

Song Metrics

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## SONG METRICS

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### INTRO

In this paper I will compare metrics in language and in music, and then go on to define the nature of metrics in song -- which contains both language and music, and therefore should display some interesting interactions of the two types of metrical behavior. I will illustrate my points about song metrics with a Havasupai narrative song.

### METRICS IN MUSIC

Linguistic and musical meter are the same in the sense that they both have timing units and a hierarchy of S and W positions. Music is divisible into equally spaced beats, and there is a hierarchy to these beats, with multiple levels. Thus in a 4/4 time signature, the first beat is strongest, 3d beat second-strongest, and 2nd and 4th beat weak. This can be represented by dots on a metrical grid, or by a tree, as seen in figure 1.

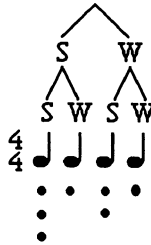


Figure 1. 4/4 musical meter, diagrammed in grid and tree form

The most celebrated work to date that applies a linguistic model to musical analysis is Lerdahl and Jackendoff's book A Generative Theory of Tonal Music, 1983 (henceforth, GTTM). I will be using that work as a jumping off point for the study of song. Meter is viewed there, and here, as a cognitive phenomenon; to quote GTTM, "We take the goal of a theory of music to be a *formal description of the musical intuitions of a listener who is experienced in a musical idiom*" (p. 1). The model proceeds from the point of view that a listener sets up a metrical model in his/her head that s/he derives from clues in the music, and then hears the rest of the piece with respect to that model. The clues that lead a listener to develop a certain metrical model are stated in GTTM as "preference rules", involving an interplay between such phenomena as parallelism in rhythm or melodic movement, accent, and length of a pitch event. The attack points of pitch events are preferred to be analyzed as strong positions, and positions occupied by rests or continuations are preferably interpreted as weak. Most importantly, once a metric pattern is set up, preference is for following pitch events to be interpreted as having the same pattern. (These are called "preference rules" because they don't have to be

followed. For example, rests may appear in strong positions, and attacks on weak positions; that is the definition of syncopation.)

The GTTM model has two types of rules for meter: one is the preference rules referred to above, and the other is "metrical well-formedness rules", which specify the possible structural descriptions for meter. A statement of these rules is shown below:

**MWFR 1** Every attack point must be associated with a beat at the smallest metrical level present at that point in the piece.

**MWFR 2** Every beat at a given level must also be a beat at all smaller levels present at that point in the piece.

**MWFR 3** At each metrical level, strong beats are spaced either two or three beats apart.

**MWFR 4** The tactus and immediately larger metrical levels must consist of beats equally spaced throughout the piece.

Musical pieces also have a grouping structure, or phrase structure of the pitch events, which may or may not be the same as the metrical structure. Figure 2 shows a grouping structure that is in phase with the meter, while Figure 3 shows a grouping structure that is out of phase with the metrical structure.

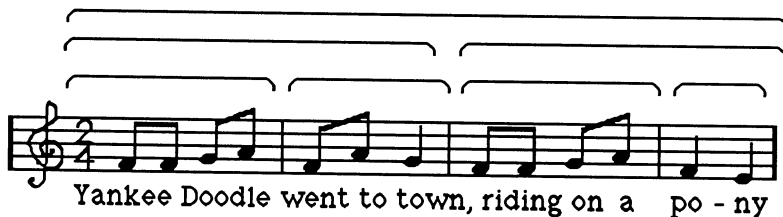


Figure 2. Grouping structure of first line of Yankee Doodle.

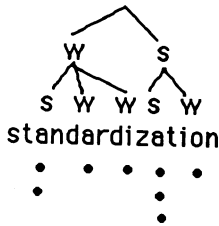


Figure 3. Opening theme of Mozart's G-minor symphony (adapted from GTTM).

## LINGUISTIC METER

In linguistics, like music, meter involves a hierarchical structure of strong and weak positions. Comparing Figure 4 (below) with Figure 1, it is obvious

that the same kinds of visual formalism can be used to represent both musical and linguistic meter.



**Figure 4.** Metrical structure of a word, shown in tree and grid notation.

In fact, the visual representation of musical meter in Figure 1 is actually the application of linguistic conventions to the musical medium. Furthermore, there are obvious parallels between music and language in the phonology of metrical structure. As Jackendoff (1989) points out, "metrical weight in music is strongly dependent on stress (or accent) and on length, two of the most important factors involved in metrical weight in language as well."

But despite the easy transfer of representational conventions from linguistic to musical data, to what extent can we say that linguistic meter and musical meter are really the "same" phenomenon? Musicologists have often warned against the facile application of linguistic models to music (e.g., Feld, 1974), which can result in fallaciously forcing the analysis of music into a foreign, inappropriate and possibly un insightful mold. Are the metrics of language and of music really two different sorts of metrical behavior, for which separate theories must be maintained? There is certainly no doubt that there are many differences between them. GTTM points out, for example, that there is nothing analogous to metrical preference rules in language.

Surprisingly, song has not normally been considered in the study of metrics. Even linguists studying music almost invariably study only instrumental music. Certainly some greater insight into the question can be gained through the study of song, where both linguistic and musical metrical systems are presumably present.

The particular question to be asked here is whether linguistic metrics and musical metrics are separate systems or a single system in song. I will show that not only must linguistic and musical metrics be viewed as a single system in the Havasupai song tradition, but that in fact cues from linguistic metrics may be the only way to determine the musical metrics. I would suggest that this is true in a large portion of song traditions throughout the world, especially in language-dominant musical genres, such as ballads.<sup>1</sup>

## SWEATHOUSE ORIGIN SONG

The Sweathouse Origin song is a member of a genre of narrative songs that used to be very prevalent among the Havasupais. A portion of the text from this long song is shown in the appendix (reprinted from Hinton, 1985). This song, as is the case with all Havasupai narrative songs, is partially improvised. That is, the text of each performance, even by the same singer, will

be quite different, much as the text of a spoken story differs from performance to performance. For this and other reasons, my goal in the development of a musical theory differs slightly from GTTM in that I am interested in a description of the musical intuitions used by a performer in the production of music. Hopefully, the cognitive models of a performer and an "ideal" listener would overlap a good deal -- I emphasize GTTM's word "ideal" because otherwise the performer's model must be considerably more precise and detailed than the listener, who can of course be inattentive, or can listen with only partial understanding of the structure of a piece. (It might be noted that GTTM's goal of describing the musical intuitions of an experienced listener is itself a product of the particular nature of our consumer-oriented musical culture, where most members are listeners and few are musicians. In many other cultures, including the Havasupais, there is not such a distinction between listeners and performers; in the old days, especially, most Havasupai people sang and composed songs. The role opposition of "audience" vs. "performer" was not a well-defined concept. And even now, while traditional music is in the process of being supplanted, I would not say that there is any such thing as an "experienced listener" who does not himself also sing.)

The Sweathouse Origin song is in verse form. A transcription of the melody for the verse is shown below.

### Sweathouse Origin Song

(Middle C = A220; ♩ = 104)

The musical score is written in treble clef with a key signature of two flats (B-flat and E-flat). The tempo is marked as ♩ = 104. The lyrics are written below the notes, with hyphens indicating long notes. The melody consists of quarter and eighth notes, with some notes beamed together.

ge ɛa te-- so-- ʃwi ʃa-- ge-- ɛa te so ʃwi ʃa

ɛa te-- so-- ʃwi ʃa-- ge-- ɛa te so ʃwi ʃa

ge ɛa te-- so-- ʃwi ʃa-- ge-- ɛa te so ʃwi ʃa

ɛa te-- so-- ʃwi ʃa-- ge-- ɛa te so ʃwi ʃa

In Figure 5, below, the durational values of the repeating metrical unit (one line of the song as transcribed) are diagrammed. The musical study of meter for this song turns out to be problematic. MWFR 4 in GTTM suggests that the metrical structure shown below is not well-formed, because the beats at the second level are not equally spaced:



Since the first beat of the metrical line is sometimes a rest, we place the first strong position on the second beat, thus defining the first position as an upbeat. But beyond that, if we try to form a metrical structure for the Sweathouse Origin Song that has equally spaced beats at all levels, we get a structure as shown in the grid below the diagram in Figure 5.



**Figure 5.** First hypothesis: extreme syncopation.

If the reader attempts to sing the song clapping hands at the strong beats as hypothesized in Figure 5, it will not sound at all right. Any alternative way of dividing the line into equal beats at this level will also result in a counterintuitive meter. In this Havasupai song, the only way to achieve a model of equally spaced beats at any level other than the smallest, creates extreme syncopation, where a good half of the attack points are off the beat. Havasupai songs in general don't exhibit this sort of extreme syncopation; any songs that have an accompaniment of a rattle or drum to show the beat don't exhibit this kind of syncopation. In general, musical traditions that have extreme syncopation have some sort of base line (such as a drum beat or a piano base) that keeps track of the meter while some other voice syncopates. It seems reasonable to try to find some other way of analyzing the meter of this song.

Despite GTTM's postulation of this well-formedness rule, the authors point out that in many musical cultures in the world, such as in Eastern Europe, metrical patterning consists of alternating lengths between beats at some levels, and that there are even some rare instances of this in the Western tonal music that forms their corpus of study. It might have been better for them to have postulated this as a preference rule. In any case, there is much precedence in the music of the world for seeking a solution that has varying distance between beats at some levels.

In figure 6, below, the second level of beats simply marks the attack of each pitch event; note that there is a pattern of alternating groups of long and short pitch events. Perhaps we cannot go any further than that in the metrical

analysis, other than to note that this pattern of longs and shorts is repeated. But to say this is to give up on another claimed universal of metricality, which is that humans group sequences of beats into higher-level sequences, always in groups of 2 or 3 (GTTM well-formedness rule 3). But how might we group these? There are various possibilities. Despite the possible abandonment of MFWR 4, we might still try to salvage regularity as much as possible. The third row of dots shows the hypothesis which leads us to the greatest regularity: three 6/8 measures, where the first and third measures would consist of Sww Sww (with the upbeat repeating as the last position in the third measure), and the second would consist of SwSwSw.

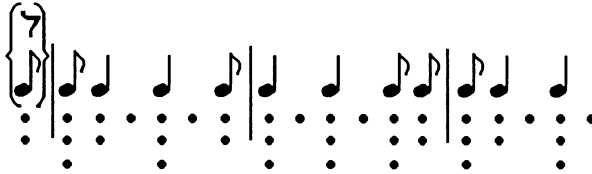


Figure 6. Second hypothesis: 6/8 measures, |SwwSww|SwSwSw|SwwSww|

Another possibility would be to utilize the preference rule cited by L and J that long pitch events are preferably perceived as strong positions, and short pitch events as weak. Since there are three groups of two long notes in the line, we might divide up the meter as shown in Figure 7. This gives us three measures of 5/8, 7/8 and 6/8. We sacrifice the notion of regular metrical units at the highest level, but it still has potential merit.



Figure 7. Third hypothesis: long notes strong.

But in general, it is next to impossible to come up with a satisfying analysis in the manner we have tried so far; and especially since this is a foreign genre, heard with Western ears, we must feel that we simply do not have enough information to decide on a good metrical analysis.

But what can we learn by looking at linguistic metrics in this song?

First of all, the words show us an important fact about grouping -- looking at patterns of syntactic form and line repetition, we find that the main break in the line is nowhere that our metrical hypotheses have led us so far -- the grouping breaks the line into two 9/8 phrases, as shown in the first line of the song, in Figure 10.



Figure 10. Text grouping.

All the lines of text in the song are divisible in the same way. Based on the text divisions, we can say that the melody of the verse is divisible into 9/8 phrases -- a, b, c, and d as shown in Figure 11. The phrases a and b are grouped into a higher level A, and c and d are similarly grouped together as B, as shown in the tree structure of Figure 12. The entire song structure is at the bottom of Figure 12: it begins with AARA, and then, for this performance, 39 repetitions of ARA.

Figure 11. Grouping (labelled as a, b, c, d)



Song structure: AABA [ABA]<sup>39</sup>

Figure 12. Song structure.

Now, let us look at the linguistic metrical pattern. First of all, an obvious truism: each attack point corresponds to a syllable of text. A consonant or

consonant cluster is a break in continuity, and therefore by definition a new pitch event begins with each syllable.

A summary of the important aspects of stress patterning in the song is shown in Figure 13. The musical notation is a repetition of the diagram showing the durational values of the metrical unit. Above the notes, I have placed numbers (1-12) for easy reference. Below the durational values I have written sample lines of the song. These AND ALL OTHER LINES of the

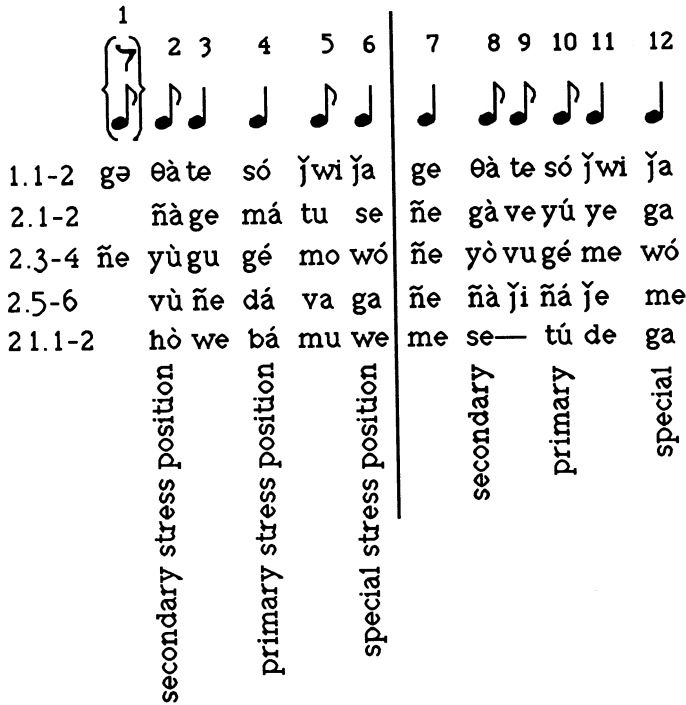


Figure 13. Stress positions of song text.

song have a highly constrained stress pattern. Positions 4 and 10 always have primary stress, that is, those positions are always occupied by a stressed root vowel (Havasupai always places word stress on the last vowel of the root of a word). Below the lines of text, I have written vertically that these are called the "primary stress position".

Positions 2 and 8 are what I call secondary stress position; these positions may carry a stressed root vowel or an unstressed prefix. Given that positions 1-6 are a phrase, phrasal stress also plays a role here: in Havasupai, the last stressed root vowel of a phrase carries primary stress, and any previous stressed root is secondary.

Finally, positions 6 and 12 are what I have labelled the special stress position, because while most of the time the vowel belongs to an unstressed suffix, there are a few stressed suffixes in Havasupai, and such a suffix will

always fall in that position. This is also the most common position for the placement of vocables.

It is interesting to note that this song, as is true of all narrative songs, is partially improvised -- that is, every performance will differ in the details of word choice, just as is the case with story telling. Yet the good singer never varies from the linguistic metrical pattern outlined here. The singer uses various devices to maintain this unvarying pattern of placement of stressed syllables. He uses a very constrained set of syntactic structures, and places inserted vowels and vocables in strategic positions.

## METRICAL SOLUTION

Now that we understand the linguistic metrics of the song, let us return to our discussion of the overall metrical structure of the song.

In Figure 14, I have once again diagrammed the durational values of the song, and as before, under it is the smallest level of beat, and the next row of dots is the attack points, or syllables. The third row of dots shows

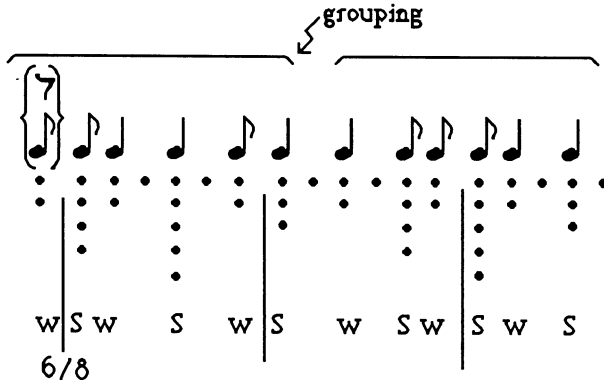


Figure 14. Metrical solution based on linguistic stress patterns.

the stressed positions that we arrived at in our analysis of linguistic metrics; that represents the highest level for the special stress position; the secondary stress position gets one extra dot, and the primary stress position gets one more. Below that, I have translated the dots into indications of Weak and Strong positions. It becomes clear, then, that the text consists of alternating strong and weak positions of one syllable each. Following the convention for musical metrics of taking a strong position to be the beginning of a metrical unit, we see that the hypothesis we developed earlier about analyzing the meter as three 6/8 measures is in fact the best solution, based on linguistic metrics. Notice also that the stresses neatly line up so that each type of stress gets its turn at the head of the measure: first secondary, then special, and finally primary. It is a sophisticated, yet very neat, sort of Round Robin meter.

In the final analysis, then, this song -- and, I guarantee, many other songs from cultures all over the world -- require knowledge of the linguistic metrics of the text in order to understand the musical meter. Thus to the metrical preference rules of Lerdahl and Jackendoff must be added another rule

referring to the text of songs: Prefer a metrical structure that fits the linguistic metrical structure of the song text.

## Footnotes

1. It must be noted, however, that in many musical traditions, aspects of linguistic metrics may be suspended in song. For example, vowel length, which is distinctive in Havasupai spoken language, is neutralized in song. Navajo tone is lost in the melodic contour of song; and in Spanish, stressed syllables frequently fall on metrically weak positions (Janda and Morgan, 1988).

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