980, 1983), Chesky (1943), Haefer (1981) and Underhill (1938) have dealt with the music and songs of the O'odham, this is the first theoretical treatment of the meter of O'odham songs. The unanalyzed status of the corpus thus necessitates the exposition of what the songs look like before presenting the analysis.

The song corpus used in this paper consists of 11 songs totaling 78 lines. The songs used are traditional, where the description of traditional corresponds to a specific purpose and melodic content, and a specific type of origin. The songs are used for social or ceremonial purposes, such as traditional round dance songs or healing songs. Musical content is generally associated with a specific purpose; for instance, a certain type of dance requires a certain rhythm (much like a polka or waltz requires certain rhythms). Also, traditional songs are those which are either passed down from one generation of a singer to another or come to the singer via the inspiration of a dream.

In this study, I analyze songs which all come from one source, Wallace (1981). Haefer (1977) discusses how variation in songs serves both as a way to discriminate between the quality of singers and as a means to create a new song. By using one source, we isolate characteristics of a given singer or singers, much as Kiparsky (1977) and others have sorted various English poets into 'dialects' of English poetry (i.e., Tudor poets, Milton, etc.) by the variation in their metrical rules.

The example below shows a song line, which I give in the format I use in this paper. Each song line is noted by SONG; the example given differs from its notation in what I term CITATION form. CITATION is used to gloss the TO song forms into TO dictionary forms. I then provide

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9 Hill and Zepeda (1992) argue for demoraicization of unstressed syllables in certain environments. In the above figure, I give only sketchy derivations. For more detailed exposition of these arguments, refer to their paper. At this point, the reader only needs to know where primary stress occurs in TO words.
10 As the orthography used for TO does not indicate stress, I have taken the liberty of doing so here. These forms come from Zepeda (1988).
11 My understanding of a definition of 'traditional' comes primarily from Haefer (1977) and Ofelia Zepeda (p.c.).
12 The description of the songs in Wallace (1981) shows that they can be easily characterized under the auspices of a single system of meter.
13 Citation forms are confirmed in Mathiot (1973) and Saxton, et al. (1989). They appear here in the official orthography.
an English gloss of the O'odham forms in GLOSS.\textsuperscript{14} The final line, TRANSLATION, represents the
song line in an approximate English translation. The format is given in (5):

\begin{tabular}{|l|l|l|l|}
\hline
\textbf{SONG} & \textbf{CITATION} & \textbf{GLOSS} & \textbf{TRANSLATION} \\
\hline
Wí-pis-mel & wípismel & hummingbird & Hummingbird songs surround me. \\
ñé-ñei & ñéñe'ia & AUX & 1SG-to surround \\
wá & a & & \\
bí-je-mi-da. & bíjemid & & \\
\hline
\end{tabular}

The notion of a line is referred to above and deserves some attention. Informally, I
consider a line a set of one or more clauses, such that a group of lines constitutes a song. A line
may also consist of just one phrase or may split a phrase between two lines. While clauses and
phrases are important, they are not necessary to the definition of line. For our purposes, \textsc{Line} is
a string of words which corresponds to a musical phrase in the song.

There are two facts which suggest that the definition suffices in giving a characterization of
line for TO songs. Lines in the songs may be repeated; one common pattern is A A B C B C,
where the first line is repeated twice (A), the next new line (B) alternates with another new line
(C), and the (B C) sequence repeats.

\section*{1.4 Reduplication}

In this section, I examine reduplication within the songs. Reduplication is used
morphologically in TO to indicate the plurality of nouns, verbs, and some postpositions. Of the
48 instances of reduplication found in the song corpus, only 20 of these are plural reduplications.
This means that there are 28 reduplicated forms which do not have an associated plural meaning.
Here, I will first contrast morphological and nonmorphological (or Vacuous) reduplication.
Following this, I will present an examination of where Vacuous Reduplication occurs. The data
here will show that Vacuous Reduplication is motivated by stress considerations. Finally, I will
give the generalizations of this section, which lay the groundwork for the analysis of meter I
present later in this paper.

As mentioned above, the songs do contain examples of straightforward, morphological
reduplication. An example of this appears below, with the reduplicated word underlined in song
and citation lines. The singular form, \textit{gídwul} 'swallow' reduplicates as \textit{gígidwul} 'swallows' (the
reduplicant is underlined).

\begin{tabular}{l}
(6) \\
E-da & gígi-dwul-e & ñéi-o-pa-ha \\
eda & gígidwul & ñéiopa VOC\textsuperscript{15} \\
while DET & PL-swallow & PL-to fly \\
'While the swallows flying...' \\
\end{tabular}

However, there are also song lines which contain reduplication without a corresponding
semantic change. That is, singular nouns and verbs reduplicate in song lines, where they would
not reduplicate in citation lines. This can be seen in the examples below, with prefixal
reduplicants underlined.\textsuperscript{16}

\begin{tabular}{l}
(7) a. Vacuous Reduplication line-initially: \\
\end{tabular}

\begin{tabular}{l}
14Ofelia Zepeda, a native speaker of O'odham and a linguist, was an invaluable source of help in both the TO
and English glossing of the songs. \\
15Vocables are contentless syllables, as in the final syllable, -\textit{ha} in the song form ñéi-o-pa-ha. Vocables
(glossed as VOC) consist of adding an entire syllable, not just a vowel, at the end of a word. While I do not deal
with vocables here, Hymes (1981) and Hinton (1980) give evidence that these 'nonsense syllables' have specific
function within a text. Vocables do seem able to appear both line-medially and line-finally, and there are examples
which have two vocables next to each other. Future research may reveal the role played by vocables in these songs.
16I rely on the helpful intuitions of Ofelia Zepeda for where reduplication is vacuous and where syllables are
meaningless, or 'vocables'.

5
The mouse runs around there below Cinched Rock.

b. Vacuous Reduplication line-finally:

Jiós oí ká-wú-li-ki yam-e ké-he-ka
Jiós 'o i-gáwulk 'am ké:k
God AUX INIT-to differ LOC to stand
'God starts to differ standing there.'

c. Multiple instances of Vacuous Reduplication within a line:
oí na só-śo kú:ku:-ńe.
oí na són kú:g
soon perhaps the beginning the end
'soon perhaps the beginning, the end,'

The first example in (7a) shows two things: 1) Vacuous Reduplication may occur line-medially, 2) Extra vowels or syllables (or both) may also occur where there is Vacuous Reduplication.

The example in (7b) and the second form in (7c) also show that extra vowels may occur with Vacuous Reduplication. The line-final vowel in (7b) may occur in speech, while the extra line-final vowel of (7c) does not occur in speech. These forms also show that Vacuous Reduplication may occur line-finally. Finally, the two reduplicated forms in (7c) also show that a given line may have more than one occurrence of this type of reduplication.

At this point, let me also point out the generalizations of Vacuous Reduplication, as suggested by the data in (7). First, only monosyllabic citation forms (wáw, ké:k, són, and kú:g) correspond with the reduplicated song forms. Second, these forms are all either nouns or verbs, and hence, bear lexical stress.17 Third, the forms either precede a stressed syllable (as each precedes either a verb or noun) or occur line-finally (or both, as in (7d)). The crucial point here is that all words which reduplicate are stressed monosyllabic words, providing these words do not precede an unstressed syllable. These generalizations become clearer in the chart below, where I present a breakdown of the conditions where Vacuous Reduplication occurs:

<table>
<thead>
<tr>
<th>Category</th>
<th>Length in σ</th>
<th>Precedes Stressed σ</th>
<th>Occurs Line-finally</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nouns</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Verbs</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

The hypothesis, then, is that it is conditions in the citation lines which correspond with song lines that show Vacuous Reduplication. This is borne out when we consider whether there are any song lines that allow stressed syllables to be adjacent or occur line-finally. The contrast obtains, as the corpus has no examples of song lines with either adjacent stresses or line-final stresses for monosyllables. There are, however, examples of polysyllabic words with stress appearing adjacent to a stressed syllable or line-finally. These cases do not occur with Vacuous Reduplication (unless they have a phonological shape, as does jewe'd 'earth', which allows

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17To simplify things here, I exclude postpositions which are stressed. Fitzgerald (1993) shows that these postpositions, when monosyllabic, behave the same way as words with lexical stress, as both types of words reduplicate preceding a stressed syllable. In certain cases, the postposition appears to be receiving stress from emphatic use. Both Kiparsky (1977) and Hayes (1983) show how contrastive stress or emphasis may change the normal scansion for stressed syllables.
scansion as monosyllables\(^{18}\)). In (9), I give these examples (only Vacuous Reduplication is underlined).

(9) a.  $s$ wa $s$ wá-pu-si-me $wú$-wa-ke.

\[\text{REP CON STAT-PL -damply to emerge}

'Damply it emerges.'

b.  Áw-pa hió-sig ga-pe hi-me-na-ha.

áuppá hiósig ga VOC híma VOC VOC
cottonwood blossom over there to walk

'Over there, cottonwood blossoms pass by.'

c.  Pí-si-ne mó-ka-me jé-je-wen

písín mó'o-kam jéwe d'
earth

'Bison Head (place).'?

The song lines in (9a-b) lines allow two lexically stressed words to appear adjacent to each other, without Vacuous Reduplication. Note that these examples do not have adjacent stresses, as in the previous examples from (7), as the underlined forms are not monosyllables. This means that there are intervening unstressed syllables.

The final two stressed words in (9a-b) show that such polysyllabic forms also appear line-finally. Again, the forms do not reduplicate. However, unlike the forms from (7), the stressed syllables of these words do not appear as the final syllable of the line.

Based on these two sets of facts (the first showing where Vacuous Reduplication does occur, the second showing where it does not), I propose that Vacuous Reduplication is motivated by the metrical system of the song.

In order to view the metrical nature of Vacuous Reduplication, I give the song lines from (7) again below in (10). In this example, I show both citation and song lines in the grid-based theory of meter used by Hayes (1983, 1989). An examination of these forms shows that Vacuous Reduplication only occurs wherever either two stresses are adjacent (XX) or wherever a stress would fall line-finally at the rightmost edge of a line (X).


Wá-wai gi-wa-lige we-co ná-ha-gio kc in mém-ë-li-hi-me.

Wáw giwkulc weco nágáigkc in mémélíhíme.

rock cinched below mouse CONJ LOC to run to repeatedly

'The mouse runs around there below Cinched Rock.'

\(^{18}\)Two disyllabic words always reduplicate line-finally: \(dó'ag\) 'mountain' and \(jéwed\) 'earth'. The intuition here is that they are treated as monosyllables by the meter, much as in English, \(heaven\) may be scanned as monosyllabic \(heav'n\); in fact, their medial onsets do allow them to be pronounced as monosyllables in less careful speech. However, in line-medial positions, they do not always pattern with monosyllables.
By aligning the song and citation lines to the metrical grid, the generalization is validated: Wherever citation lines appear with adjacent stresses or a line-final stress, the song line appears with the leftmost word of two stressed words or the final word in a line vacuously reduplicated. These observations suggest two conclusions: 1) Stress clash and line-final stresses are impermissible in the song meter and 2) Vacuous Reduplication resolves these stress violations where they would otherwise occur, given the corresponding citation line.

Song lines may include additional vowels. Let me now cover the interaction of the effects of Vacuous Reduplication with these vowels to show that they are irrelevant to this metrical process. Below I compare examples of Vacuous Reduplication in song lines with and without extra vowels. The examples in (11b,c) show that extra vowels may also appear in the same environment (where two stresses are adjacent or where a stress is line-final) where Vacuous Reduplication occurs. I have underlined adjacent stresses and double-underlined line-final stresses.

    SONG Wá-wai gí-wa-lige we-co ná-ha-gio kc in mém-ë-li-hi-me.

    CIT Wáw giwulk weco náhagio kc in mémelihim.
rock cinched below mouse CONJ LOC to run to
'The mouse runs around there below Cinched Rock.'

    RED ONLY Wá-wai gí-walk we-co ná-ha-gio kc in mém-ë-li-him.

    VOW ONLY Wáw gí-wa-lige we-co ná-ha-gio kc in mém-ë-li-hime.
The first two examples show that extra vowels and Vacuous Reduplication may occur in the same environment; that is, wherever stresses are adjacent or line-final. However, the forms in (11 a,c) are critical in showing that only Vacuous Reduplication is motivated by this environment. Wáw in (11 a) and són in (11 c) both reduplicate adjacent to another stress, without surfacing with extra vowels. This indicates that these vowels, regardless of whether they appear in TO speech or underlying forms, do not affect Vacuous Reduplication. They must be invisible to the meter in order to meet the conditions for Vacuous Reduplication.

1.5 Characteristics of Song Lines

In this section, I cover three characteristics of song lines. First, I discuss the length of song lines, and show that there is a flexible number of syllables. Second, I show further flexibility in the number of stresses per line. Third, I discuss two important metrical positions of TO song lines, second and final to show that distributional facts reveal these two positions are never filled with stressed syllables. These facts indicate how TO song lines are rigid.

This section is important for several reasons. First, it will help in determining how to characterize the underlying metrical pattern of TO song meter. Second, recall from the discussion of meter above that rhythmic patternings are derived from quantity, stress, or syllables. Here the discussion shows that it is difficult to place TO song meter in one of these categories.

First, let us examine line length. Line length in these songs is rather variable; songs may use lines of anywhere from 7 to 19 syllables, as seen below:

---

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First, let us examine line length. Line length in these songs is rather variable; songs may use lines of anywhere from 7 to 19 syllables, as seen below:
They say over here are the People. With the People is the one who was.'

'soon perhaps the beginning, the end,'

'There, they say, damply they emerge.'

The song line in (12a) has 19 syllables, (12b), has 7 syllables and the third example (12c) is 10 syllables.

Songs do not individually cluster about a certain line length either, as each song may contain lines of varying lengths. This in itself is not unusual, as it is characteristic of Old English verse, such as Beowulf (cf. Cable 1974, 1991; Russom 1987). However, the variability in OE meter can be reduced by factoring out resolution. This is not true of TO meter. While the statistics show how long (or short) lines may be, there is little to tell what the limits to the lower and upper reaches actually are. Therefore, I suggest that the length of a song line is unconstrained.

The number of stresses per line, and where they appear, is also an important factor in characterizing the flexible nature of the line. The number of stresses per line appears to cluster around 3, although like line length, these numbers are relatively flexible. A given line may contain anywhere from 1 to 5. The actual numbers for the distribution are given here in (13):

<table>
<thead>
<tr>
<th>STRESS:</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMBER OF LINES:</td>
<td>0</td>
<td>4</td>
<td>28</td>
<td>33</td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

The numbers in (13) show that most song lines contain either 2 or 3 stresses. In (14), I combine information to show the interaction of number of stresses per line with number of syllables.

---

19Resolution is 'whereby a short stressed syllable and the following syllable, long or short, are scanned as one' (Cable 1974, 7).
(14) Distribution of song lines, according to line length and number of stresses

<table>
<thead>
<tr>
<th>Number of stresses per line</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syllables per song line</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>17</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>19</td>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This chart shows that as the number of stresses increases, so does the number of syllables. One stress per line corresponds with song lines of the smallest attested lengths, 7 and 8 syllables. These lengths have more lines with 2 stresses per line; at 2 stresses per line larger lines also start to appear, with line lengths of 9-13, and 18 attested at this point. These line lengths (9-11 syllables) become more common with three stresses per line; in fact, they are the lower cutoff point for this range. At three stresses per line, lines of 12-15 syllables, and 19 syllables begin to appear. At four stresses per line, the lower cutoff becomes 13 syllables in length; 14 and 18 syllable lines also appear with four stresses per line. Finally, 5 stresses per line, the highest attested number of stresses, appears in 17 syllable lines.

The crucial generalization here has been with respect to the nature of a song line; it cannot be characterized consistently in terms of length in syllables or number of stresses. It does appear that as the number of stresses per line increase, so do the syllables. However, there is no clear evidence for there being restrictions on either, except for the restrictions on where stresses can appear in a line.

Now let us explore the distributional facts of where these stresses may appear in a line. As stated above, the second and final metrical positions of a given line are never occupied by stressed syllables. The distributional facts are most easily revealed in the chart below, which gives the distribution of stresses for the first four metrical positions in a line, the final three in a line, and all other (medial) positions.

(15) Position of stresses within a song line:

<table>
<thead>
<tr>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
<th>Other</th>
<th>Antepenult</th>
<th>Penult</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>0</td>
<td>18</td>
<td>35</td>
<td>65</td>
<td>39</td>
<td>9</td>
<td>0</td>
</tr>
</tbody>
</table>

The restriction on these two positions does not hold of citation line. The table in (16) shows that stresses appear in all positions in a (citation) line:

(16) Position of stresses within a citation line:

<table>
<thead>
<tr>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
<th>Other</th>
<th>Antepenult</th>
<th>Penult</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>32</td>
<td>7</td>
<td>15</td>
<td>41</td>
<td>16</td>
<td>28</td>
<td>34</td>
<td>5</td>
</tr>
</tbody>
</table>

A comparison of these three distributional charts suggests that the songs restrict the second and final position. The latter restriction is noted as typical of trochaic verse, according to Attridge (1982). The restriction on second position in song lines, when viewed in conjunction with the high number of stresses which appear in the initial metrical position of a line, suggest that song lines begin with a trochaic sequence (S W) or two lexically unstressed syllables (W W), but never begin with an iambic sequence (W S). These elements argue for a trochaic meter, at least at the line's edges.
It is important to note one further point: trochaic meter typically places stresses in the S positions, which are odd, and avoids placing in W positions, the even ones. While this characterization is true of the leftmost W position (it is always even and never has stress), the same is not true of the rightmost position (the final metrical position of a song line may be either odd or even, and never has stress). I postpone further discussion of this for later, when I propose an analysis for TO song meter.

These gaps in the second and final positions of the charts in (15) and (16) become even more intriguing when we note that these positions are occupied in citation lines. The low number of stresses even in citation lines suggests that avoiding stress in these positions plays a role in structuring the line, even at the citation level. I compare these facts in (17), where I compare song and citation lines in the grid.

(17)  

a. Stress appears in second position in citation line, but not in song line:

\[
\begin{array}{ccccccc}
\text{Wá-wai} & \text{gi-wu-lik-e} & \text{nó-no-haŋ} \\
\text{Wáw} & \text{gíwulk} & \text{dó'ag} \\
\text{rock} & \text{constricted} & \text{mountain} \\
\end{array}
\]

'Constricted Rock Mountain'

b. Stress appears in final position in a citation line, but not in a song line:

\[
\begin{array}{ccccccc}
\text{Jióś} & \text{ói} & \text{ká-wu-li-ki} & \text{yam-e} & \text{ké-he-ka} \\
\text{Jióś} & \text{'o} & \text{i-gáwulk} & \text{'am} & \text{ké:k} \\
\text{God AUX INIT-to differ LOC to stand} \\
\end{array}
\]

'God starts to differ standing there.'

The contrast in (17) between the song lines and the citation lines shows first that stresses are prohibited in the second and final metrical positions of a line. The line in (17b) also shows that the morphology of TO, which uses reduplication to indicate the plurality of nouns and verbs, may also be employed in order to avoid placing stresses in final position. I showed above that the Vacuous Reduplication in these lines is used to systematically prevent stresses from being adjacent from each other or from appearing line-finally. The example in (17a), which triggers reduplication by virtue of the two adjacent stresses, does show a stress in second position. Interestingly, stressed syllables which occupy second position in citation lines also appear adjacent to other stresses, violating two restrictions on the meter. This is resolved by Vacuous Reduplication in the song line. As the reduplication adds another syllable, the stressed second syllable moves into the third metrical position.

Finally, if we look at the line-final stress which triggers reduplication, we see that both conditions (line-final and adjacent stresses) may appear in one line. This can be seen in (18).

---

20 An alternate account of the form wáwai 'cliff' is that the form reflects an archaic singular, rather than reduplication (thanks to Jane Hill for noting this). Interestingly, the form wáw also appears once, at the beginning of one song, as wawawai. The scarcity of other forms like this make it impossible to generalize. I do note here that wáwai may reflect a preserved form; this does not change the fact that stressed syllables do not appear in the second metrical position. I assume here that wáw is the citation form and wáwai a form reflecting Vacuous Reduplication.
In this section, I have made several points regarding the absence of stressed syllables in the second and final metrical positions in a song. Specifically, I have shown that 1) Distributional facts of song lines reveal these positions to never appear with stressed syllables, 2) Citation lines may appear with stressed syllables in these positions, and 3) Vacuous Reduplication strategically allows a stressed final syllable to appear nonfinally, as well as helping to avoid the placement of such syllables in second position. I conclude this section having shown that as the morphology may be manipulated to avoid the appearance of stresses in second and final positions within a song line, it is the case that these positions are systematically devoid of stressed syllables. That is, it is not a coincidence, but rather reflects a metrical strategy of avoiding these two positions in the meter.

2.0 An Analysis of Tohono O'odham Song Meter

In this section I will present an analysis of the TO song meter. The crucial generalizations that this analysis must accommodate are these:

(19) The descriptive generalizations of Tohono O'odham song meter:
A. The second and final metrical positions are never filled with stressed syllables as Vacuous Reduplication is used to prevent stresses from appearing in these positions.
B. The song's meter is also restrictive in that it prohibits adjacent stresses. Adjacent stresses trigger reduplication of the leftmost element to create an intervening unstressed syllable.
C. Lines are flexible in number of stresses and syllables.

In this section I will first present a proposal which covers the first set of generalizations. Then I will propose a treatment of the second set of generalizations; following this, I will discuss the integration and interaction of both constraints.

2.1 The Edge Constraint

There are three sets of related facts which must be dealt with adequately in this section: the restriction on both the second and final metrical positions; the strictness of both edges; and the fact that the final position may be either odd or even. In fact, all noninitial stresses may occur in either odd or even positions. In the first section, we saw the edge effects robustly. Here I will show the third characteristic as well.

The restriction on stress in these two positions suggests that the meter is trochaic (S W); S positions are odd and W positions are even ones within a line. In the examples below, I show one unfortunate consequence of proposing that the meter is trochaic; by aligning each syllable in the song line with alternating odd and even positions, I show that all noninital stresses may fall in odd or even positions, focusing here on the final position. The examples are given below.
These four examples show two things: 1) that lines do not consistently end in either odd or even syllables, and 2) if song lines are characterized as trochaic, as above, approximately half of all stresses appear in Weak positions. Six of the eleven stresses appear in Weak position. This observation is important, although at this point, I wish to postpone discussion of it until below, as it does not fit into the current discussion of edge effects. The relevant examples, however, show that the fluidity of the line length makes it difficult to characterize the meter as underlyingly trochaic, if such meter is viewed merely as alternating strong and weak positions as for Hayes.

The current problem is this: how do we characterize the fact that stresses are restricted from these two metrical positions (second and final) on edges of song lines? Is it possible to characterize, in one way, the similar behavior of these two positions (both on the edge, both typically iambic and hence weak), despite the dissimilarities (one is always even, while the other may be even or odd)? Or can it only be characterized as two separate restrictions?

I suggest that it is possible to make a unified characterization of the behavior of these two positions, and that this characterization is imperative in view of the fluidity of line length in TO song meter. My proposal is quite simple: (1) Trochaic feet are built on each edge of a song line; (2) Stresses are prohibited in the Weak positions of these feet. I have formalized the two parts of this proposal as components of the Edge Constraint in (21):
(21) **Edge Constraint:**

a. All metrical song lines minimally begin and end with a trochaic foot.

b. *Foot

\[
\begin{array}{c}
\wedge \\
S W \\
\mid \\
[... X ]
\end{array}
\]

What does each part of (21) do? The statement in (21a) stipulates that the left and right edges of song lines must consist of trochaic feet. Only feet allow the reference to the second and final metrical positions; no other construction ensures reference to the restrictions on these positions. The construction in (21b) prohibits stress in the Weak position of a foot. The Edge Constraint as formulated will only apply to two metrical positions (second, final), because there are no other feet in the meter to which (21b) can apply (at this point, I argue for the presence of feet only at line edges).

Especially striking is the formal reference to the Foot. Without a binary foot, as in (21b), we cannot unify the reference to both positions. In fact, without a foot, it is otherwise impossible to refer to the second position in meter.21

The formalization in (21) accomplishes several goals: 1) It accommodates both edge restrictions. 2) Edges are restricted without directly specifying the position, but instead by using a linguistic unit, the foot. 3) It formalizes only a prohibition on stresses in edgemost W's; recall that the evidence of (20) showed that stresses appear in other W positions. At this point in the analysis, the constraint in (21) suggests that there are only two relevant W positions which are evaluated. This can be seen in (22), where I give the song lines in (20) under the Edge Constraint:

(22) a. No violation of the Edge Constraint in a song line ending in odd:

\[
\begin{array}{c}
\text{Foot} \\
\wedge \\
S W \\
\mid \\
[X . . X . . X . . ]
\end{array}
\]

SONG

pi-si-ne mò-ka-me jé-je-wen
pisin mô'o-kam jéwed
bison head-one earth

'Bison Head (place).'

21The only other possible way to restrict these positions would be if we characterize the line as : [S W ... W], prohibiting stress in all W positions. This characterization would be possible if there were only edge effects in TO song meter and the middles of lines were completely unrestricted. However, the restriction on adjacent stresses as a condition for Vacuous Reduplication suggests that TO song meter consists of more than just edge restrictions. I will show this in more detail in the next section.
No violation of the Edge Constraint in a song line ending in even:

Foot   Foot
\             \      
S W             S W  
\              \   [ X . . X . . X . . ]

SONG  S w a   s-wá-pu-si-me   wú-wa-ke
\   s w a   s-wápusim   wúwhag
REP   CON   PL-damply   to emerge
'Damply they emerge.'

c. No violation of the Edge Constraint in a song line ending in even:

Foot   Foot
\             \      
S W             S W  
\              \   [ X . . X . . X . . ]

SONG  Nó-lig-kam-e   jé-wen-e   ká-ha-ce
 Nóligk   'am   jéwed   kác
  to turn    LOC    earth    to lie over an area
'Noligk lies there on earth.'

d. No violation of the Edge Constraint in a song line ending in odd:

Foot   Foot
\             \      
S W             S W  
\              \   [ X . . X . . X . . X . . ]

SONG  Wi-pis-mel   ñé-nei   wa-ñ   bí-je-mi-da.
 wípismel   ñéñe'i   a   ñ-   bjémid
  hummingbird  PL-song  AUX  1SG-to surround
'Hummingbird songs surround me.'

The formalization of the Edge Constraint in (21) successfully captures the generalizations of the data and characterizes song lines.

A similar observation is true with respect to the right edge, as a line with final stress, which would otherwise violate the Edge Constraint, instead corresponds with Vacuous Reduplication. The correspondence between the Edge Constraint and line-final cases of Vacuous Reduplication can be seen in (23), where I give each line in song line form and citation line form (final stresses are underlined, with violations double underlined):

(23) a. Foot   Foot
\             \      
S W             S W  
\              \   [ X . . X . . X . . ]

SONG  Jiós   oi   ká-wu-li-ki   yam-e   ké-he-ka
 Jiós   'o   i-gáwulk   'am   kék
 God    AUX    INIT-to differ    LOC    to stand
'God starts to differ standing there.'
2.1 Edge Constraint

In (23) we see that the crucial violations of the Edge Constraint come in those lines where a stressed monosyllabic word falls line-finally (CITATION). The actual song lines (SONG) are without violation because the final word reduplicates. Vacuous Reduplication clearly prevents a violation of the Edge Constraint.

Let me now summarize this section. I have isolated the generalizations about edge effects, and proposed the Edge Constraint to resolve these effects. The Edge Constraint has two parts: 1) It builds trochaic feet at each edge of a song line and 2) It prohibits stresses in the weak positions of feet. By building feet only at the edges, I have made a proposal which unifies the edge effects under one treatment. This analysis also has the benefit of allowing a characterization of the restriction on the final metrical position, which can be either odd or even, but is never filled with a stressed syllable. Finally, this analysis is compatible with the flexible song line.

2.2 An Account of Adjacent Stresses

Let me review the relevant facts about Vacuous Reduplication first. Recall from the first section that a stressed monosyllable will reduplicate when to the left of a stressed syllable or occurring line-finally. As the Edge Constraint treats only those stresses appearing line-finally, the behavior of adjacent stresses must be accounted for. Crucially, Vacuous Reduplication creates an unstressed syllable between two stressed ones.

I propose that Vacuous Reduplication enables the meter to construct a binary trochaic foot which does not violate the Edge Constraint. Again, the proposal is simple: by adding a principle which builds binary feet from stresses, the Edge Constraint will rule out any illicit feet. However, for the Edge Constraint to apply, there must be feet. Recall that from the earlier discussion, I showed the difficulty of characterizing the final metrical position with the meter aligned to alternating S and W positions. In (24), I show song lines with Vacuous Reduplication aligned to this metrical pattern:

SONG
Wá-wai     gi-wu-like     nó-no-hañ
S  W   S  W  S  W   S  W  S

CIT
Wáw      Gíwulk   dô'ag
S  W S    S  W

rock  constricted  mountain
'Constricted Rock Mountain'

b.

SONG
Oi na    só-so    kú:-ku:-ñe
S  W   S  W   S  W  S

CIT
Oi na    són    kúk
S  W    S  W

soon perhaps  the beginning  the end
'soon perhaps the beginning, the end,'

c.

SONG
am  ha-wui  mé-he-da.  ká-cim  ha wu-wui  hí-me-da
S  W  S   W  S  W   S  W  S  W  S  W

CIT
'am  ha-wui  méč.  kácim  ha-wu'uwui  híma
S  W  S   W  S  W  S  W  S  W  S  W

LOC  3PL-to  to run.  sky  3PL-DIST.PL-to  to move to
'They are running towards it. Towards them, the sky moves.'

For the first and third examples, with two adjacent stresses in a citation line, the first of these occurs in a strong position and the second in a weak position. Presumably, the Edge Constraint will rule them out and Vacuous Reduplication will create the legal unstressed syllable for the weak position. Note that the song lines in (24) also place stressed syllables in strong positions. However, (24c) is problematic for such an account. In this example, both in the citation and the song line, it is the first stress of two adjacent stresses which falls in the weak position. The Edge Constraint is violated in both lines, despite the efforts of Vacuous Reduplication. This shows that the characterization of the meter as a string of alternating S and W positions is not correct. The correct characterization must consistently place the second of two adjacent stresses in weak position. I have shown previously that stresses will appear in odd (S) or even (W) positions if the song meter is characterized as alternating S and W positions.

Here, I propose that the proper treatment of the metrical pattern is one which allows all stresses to appear in S position. This gives an adequate formal characterization of the prohibition on adjacent stresses; these stresses head binary feet. Binary feet consist of two positions, and the Edge Constraint will rule out any foot made up of two stressed syllables.

To achieve this effect, the meter requires one more constraint, which will effectively build binary feet wherever stresses appear. In (25), I formalize this rule:

---

22 The nature of Vacuous Reduplication deserves a comment. As it is prefixal, it actually allows the stress to move from one syllable to the newly created one. This has the ultimate effect, however, of creating a weak position in the meter. Also, the phonological changes found in songs, especially those related to features, nasalization, and lenition, are often reflected in the reduplicated forms.
(25) **Binary Foot Constraint:**

a. All stresses appear in the strong position of a foot.

b. All feet are binary (following Hayes 1987).

With the proposed Binary Foot Constraint (BFC) of (25), we also require a formalization of Vacuous Reduplication to reduplicate and prefix syllables that result in the eventual filling of the necessary weak positions by the BFC. I give this formalization in (26) (following McCarthy and Prince (1990)). The formalism creates a prefixal reduplicant wherever a vacant position appears in a foot in the meter.

(26) **Vacuous Reduplication:** (In this rule, *són* typifies the forms which participate in this process; that is, stressed monosyllables.)

\[
\Sigma^-(\Phi (són)) = \Sigma^-(són\Phi)*\max /\Phi \\
\sigma = \Sigma^-(són\Phi) \\
\sigma = \sigma són
\]

where

<table>
<thead>
<tr>
<th>Foot</th>
<th>S</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>_</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The rule in (26) will reduplicate monosyllables wherever they are not followed by an unstressed syllable. Note that stressed syllables cannot fill these positions, as this violates the second half of the Edge Constraint (21b). In the data in (27), I show the effects of the proposed BFC and Vacuous Reduplication. Note the empty weak positions (underlined) that result from the ban on a stress in weak position:

(27) a. Foot Foot Foot Foot

<table>
<thead>
<tr>
<th>Foot</th>
<th>S</th>
<th>W</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>_</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| X .  | X . | . . | X . . . | X . . .

**SONG** Wá-wai gi-wa-lig-e we-co ná-ha-gio kc in mém-ē-li-hi-me

wáw giwulk weco náhaygo kc 'in mémelihim

rock cinched below mouse CONJ LOC to run to rpt

'The mouse runs around there below Cinched Rock.'

<table>
<thead>
<tr>
<th>Foot</th>
<th>S</th>
<th>W</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>_</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>_</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| X .  | X . | . . | X . . . | X . . .

**CIT** wáw giwulk weco náhaygo kc in mémelihim
The lines in (27) show several consequences of the second part (BFC ; Vacuous Reduplication) of my proposal: 1) The second of two adjacent stresses cannot fill the weak position of the foot, following the Edge Constraint. 2) Line-final stresses cannot build binary feet to satisfy the BFC, for they have no material to fill the weak position. 3) All stresses will necessarily appear in strong positions. 4) The BFC and Vacuous Reduplication make redundant part of the Edge Constraint, specifically, building feet on right edges.

It is this final consequence which suggests that the Edge Constraint should be revised to build feet only at left edges. I give the simplified Revised Edge Constraint below in (28).

---

23This example also shows the ambiguity in how the meter treats jéwed. The form must be scanned as a disyllable here as it does not reduplicate.
REVISED EDGE CONSTRAINT: Tohono O'odham song meter is governed by the following:

a. The left edges of song lines minimally begin with a trochaic foot.

b. 

\[ * \text{Foot} \]
\[ \wedge \]
\[ \text{S} \text{W} \]
\[ \mid \]
\[ [... \text{X}] \]

To conclude this section, the significance of the lines in (27) are that they confirm the intuition that Vacuous Reduplication is a metrical effect; the significance of the Binary Foot Constraint is that it explains why the extra syllable of Vacuous Reduplication is generated: to build satisfactory trochees. An additional benefit is that the BFC unifies the right edge effects, the prohibition on adjacent stresses, and the effects of Vacuous Reduplication under the auspices of constraints that govern the meter. Thus, the BFC augments the Edge Constraint, and a highly complex, rigid system of meter emerges in the O'odham songs.

2.3 Consequences of the Constraints

Here, I will briefly demonstrate why each part of the two constraints is necessary to rule out nonoccurring lines. There are three types of lines which never occur in the corpus; I give these below, followed with sample lines that are acceptable.

(29) Unacceptable Lines:

a. * . X ...........

b. * . . . . . . . X

c. * . X X X ...........

Acceptable Lines:

d. X ..............

e. . . . X ...........

f. X . X ...........

g. . . . . . X . X

Which lines are judged acceptable and unacceptable by only application of the Revised Edge Constraint? Those in (29b-g) are all acceptable, while only (29a) is unacceptable. The line in (29a) is exactly the type of line the Revised Edge Constraint is meant to rule out. How do the lines fare in a comparable treatment with the Binary Foot Constraint? By the Binary Foot Constraint, the acceptable lines are (29a,d-g) and the unacceptable ones are (29b-c). The figure below shows this in more detail:

(30) Revised Edge Constraint

\[ * \text{Foot} \]
\[ \wedge \]
\[ \text{S} \text{W} \]
\[ \mid \]
\[ [... \text{X}] \]

Binary Foot Constraint

\[ \sqrt{\text{Foot}} \]
\[ \wedge \]
\[ \text{S} \text{W} \]

a. * . X ...........

b. * . . . . . . . X

d. \[ \sqrt{\text{Foot}} \]
\[ \wedge \]
\[ \text{S} \text{W} \]

b. * . . . . . . . X

21
As this figure shows, the Revised Edge Constraint and the Binary Foot Constraint are both independently needed to account for different types of ungrammatical lines. Each rules out a different subset of the unacceptable lines. Note that for the acceptable lines, there is only overlap in lines like (30d,f), which begin with a stressed syllable followed by an unstressed one. Here, both of the constraints build acceptable feet. This marginal overlap, however, is a consequence which is insignificant in view of the work both constraints do separately on unacceptable lines.

Let me quickly review the analysis presented in this section. My analysis consists of three parts, the Revised Edge Constraint, the Binary Foot Constraint and Vacuous Reduplication. The Revised Edge Constraint consists of two parts: 1) All metrical song lines minimally begin with a trochaic foot, and 2) Stresses are prohibited in the weak positions of feet. This filter constrains the meter by restricting the left edge position which does not allow stress, the second metrical position. The Revised Edge Constraint allows us to refer to this metrical position by using the Foot, as there is no other category which covers the set of distributional facts. I argue that the Edge Constraint in its earliest version is further confirmed by the behavior of monosyllabic stressed words line-finally. For the Revised Edge Constraint, the manipulation of the stressed syllables by the morphology shows that the avoidance of the two positions is significant, and not that they were merely overlooked.

I further argued that the critical effect of Vacuous Reduplication is to create an extra syllable which results in separating two stresses by an unstressed syllable. This effect can also be characterized under the Revised Edge Constraint, if we make one crucial modification to the analysis. I proposed that the Binary Foot Constraint effectively makes a binary foot for each stressed syllable. Here again we see how the Revised Edge Constraint rules out any foot with a stress in the weak position. Binary feet ensure that stressed monosyllables will never appear line-finally, as they create degenerate feet. Thus the Binary Foot Constraint allows both a

24The meter does show surface dactylic (S W W) effects. This is seen at the right edge with respect to the extra vowels, as pointed out to me by Leanne Hinton and Gilbert Youmans. Forms such as ké:k surface as a dactyl when line-final: kéheka. Note that a dactylic account fails when we consider the fact that trisyllabic words, such as bijemid, ‘to surround’ ends with an extra vowel in the songs: bi-je-mi-da (36:1). Also, vowel-final disyllables may
characterization of the distributional facts (no adjacent stresses, stress may fall in either even or odd metrical positions), as well as an account of Vacuous Reduplication which coheres with the entire metrical system of the songs.

This analysis of Tohono O'odham song meter enriches our understanding of metrical theory. There is no other way in which we can characterize the data presented here; the metrical categories of foot and line are strongly motivated, and indeed, we are able to construct a metrical theory using rather simple theoretical entities. Further, the system argues for strict binarity in the representation of the foot in meter.

3. On Meter and Universals

In this section I will discuss Hayes' theory of meter with respect to the analysis presented in the previous section. Hayes (1989) claims that metrical requirements are lax line-initially. The analysis of TO requires modification of the typological claims made in Hayes (1989), as O'odham metrics requires strict left edge metrical constraints.

Let me review Hayes' rule typology. Three rule types make up 'an exhaustive typology of the ways in which metrical rules may refer to bracketing. A given rule may belong to more than one type' (Hayes 1989: 246). In (31), I list and define these three types:

(31) a. **BOUNDING RULE:** 'considers only those peaks that are defined within a given peak in a snapshot of that category.' (p. 245)

b. **RIGHT EDGE RULES:** 'apply to rule out structures of the following form:

\[
[D... \text{Peak}]
\text{W}
\]
where 'D' is a specified prosodic domain, 'Peak' is a peak in metrical position defined within D, and '...' is material included in D that the rule may optionally specify. The claim here is that the right edges of prosodic categories are often scanned with special strictness.'(p. 245)

c. **LEFT EDGE RULES:** 'apply to configurations of the form

\[
[D \text{Peak}...]
\text{W}
\]
where 'Peak' and 'D' and '...' are defined as before. The difference here is that left edge rules, rather than forbidding a specified cadence, may overrule other metrical rules, licensing cadences that would otherwise be ill-formed.' (p. 245)

An interesting situation arises when we consider the Revised Edge Constraint. If we allow a loose definition of domain here, such that Foot and Line are allowed, the Revised Edge Constraint (28a) contradicts Hayes' claim for left edges as lax, as it provides that a foot must be built on the left edge of a line (to prevent a stress in weak position). This is never violated in the songs, robust evidence that left edge rules for TO song meter are strict. The more general part of the Revised Edge Constraint (28b), which prohibits stresses in metrical W, is consistent with receive no additional syllables, as when kak-ke (20:3) 'to ask', surfaces line-finally without change. The formalization of Vacuous Reduplication could easily be changed to produce dactyls for these types of words, as well as for adjacent and line-final stresses. The effects of Vacuous Reduplication clearly support a dactylic analysis of the meter.

Finally, the form kāidaghim, 'resounding noise-CONT' truncates into a disyllable when it ends a line: kāim-he (24:6). These facts are incompatible with a dactylic analysis of the meter.

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25 **PEAK:** any syllable with a higher grid column than AT LEAST ONE of its neighbors (Hayes 1989, 227).
Hayes' formulation of right edge rules. But crucially, it is the instantiation of this for the initial, left edges of song lines which contradicts his typological claim of left edge rules as lax. The necessity of building a strict trochaic foot line-initially presents the argument for a revision to the typology of rules to allow strict left edge rules.

Finally, I would like to discuss the theoretical role played by the categories motivated in this paper: Foot and Line. Hayes notes that the 'bracketed units Line, Colon, and possibly Foot are thus supported by the metrical rules that must refer to them' (1989: 256). A central point of this paper is the motivation of the Foot as a category referred to by metrical rules. Kiparsky (1977), Prince (1989), and Youmans (1989) (and others) also provide evidence for the Foot. The second comment is that while Hayes acknowledges that the Metrical Hierarchy (made up of Line, Colon, Foot) plays a role in meter, he observes that the metrical rules referring to categories of the Metrical Hierarchy follow the typology of metrical rules which he proposes. Again, however, I argue that the study here shows that line-initial strictness must be allowed.

4. Conclusion

In this paper, I have argued for a number of points. Let me review them, starting with those of a more descriptive nature. The data involved in this study is very complex, and I have attempted to organize the various phenomena in the songs according to their relevance to the meter, as that is the focus of this paper. Tohono O'odham songs are made up of lines which are flexible in some ways, and rigid in others. The line is flexible in allowing a relatively unconstrained number of stresses and syllables.

Vacuous Reduplication shows itself to be metrically motivated. I have shown that it involves the systematic manipulation of the morphology to avoid adjacent or line-final stresses.

The descriptive facts of Tohono O'odham songs reveal the dual nature of the line: it is flexible in terms of the number of stresses and syllables; it is rigid in terms of regulating where stresses may appear. The closest parallel can be found in Old English poetry, such as Beowulf. The meter of Beowulf has typically been described as a line which consists of two verses, which in turn are made up of two main stresses and an unspecified number of more weakly stressed syllables. However, unlike TO song meter, the meter of Beowulf can be characterized by the regularity of the number of stresses.

In O'odham song meter, the regularity is derived differently; it is derived through restrictions on where main stresses may appear. Unlike other meters which regulate this characteristic, Tohono O'odham song meter does not regulate line length. Like Beowulf, this results in a meter which allows an indeterminate number of syllables of lesser prominence. The characterization of the O'odham song meter may exemplify a novel system of meter. This finding alone is an important one for the typology of versification systems.

The metrical system can be captured in an analysis which relies on the foot. The foot-based analysis also provides for the line's flexibility. The O'odham meter shows that these components are necessary for generative metrics.

I have made two specific proposals the cornerstone of my analysis. First, I argued for the Revised Edge Constraint, which proposes that the prohibition on stressed material in the second metrical position, can only be handled by building a foot at the beginning of each song line and restricting stresses from appearing in the weak position. Second, I showed that the additional restrictions on the line, namely the prohibitions on stresses appearing adjacent to each other or line-finally, can be derived by the Binary Foot Constraint, which states that all feet are binary trochees and all stresses must appear in strong position of feet.

Under my analysis, the flexibility in song lines comes from the fact that the meter only regulates stressed syllables; weak syllables are relevant only when they are incorporated into...

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26 However, see Hayes (1983) for arguments against Kiparsky's analysis.
27 However, both Cable (1974) and Russom (1987) argue against this 'textbook' characterization of the meter, and propose their own alternatives.
feet by the Revised Edge Constraint or the Binary Foot Constraint. All other weak syllables in the line are unrestricted. This results in the variability of line lengths seen in the songs.

Three central theoretical points have been developed here. First, I show that the line may be flexible in some poetic traditions. Second, I argue that binary feet, with constituency, are needed in this line. Finally, I argue that Tohono O'odham songs attest to the existence of strict metrical rules for left edges. The necessity of beginning each line with a foot, to ensure the strict enforcement of no stresses in the second metrical position, provides the impetus to revise the typology of meter presented in Hayes (1989): He argues for a typology of metrical rules that states left edge rules are lax. The importance of this study from a typological perspective is evident.

In conclusion, this study has isolated certain problem areas in generative metrics, as well as providing evidence for a novel system of versification. By using data that from Tohono O'odham, a Native American language steeped in the oral tradition, we can see not only where metrical theory is lacking, but also recognize the unique properties of the system of meter used in these songs. The metrical system is rooted in three simple principles (the Revised Edge Constraint, the Binary Foot Constraint and Vacuous Reduplication) which produce the intricately organized metrical pattern, the meter of Tohono O'odham songs.
References


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