

TONE AND SONG IN KALAM KOHISTANI (PAKISTAN)

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To appear in: Hugo Quené & Vincent van Heuven (eds.): *On Language and Speech: Studies for Sieb G. Nootboom*. Utrecht: Netherlands Graduate Institute of Linguistics. 2004.

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Abstract

Like many other languages in the north-western corner of the South-Asian subcontinent, Kalam Kohistani, spoken in two mountain valleys in northern Pakistan, has contrastive lexical tone. This paper explores how the tonal distinctions of Kalam Kohistani are reconciled with the musical use of pitch in sung recitations of traditional poetry.*

1 Introduction

One of the better-kept secrets in linguistics—known to the immediate specialists but hardly at all to the wider linguistics community—is the widespread occurrence of tone (defined here as the use of pitch variations to contrast word meanings) in the languages of the north-western corner of the Indo-Aryan language territory. People are often aware that Punjabi is a tonal language, but usually think of it as an island in a sea of non-tonal languages. The following quote from a recent textbook is rather typical. Speaking about the South-Asian subcontinent the author says, “[E]ven here we find the occasional tonal language, such as Punjabi” (Yip 2002:171). Stronger yet is Bhatia (1993:343), who states that “Punjabi is the only modern Indo-Aryan language which has developed tonal contrasts.”

In actual fact, Punjabi is not the only tone language in the region, and neither is it an “occasional” tone language. Rather, it is part of a much larger area, covering north-western India, northern Pakistan, and possibly also bordering regions in Afghanistan, that is remarkably rich in tone languages. These include language varieties such as Hindko and Pahari-Pothwari, which are closely related to Punjabi, and also more distant ones such as many of the so-called “Dardic” languages of the mountains of northern Pakistan, several languages belonging to the Rajasthani and Western Pahari subgroups of Indo-Aryan, and the non-Indo-Aryan language Burushaski. A survey of tone languages of northern Pakistan can be found in Baart (2003).

Not only is this area rich in number of tone languages, it is also rich in terms of the complexity of tonal phenomena displayed. While many of these languages have not been studied in depth, recent years are witnessing the appearance of a number of important contributions to the study of tone in these languages, notably Schmidt & Kohistani (1998)

* I would like to thank my friend and colleague Muhammad Zaman of Shahoo, Kalam. Neither this nor any of my work on Kalam Kohistani would exist without his help. Lal Badshah, Muhammad Nabi, Maulana Abdul Haq and other poets and musicians of Kalam have made their songs and music available to me, sometimes in written form, sometimes in audio-recorded form, sometimes in both, and sometimes in the shape of a live performance. I benefited from the ideas of several colleagues, including Cal Stevens, Todd and Mary Beth Saurman, and Tom Avery. My research in Pakistan is carried out under the auspices of an agreement of cooperation between SIL and the National Institute of Pakistan Studies (NIPS) in Islamabad. The support over many years of Ghulam Hyder Sindhi, the director of NIPS, has been of tremendous value. Sieb Nooteboom, my Ph.D. supervisor, has had a pervasive influence on my academic work. Even so, not he but I alone am to blame for any shortcomings in this paper.

and Radloff (1999) for Shina, Zoller (forthcoming) for Indus Kohistani, Losey (2002) for Gujari, and my own work (Bart 1997, 1999, 2004) for Kalam Kohistani.

Many of the languages in this area have rich traditions of storytelling, poetry recitation, music, and song. As the linguistic features of the tone systems of these languages are beginning to be unraveled, curiosity leads us to ask further questions, and one of these concerns the correspondence (or lack thereof) of phonological tone and the melody of song: Is there a systematic relation between the pitches of a song and the phonological tones of the words of the song? To my knowledge, this question has hardly been addressed, if at all, for any of the Indo-Aryan languages. An exception is Vedic chant, to which I will return near the end of this paper.

In the remainder of this contribution I present some results of a study of traditional Kalam Kohistani poetry and its sung recitation. I look at the syllable structure and meter of poetic lines in this particular genre, and at the relationship between linguistic tone and sung pitch. Interestingly, it turns out to be the case that there is no straightforward correlation of tones and sung pitches. This result leads to yet another question, namely, to what extent is it common in the tone languages of the world for tone to be ignored in singing? I am not in a position to give an answer to this question, but will present a few preliminary observations. First, however, I start with a brief introduction to the Kalam Kohistani language.

2 The Kalam Kohistani language

2.1 Language, speakers, and classification

Kalam Kohistani (also called Gawri) is one of about thirty languages that are spoken in the mountain areas of northern Pakistan. *Kohistan* is a Persian word that means ‘land of mountains’ and *Kohistani* can be translated as ‘mountain language’. As a matter of fact, there are several distinct languages in the area that are all popularly called Kohistani. The language under study in this paper is spoken in the upper parts of the valley of the river Swat, in the North-West Frontier Province of Pakistan. The name of the principal village of this area is Kalam, and hence the area is known as Kalam Kohistan.

In the older linguistic literature, the language of Kalam Kohistan is referred to as Bashkarik (Morgenstierne 1940), or as Garwi or Gawri (Grierson 1919, Barth & Morgenstierne 1958). These names are hardly, if at all, known to the speakers of the language themselves, who normally just call their language Kohistani. However, very recently a number of intellectuals belonging to a local cultural society have started to call their language Gawri, a name that has old historical roots (see Bart 1997:4-5).

The same language is also spoken across the mountains to the West of Kalam Kohistan, in the upper reaches of the Panjkora valley of district Upper Dir. When added together, the two Kalam-Kohistani-speaking communities comprise approximately 100,000 people.

According to its genetic classification (Strand 1973:302 and 2004), Kalam Kohistani belongs to the Kohistani subgroup of the north-western zone of Indo-Aryan languages, along with several closely related languages in its geographical vicinity: Torwali (in the Swat valley south of Kalam), Indus Kohistani, Bateri, Chillisso, and Gawro (the latter four east of Kalam in Indus Kohistan). Together with a range of other north-western Indo-Aryan mountain languages, these languages are sometimes collectively referred to as “Dardic” languages.

2.2 Phoneme inventory

Vowels

The Kalam Kohistani vowel system consists of six basic vowel qualities to which a distinction of length is applied, see Table 1. In agreement with standard “Orientalist” practice, long vowels are represented in this paper by writing a macron over the vowel symbol, as in *ā*.

Probably all vowels can have nasalized counterparts. In this paper these are written with a tilde following the vowel symbol, as in *mā̃* ‘my’.

Table 1. Kalam Kohistani oral vowels.

	front		back	
	short	long	short	long
close	i	ī	u	ū
mid	e	ē	o	ō
open	ä	ā	a	ā

Consonants

Table 2 presents the inventory of Kalam Kohistani consonants. Note the voiceless lateral fricative, which is written *ɬ*. It contrasts with the voiced lateral *l* as in *lām* ‘village’ vs. *ɬām* ‘cedar wood’.

Table 2. Kalam Kohistani consonants.

		labial	dental	retroflex	palatal	velar	post-velar
plosive	aspirated	ph	th	ɖh		kh	
	voiceless	p	t	ɖ		k	q
	voiced	b	d	ɖ		g	
affricate	aspirated		tsh	ɖh	çh		
	voiceless		ts	ɖ	ç		
	voiced				ç		
fricative	voiceless	f	s	ʂ	ç	x	h
	voiced		z			ɣ	
nasal		m	n	ɳ		ŋ	
glide		w			y		
lateral	voiced		l				
	voiceless		ɬ				
flap			r	ɽ			

2.3 Tone

As mentioned above, many of the languages spoken in the north-western corner of the South-Asian subcontinent are tonal. Baart (2003) presents a preliminary overview of tone languages in northern Pakistan. In that paper, these tone languages are grouped into three classes. In Shina-type languages (to which belong Shina itself, Burushaski, Palula, Indus Kohistani, and

probably a range of other languages), a contrast between a rising and a falling tone is possible on long vowels (in Indus Kohistani on bimoraic syllables in general), as in the Shina words *kām* ‘relative’ vs. *kām* ‘a vegetable’.

In Punjabi-type tone languages (which include Punjabi itself and also Hindko, Pahari-Pothwari, Gujari, and possibly others) there is a three-way contrast between what is commonly described as a mid or level tone, a high or high-falling tone and a low or low-rising tone. A classical example of the contrast in Punjabi is *kōṛā* ‘whip’ vs. *kōṛā* ‘leprosy patient’ vs. *kōṛā* ‘horse’. In Punjabi, there is a clear correlation between the loss of breathy-voiced consonants and the emergence of tonal contrasts (see Masica 1991:118-9 and references cited there).

Finally there are a number of languages in the area that have more than three contrastive tones on the surface, and Kalam Kohistani is one of them (along with Torwali and Khalkoti). The five contrastive tones of Kalam Kohistani are illustrated in the following examples. With the examples I give a description of the phonetic pitch that is observed when these words occur in non-final position in the sentence. (In final position, intonation normally adds a low tone, which may then cause a modification of the lexical pitch of the last word.)

- | | | | |
|-----|-----|-------------------------------------|-------------------|
| (1) | bōr | (high level pitch) | ‘lion’ (singular) |
| (2) | bōr | (high-to-low falling pitch) | ‘lions’ (plural) |
| (3) | bōr | (delayed high-to-low falling pitch) | ‘deaf’ |
| (4) | bōr | (low level pitch) | ‘Pathan’ |
| (5) | gōr | (low-to-high rising pitch) | ‘horse’ |

There is a distinction between the high-to-low falling pitch and the *delayed* high-to-low falling pitch, in that the delayed falling pattern typically falls, so to speak, from the last syllable of a word onto the first syllable of the next word, while the regular falling pattern is fully executed within one and the same word. The five tones of Kalam Kohistani are “word melodies”: the pitch patterns described above belong to whole words, rather than to single syllables, as in the word *būbāy* ‘apple’, where the rise spreads over two syllables. For further information on Kalam Kohistani tone the reader is referred to Baart (1999 and 2004).

3 Kalam Kohistani poetry

3.1 Introduction

There are a number of different styles of poetry and song in Kalam Kohistani. In this paper, I focus mainly on what can be called the classical form of Kalam Kohistani poetry, for which the local name is *rō*. This is no doubt also the most popular form of poetry in the language, and audio cassette recordings of the most famous poet-singers of this genre are for sale in the bazaars of the area. The theme of this poetry is usually romantic love, in particular the pain of separation from the beloved, or the sorrow caused by the death of one of the lovers. When reciting, some poets begin every verse with *alā!*, which is the exclamation that is also used in real life for expressing pain or woe.

Kalam Kohistani *rō* is sung to the accompaniment of a local variant of the Chitrali sitar (called *sārōd* by the Kalam Kohistanis) and a little drum called *mangey*. Akbar (2000) describes the Chitrali sitar as a long-necked lute made of mulberry-wood. It consists of a guitar-like neck, an oval-shaped, hollow base, six metal playing strings (including two main strings) and five sympathetic strings. The Chitrali sitar is a popular instrument all over the North-West Frontier Province, including not only Chitral but also areas such as Swat, Dir, and the central plains inhabited by the Yousafzai tribe. Most of the sitars in use in Kalam

Kohistan are locally made, and may deviate from Akbar’s description in several ways. The Kalam Kohistani variant usually has seven playing strings (two of which are used as melody strings) and no sympathetic strings. For the neck of the sitar, Kalam Kohistanis often use the wood of the Himalayan blue pine, while the hollow base may indeed be made of mulberry-wood, or, alternatively, of the wood of one or two other locally available trees, including walnut.

In daily life, the *mangey* is an earthenware water pot. It has a large round belly and a much narrower short cylindrical neck. For use as a musical instrument, the opening of the pot may be covered with a round piece of rubber. Players beat this rubber membrane with one hand and the round belly of the pot with the other. They may wear a ring on one finger to produce a clicking sound. (Further information on these musical instruments can be found in Akbar 2000:787-9.)

The musicians and the singer take turns performing. The musicians pause when the singer begins to sing the first line of a verse. The sitar plays two or three chords at the end of the first line, and then the singer starts the second line of the verse. During the last few notes of the song, the sitar joins in again, followed by the *mangey*. The two instruments perform together for half a minute or a minute or so, and then the singer begins the next verse.

3.2 Melody and meter

The melody used in the sung recitation of *rō* is traditional and follows a rather rigid pattern, within which only minor variations are possible. The lyrics themselves also conform to rather specific rules of composition. Each individual *rō* consists of only two lines. Together, these two lines express a complete thought, and can stand alone as an independent poem. The lines of a *rō* consist of seventeen syllables each. Main accents are assigned to the fourth, sixth, tenth, twelfth and sixteenth syllables in a line. In sung recitation, these accents are primarily realized by stretching out the length (duration) of the syllables, while downward glissandos may also be executed on these syllables (except for the last main accent, which starts and remains on the bottom of the pitch range). Minor accents are assigned to the other even-numbered syllables in a line.

Syllables that occur in positions of main accent almost always contain a phonologically long vowel (in my corpus of Kalam Kohistani poetry, about 95 percent of the vowels occurring under a main accent are phonologically long). Syllables that occur in positions of minor accent or in unaccented positions usually contain short vowels (only 19 percent of the vowels occurring under a minor accent are phonologically long, and only 16 percent of the vowels occurring in unaccented positions are phonologically long). In all positions, both open and closed syllables are possible. Figure 1 presents an example of a Kalam Kohistani *rō*.

Not indicated in Figure 1 is the fact that the two poetic lines of a *rō* are padded on both sides with some non-changing additional syllables. Lal Badshah, the poet-singer on whose work this paper is mainly based, usually precedes the first line with *alā!* (an exclamation of pain, as explained above). He always starts the second line with the vowel *ē*, and this same sound is also appended at the end of both the first and the second line. *ē* (sometimes *ō*) is also the preferred sound for “stuffing”, that is, for filling holes in a poetic line that has less than the required seventeen syllables. An example is seen in the poetic line in (6), translation in (7), where the tenth syllable is a stuffed *ē*.

(6) iz- rä- īl sāb kā tē- di kā- ra~ṣ̌ ē ni- mā-ru- šā~ khān rā- kā
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

(7) With what haste did (the angel) Izrael strike on the mount of Nimarush!

lä-xä päš- k̄a- lā~ ā- ga täy çhä- lāš tā- sē~ su-ri tā~ mās rä
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

kā mā-ni cō ām- sōs kā-ranttu āj mux- tōr ō su-mē~ theṭrā- kā
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Figure 1. Melody and syllable structure of a Kalam Kohistani *rō* (double underlines indicate the main accented syllables). Translation: ‘(a) As a monsoon shower you have sprayed (your cruelties) on the flesh of her body; (b) Why are you sorry now? You are the guilty one, (sitting in mourning) on a mound of earth.’

The second line in Figure 1 shows an occurrence of a stuffing syllable (the vowel *ō* between syllables 12 and 13) that is less easy to explain, as without it the line already has the required seventeen syllables. My conjecture is that in this case the presence of the stuffing syllable slows down the pace and in this way serves to focus the attention (like a drum roll) on what immediately follows; the following part of the verse indeed contains a surprising turn (it refers to a heap of earth, that is, a grave, and from this we infer the tragic fact that the beloved is dead).

3.3 Phonological tone and sung pitch

As Kalam Kohistani is a tone language with lexically contrastive high, low, rising and falling tones (see Section 2.3 above), one might expect a syllable with phonological high tone to be sung to a relatively high pitch, and a syllable with low tone to be sung to a relatively low pitch. However, this expectation is not always borne out. A counter-example can be seen in the first line of Figure 1. The word *çhālāš* ‘sprayed it’ (syllables 9 and 10) has a low tone on the first syllable and a high tone on the second syllable (the word as a whole, in other words, has a low-high or rising pattern). In the sung recitation of this verse, however, the pitch of the first syllable is higher than the pitch of the second syllable, thus giving a falling pattern to the word as a whole. Another example of a mismatch of phonological tone and sung pitch is seen in the second line of Figure 2. The word *thōs* ‘head’ (syllable 12) has phonological low tone, yet it is sung to a high pitch (which glides down, but that is normal for all syllables under a main accent, except for the last main accent in a line).

In order to assess the degree to which linguistic tones are ignored in the sung recitation of Kalam Kohistani *rō*, I looked more closely at a sample of fourteen poems, randomly selected from my corpus. Taking a cue from a study of Cantonese song by Wong & Diehl (2002), I compared for each pair of consecutive syllables in the sample the direction of pitch change in the melody of the song with the direction of pitch change that would occur over those same two syllables in normal speech.

The direction of pitch change between two notes in a song is *rising* if the second note is higher than the first note, *falling* if the second note is lower, and *level* if the two notes are the same. (The second one of two tied notes in the song was disregarded for the purpose of this comparison.)

zyā-ul-hā- qā~ qā- lā ši bam dā- buṣ māy- dō- nē~ gu-ju- rī- nā
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

pāx-tū-nā~ nām chu- āṣ ti-thi lēk- bā- rā~ thōs rā zā- rā~ rāj dit
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

Figure 2. Melody and syllable structure of a Kalam Kohistani *rō*. Translation: ‘(a) A bomb was planted in the fort of Zia-ul-Haq by that Gujar woman of Maidon; (b) The name “Pakhtun” had been betrayed and hence a golden crown was placed on the head of a child.’

The linguistic pitch of syllables was classified (on the basis of surface realization) as either low, high, or extra-high. On the basis of this classification, the direction of pitch change (as it would occur in normal speech) for each pair of consecutive syllables was determined, using once more the categories *rising*, *falling*, and *level*. The results of the comparison are shown in Table 3. (Extra-high surface pitch occurs on syllables with a high tone that are immediately followed by a low tone within the same word. The effect of declination and other perturbations of pitch were disregarded. There were relatively few syllables in the sample bearing a rising or falling contour tone; in such cases, the classification of the syllable was based on the initial pitch of the contour.)

Table 3. Comparison of pitch direction over pairs of consecutive syllables in sung recitation (columns) and in normal speech (rows). For each combination, the number of occurrences is listed, with percentage figures in parentheses. The total number of syllable pairs in the sample was 434.

		Pitch direction in song		
		Rising	Falling	Level
Pitch direction in normal speech	Rising	99 (22.81)	34 (7.83)	25 (5.76)
	Falling	13 (3.00)	89 (20.51)	25 (5.76)
	Level	61 (14.06)	68 (15.67)	20 (4.61)
		Sum of percentages in diagonal cells = 47.93		

As is seen in the table, the direction of sung pitch matches the direction of phonological pitch in less than 50 percent of the syllable pairs in the sample. In other words, alignment of linguistic pitch and musical pitch does not seem to be a high-ranked constraint for Kalam Kohistani *rō*. However, when we restrict our examination to rising and falling sequences of linguistic tones, ignoring level sequences of tones for the time being, there does seem to be a tendency to respect phonological tonal relations in song. A rising sequence of tones corresponds to a non-matching falling or level sequence of sung pitches in 59 instances, but to a matching rising sequence of sung pitches in 99 instances (63 percent). A falling sequence of tones corresponds to a non-matching rising or level sequence of sung pitches in 38 instances, but to a matching falling sequence in 89 instances (70 percent).

In the sample, sequences of identical phonological tones are as frequent as rising or falling sequences. However, in the melody used for sung recitation of *rō* (transcribed in Figures 1 and 2), there are no sequences of identical musical notes, except for two or three such sequences at the end of a line. Consequently, it is difficult to accommodate level sequences of tones in the sung melody, and that may explain why there are relatively few matching combinations in the bottom row of Table 3.

If we restrict ourselves to rising and falling sequences of tones, it is still the case that in approximately one-third of the cases in our sample, the direction of pitch change between two consecutive sung syllables does not agree with the direction of change between the phonological tones of those syllables. So, while distinctions between rising and falling tones are respected in song more often than not, there is a sizeable minority of instances where these distinctions are ignored.

4 Tone and song in some other languages

Chao (1956, cited in Wong & Diehl 2002) investigated the relationship between sung pitch and linguistic tone in Chinese songs of various styles. In Chinese “Singsong” (a style that is intermediate between speaking and singing), each tone is sung with a consistent pitch pattern, making it relatively easy for listeners to identify linguistic tones and, hence, word meanings. On the other hand, in contemporary Mandarin songs, composers mostly ignore linguistic tones in their compositions, according to Chao’s findings. Yung (1983, cited in Wong & Diehl 2002) looked at Cantonese opera and found a relatively consistent relation between melody and tone, comparable to Chao’s finding for Singsongs. Wong & Diehl (2002) analyzed four contemporary Cantonese songs. They looked at direction of pitch change over pairs of consecutive syllables and found an overall correspondence of 92 percent between musical and tonal sequences (definitely much higher than my result of 48 percent for Kalam Kohistani *rō* in Table 3 above).

Saurman (1999) analyzed a number of Thai songs of different styles, looking at direction of pitch change over consecutive syllables. The degree of correspondence between tones and sung pitches in classical and traditional songs was around 90 percent. For contemporary popular songs (that borrow elements of western music) the number of matching correspondences was between 60 to 70 percent. In a western hymn, translated into Thai, tones and sung pitches matched in only 42 percent of the cases. For the Thai national anthem, the degree of matching she found was 32 percent.

Saurman suggests that the degree to which tones and sung pitches match with one another in Thai is related to the degree to which the melody of a song is “imposed” on the lyrics. A melody is imposed when it is a pre-existing traditional melody to which new lyrics have been set (as is the case with the Thai national anthem), or when the melody, or certain elements of it, have been borrowed from outside.

Howard (2000:240-241) reports on the relation of tones and sung pitches in Vedic recitation. In traditional terminology, syllables in Vedic texts can bear a raised accent (*udātta*), an unraised accent (*anudātta*) that normally precedes the *udātta*, a sounded (transitional) accent (*svarita*) that marks a shift down from a raised accent, or no accent at all. One might expect the raised accent to be sung to a high pitch, and conversely, the unraised accent to be sung to a non-high pitch, but Howard cites research that shows that this is not consistently the case and that the accents are in fact not distinguished by pitch.

In March 2004, I posted a question on a linguistics discussion list about tone languages and song. I obtained the following information about what happens to the tones of various languages when people sing:

Piraha (Brazil): The non-normal channels of speech (hum speech, yell speech, musical speech, whistle speech) all crucially preserve the tones (D.L. Everett).

Cheyenne (USA): In general, Cheyennes align the notes of music so that phonemic high tone has a higher pitch in music (W. Leman).

Mamainde (Brazil): Tonal distinctions are partially preserved in only some types of songs (D. Eberhard).

Kabiye (Togo): In church music at least, the musical melody does not always align with spoken tonal patterns (D. Roberts).

Nawuri (Ghana): It is easy to find mismatches between phonological tones and sung pitches (R. Casali).

Chumburung (Ghana): The tones of the language are ignored in song (K. Snider).

Akoose (Cameroon): There seems to be no correlation between the lexical and grammatical tones of the language and the melody of songs (R. Hedinger).

Mazatec (Mexico): From an inspection of four popular songs, it appears that the tones of the spoken text do not coincide with the melody of the sung text (S. Marlett).

Isthmus Zapotec (Mexico): Tonal behavior of speech does not correspond to the musical pattern of songs (S. Marlett).

5 Summary and conclusion

In view of its rich tonal structure, one would expect tonal distinctions in Kalam Kohistani to be preserved in song. However, my study so far of *rō*, the most popular style of song and poetry in Kalam Kohistani, does not show a clear correlation between phonological tones and sung pitches. Even though a rising sequence of tones more often than not corresponds to an ascending sequence of musical notes in a song, and a falling sequence of tones more often than not corresponds to a descending sequence of musical notes, yet the number of instances where tones and sung pitches do not match is considerable.

A preliminary survey of song in some other tone languages of the world shows that there is a wide range of variation with respect to the degree to which phonological tonal distinctions are left intact in songs. Also, within a language there may be a wide range of variation between different styles of song. In styles where a musical melody is “imposed” on the lyrics (fixed, traditional melodies, or melodies that have been borrowed from outside), there is a greater likelihood that tonal distinctions are ignored in song as compared to styles where melodies are newly composed with the lyrics.

The sung recitation of Kalam Kohistani *rō* makes use of a standard, traditional melody, which is imposed on the text of the songs. My finding, then, that tones and sung pitches in this genre often do not match, fits within the more general scheme of things. There are other styles of song in Kalam Kohistani, including lullabies, children’s songs and work songs. The tone-song relationship in those other genres is an obvious area for further research. Other factors, too, may determine to what extent tone is respected in song, one of them being the functional load of tone in a language. The subject of functional load also leads to questions about the intelligibility of songs. For instance, if tone is often ignored in song, how do listeners still

derive the meaning of the words of a song? Such questions are worthy of further study. As far as South Asia is concerned, we are not even beginning to scratch the surface.

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