

The Correspondence between Linguistic Tone and Musical Melody  
Author(s): William R. Leben  
*Proceedings of the Ninth Annual Meeting of the Berkeley Linguistics Society* (1983), pp. 148-157

Please see “How to cite” in the online sidebar for full citation information.

Please contact BLS regarding any further use of this work. BLS retains copyright for both print and screen forms of the publication. BLS may be contacted via <http://linguistics.berkeley.edu/bls/>.

---

*The Annual Proceedings of the Berkeley Linguistics Society* is published online via [eLanguage](#), the Linguistic Society of America's digital publishing platform.

On the Correspondence between Linguistic Tone and Musical Melody  
 William R. Leben  
 Stanford University

1. Introduction.

In this paper I offer a reinterpretation of a study by Richards 1972. Richards looked at a song in Hausa, a tone language, and attempted to determine the degree to which the musical melody resembles the linguistic tones of the lyrics. His result was unambiguous but unimpressive: the correspondence was statistically significant but admitted many deviations. This contrasts with what we know from other studies of the correspondence between tunes and tones, where in general the result is that the correspondence is either extremely close or practically nonexistent. My reinterpretation of Richards' data will suggest that for this particular Hausa song, a comparison should be made not between the musical melody and the phonemic tone levels but rather between the musical melody and a normalized intonational realization of the lyrics. I will try to conclude something from this about the nature of phonetic representations.

2. A Study of Wakar Indefendan, "The Song of Independence".

The song Richards examined was performed and recorded in 1964, at the height of its popularity in northern Nigeria. Richards compared the pitch displacements in the song with those that would be predicted in the spoken language on the basis of the phonemic tone differences in Hausa. Hausa has two underlying tones, H and L, which can combine on some heavy syllables to give a sequence HL, or falling. Falling tones have rather low frequency (in the present song, there are only 22 falls, as compared to 488 highs and 337 lows), and so to simplify his study Richards counted falling tones as low. He looked at the first 52 lines, about one quarter of the song in question, and the first two lines appear in (1):

(1)

S. bá-bá bá-r ká-sár shé-hù dáj hó-dí-yá

ná-jé-rí-yá tá tsa-ré gas-kí-yá

The way that Richards tabulates the tune-tone correspondence is the following. To normalize the shift from one musical note to the next with the concurrent move from the phonemic tone level of one syllable to the next, Richards translates musical note sequences and phonemic tone sequences into a different notation, as follows: for a transition between a relatively H pitch and a relatively L one, Richards writes F; for a transition between a

relatively L pitch and a relatively H one, Richards writes R, for rising; for level movements from syllable to syllable, Richards writes L. Note that in Richards' system L stands for level, not for low tone. A sample transcription using these new symbols is given in (2). This is a transcription of the first line in (1). Where there is a sequence of notes on a single syllable of lyrics, I count only the first note. I assume that Richards does the same, but he does not mention this explicitly. One other simplification Richards makes is to count phonemic falling tones as if they were low tones; this simplification is arbitrary, but it does not throw off the count severely, since falling tones make up only 22 of the 847 tones Richards counts in the complete text.

(2) Sample transcription:

Tune: R L L L L L F F

Tone: R L L L F R L L F

Richards now counts the number of tune-to-tone correspondences in the actual song and compares these to the number of correspondences that would occur by chance, that is, if the poet did not aim for a fit between the linguistic tones and the musical ones. Richards' results are statistically significant but woefully unimpressive. The attested cases of perfect matches between tune and tone are a mere 53.4% of the total. Although the percentage of matches to be expected by chance is lower, it is only somewhat lower, in the range of 35% to 40%, depending on how one calculates. The difference is large enough to be statistically significant but nonetheless not really very large at all. Only slightly more than half of the musical notes actually coincide with the phonemic ones. This is a puzzling finding, for at least two reasons. First, we wonder why a composer would seek to make the melody conform to the phonemic tone pattern to such a limited extent. Poets are entitled to nod, but not 46.6% of the time. Second, in other cases in the literature, it seems that composers do not behave like this at all. Either they pay rather close attention to the tones or they ignore them altogether. In the next section I summarize the literature I have encountered on this topic in African Languages.

3. Survey of other sources.

Greenberg 1949 reports on one Hausa song, a popular song two lines of which he transcribes. He notes that there is no correspondence between the musical and linguistic tones. Within each foot (of two or three syllables), the syllables are all on the same musical note, regardless of the linguistic tones of the lyrics. However, Greenberg refers to Maloney, who has found correspondences between linguistic tones and music in a number of West African languages, including Hausa. Unfortunately, I have not yet been able to consult this source.

Jones 1959 and Schneider 1943-44, 1961 concur that there is a dramatic correspondence between tune and text in Ewe, a Kwa language of Togo and Ghana. Jones, in fact, notes an agreement of slightly more than 90% between the linguistic tones and the musical pitches of the one song for which he calculates the correspondences. This is all the more impressive because Ewe has three phonemic tones, High, Mid, and Low. Jones and Schneider disagree, somewhat bitterly, over the reasons behind the small minority of cases in which tune and tone don't match. Schneider presents a number of hypotheses, the most interesting of which has to do with tone being overridden by meter: H may be L in song on a metrically important syllable, and L may be H in song on a metrical point of secondary value.

Finally, Simmons 1980 takes the close correspondence between tune and tone for granted in Efik, a Benue-Congo language of Nigeria, presumably because the correspondence is so exact, though Simmons offers no actual tabulations. And Simmons raises the further question of whether it is the tones of the lyrics that set the pattern for the melody or the tones of the melody that narrow down the choice of words for the lyrics to tonally matching ones.

Thus, with the exception of Richards, all of the sources quoted find either a clear tune-tone correspondence or a clear lack of it. In the remainder of this paper I will argue that the Hausa song which Richards analyzed does in fact exhibit a remarkable correspondence between musical melody and linguistic pitch, but that this correspondence is obscured by paying attention to the phonemic tone levels H and L. Rather, these tone levels must be adjusted by rules which are in fact related to the rules of Hausa intonation. The basic point can be seen by observing that most of the violations of the tune-tone correspondence in the following text, taken from four more lines of Wakar Indefendan, are of one of two kinds. First, the third syllable of the proper noun Nigeria is marked as L in the phonemic transcription, but it is on the same note as the preceding high-toned syllable in the song. This is simply a consistent transcription error on Richards' part: phonemically, the third syllable of Nigeria is actually high, not low. The second violation involves the fact that in practically every sequence HLH, L in the song is realized on the same level as preceding H, rather than being relatively low. The deviant L tones are encircled.

(3)

S. ma - za kuŋ ga kir- (kin) ta (Na) - je - ri - ya

da tak (kar) bi mil- (kin) ta (Na) - je - ri - ya

ta kai a - ma - (na) ka - (sa) - sheŋ ga - bas 15

ta kai a - ma - (na) ka - (sa) - sheŋ gu - suŋ

Thus, what appears to be the case is that the poet patterned the melody not after the phonemic tone levels *per se*, but after these levels modified by a rule that makes a L equivalent in fundamental frequency to a preceding H. Interestingly, as I learned from a study reported in Leben 1983, the L in HLH is quite variable in where it is plotted with respect to the preceding and following tones; in actual Hausa intonation curves it is not unheard of for L to be not only as high as the following H but even as high as the preceding H. This being the case, it is possible that the poet is modeling the song on the basis of a version of Hausa intonation that is indeed stylized, but that is clearly adopted from one of the options taken in normal speech. However, before we can consider this topic any further, we must first take a closer look at Hausa intonation in general.

#### 4. Intonation in Hausa.

The standard view of Hausa intonation is that, to a first approximation, a low tone lowers the register for a following high tone. As a result, the H on the right in HLH is, on the average, lower in fundamental frequency than the rightmost H in HLH. This is true, but in addition, many investigators have either assumed or claimed that the reason behind this downdrifting pattern is that in a sequence of tones, a low tone is plotted, say, two steps below a preceding H, while a H is plotted only one step above a preceding L. This point of view emerges from work focused on Hausa in particular, such as Hodge and Hause 1944, Meyers 1976, Miller and Tench 1980, 1981, as well as from general works concerned with the formalization of the downdrift phenomenon, such as Schachter and Fromkin 1968, Clements 1979, and Hyman 1979. However, there are signs that the lowering effect of a L on a following H is independent of where that L is plotted on the actual intonational curve. The results are reported in greater detail in Leben 1983, but the basic phenomenon is the following.

In fluent speech, L tones are extremely variable in their realization. Quite often they are no lower than the following H, as Meyers 1976 has observed. And in quite a few cases L is actually higher than the following H. Thus, the following sort of picture, traced from an oscillographic print-out using the pitch extraction system of the Phonology Laboratory at the University of California, Berkeley, is not atypical:

(4)

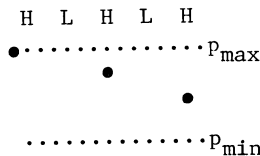
yáa cí (gábá) (dà) céèwáa...

'he went on to say...'

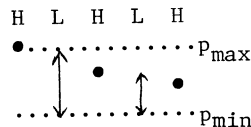
Note that the encircled syllables are approximately as high as the preceding high-toned syllables, even though they themselves are phonemically low (as can be judged by eliciting them in isolation, or in very slow speech).

As I propose in Leben 1983, I believe that this phenomenon shows that the mapping of low tones onto intonation contours ought to be regarded as separate from the effect that low tones have in many languages of lowering the register for the following H. That is, first we map high tones onto a register, then subsequently, we add the values for L, as depicted in (5):

(5) a. H plotting



b. L plotting (arrow shows possible range of variation)



In the light of this, one interpretation of the song is that the composer is aware of the fact that L in HLH is more variable in its realization than other tones. What he is consistently doing in the present song, then, is assigning L to one of the

extremes that it occupies in real discourse. On this view, the mapping of the encircled L's is not exceptional at all, and the tune-tone correspondence for the song is near 100%.

## 5. Discussion.

This seems to tell us something about this piece of Hausa music, namely that its tune reflects Hausa intonation and not just Hausa tone. But a reasonable question to ask is whether this has any wider significance. I think that it possibly does. Bloomfield held the view that between physical phonetics and the level he called phonemics there was no linguistically significant level. He reasoned that only phonemics provided a non-arbitrary criterion for factoring certain properties out of the speech signal and leaving others in. The criterion was based on whether the property in question was distinctive or not, in the sense of distinctive that Bloomfield defined. Hence, if you tried to represent a level somewhere between the phonemic level and the level of physical phonetics, there was no apparent non-arbitrary criterion that you could use in order to sort out the properties that you left in the phonetic transcription from the properties that you chose to omit from the transcription.

Nowadays, we have more or less abandoned Bloomfield's assumptions on this matter, and we speak of a so-called level of "systematic phonetic" representation. Unfortunately, the properties of this level are not defined in any language-independent way, and so really Bloomfield's point still ought to hold. I think that the musical structure of this Hausa song may help to provide a non-arbitrary basis for the notion "systematic phonetic representation", for at the very least this song shows that the composer was not relying solely on phonemic tones. In particular the composer was making use of certain characteristics of Hausa intonation contours. But the song melody is obviously not identical with the actual physical fundamental frequency patterns of spoken utterances, nor can the melody be directly derived from these fundamental frequency patterns. Thus, the composer seems to be drawing representations from a level that is more superficial than the phonemic level yet more abstract than the physical signal. I suggest that the study of songs like these may help to show which characteristics of an intonation contour are salient to Hausa speakers, so that they can draw on these even though they are not contrastive in any way.

We can gather from work on metrics by Kiparsky and others that poets are able to draw on rather abstract properties of phonological representations in putting together their poems. I think it might be possible to interpret the present study in somewhat the same vein, only here we have an art form that taps linguistic representations which are abstract, but which are nonetheless closer to the surface than the level of phonemic or underlying representation.

## REFERENCES

- Clements, G. N. 1979. "The description of terraced-level tone languages." Language 55.536-558.
- Greenberg, J. H. 1949. "Hausa verse prosody." Journal of the American Oriental Society 69.125-135.
- Hodge, C., and H. Hause. 1944. "Hausa tone." Journal of the American Oriental Society 64.2
- Hyman, L. M. 1979. "A reanalysis of tonal downstep." Journal of African Languages and Linguistics 1.9-29.
- Jones, A. M. 1959. Studies in African Music. London: Oxford University Press.
- Leben, W. R. 1983. "Intonation in a tone language." Paper presented at Fourteenth Conference on African Linguistics, U. of Wisconsin, Madison.
- Meyers, L. F. 1976. Aspects of Hausa tone. UCLA Working Papers in Phonetics 32.
- Miller, J., and J. Tench. 1980. "Aspects of Hausa intonation, 1." Journal of the International Phonetics Association 10.45-63.
- Miller, J., and J. Tench. 1981. "Aspects of Hausa intonation, 2." Journal of the International Phonetics Association 12.78-93.
- Richards, P. 1972. "A quantitative analysis of the relationship between language tone and melody in a Hausa song." African Language Studies XIII, pp. 137-161.
- Schachter, P., and V. Fromkin. 1968. A Phonology of Akan. UCLA Working Papers in Phonetics 9.
- Schneider, M. 1943-44. "Phonetische und metrische Korrelationen bei gesprochenen und gesungenen Ewe-Texten." Archiv für Vergleichende Phonetik 7,1/2.1-6.
- Schneider, M. 1961. "Tone and tune in West African music." Ethnomusicology 5,3.204-415.
- Simmons, D. C. 1980. Extralinguistic uses of tonality in Efik folklore. U. of Alabama Press.