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Paths to tone in the Tamang branch of Tibeto-Burman (Nepal)

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We examine a phonological change in progress in Tamang-Gurung-Thakali-Manangke (TGTM), a group of Tibeto-Burman dialects or languages of Nepal. Data from eight language varieties, five of them studied first-hand in the field, are presented. The phonological change studied is a modern-day instance of the tonal split which swept through the whole of Asia in the Middle Ages: Chinese, Vietnamese, Thai and many less known languages underwent a merger of two of their series of initials (most commonly voiced/voiceless), resulting in a split of their tonal systems. Hypotheses about the modalities of implementation of this change have been offered, but modern day traces of intermediate stages are very limited. The languages of the Himalayas are situated at the geographical and chronological end of this wave so that the change is still in progress. In all the TGTM dialects studied here, the tonal split is phonologically completed, but traces of previous distinctions in manner of articulation and in phonation type survive, offering possible models for previously unobserved intermediate stages in tonogenesis.¹

From the similarities and differences observed between the dialects, some conclusions can be drawn. In diachrony, the common passage by a breathy stage between consonant-borne voice contrasts and tone, which has been proposed for the pan-Asian tonal split, is corroborated for all TGTM languages. But after the phonologization of tone, the degree, modality and factors of retention of the old features of voice and breathiness differ from dialect to dialect. Building on the repetition of distinct but similar changes, a tentative “law” is proposed for the evolution of breathiness, emphasizing the interplay of phonetic and phonological constraints in historical development: in a language where breathiness is used

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as a cue to a given tone and is not an independent feature orthogonal to tone, it is retained only as long as the phonetic pitch of the tone remains low. For the synchronic analysis of linguistic states during which different cues contribute to the identification of a given “tone”, we propose that conceptualizing a toneme as a bundle of cues, some of them non-pitch features, rather than as defined by a single distinctive feature accompanied by “redundant” features may better account for the variability observed in tonal realization.

1. Introduction

1.1 Reconstruction and variation inter- or intra- dialect

Reconstruction, internal or comparative, is done on structural grounds, with a small amount of help from phonetic considerations. We will exemplify this point in Section 2. As all comparativists know, what is important is not the phonetic similarity between compared lexical items, but the regularity of the correspondences between elements. If a correspondence is regular, we can even say that the more phonetically different the elements are, the better evidence they provide for a common ancestry. Nonetheless, after a common ancestry has been established, and a reconstruction proposed, it is necessary to relate the forms of the reconstructed language to the modern language or languages by a plausible story in terms of general linguistic knowledge, that is, to postulate a sequence of plausible changes, understood as phonetically well-motivated changes or changes attested somewhere else among the world’s languages. In Calvert Watkins’ terms “It is the history which is, de facto, the proof of the genetic relationship” (Watkins 1990: 292).

At this point, historical linguists can turn to fieldwork in search of related languages which may be less advanced on the same evolutionary path. The attestation of such typologically intermediate stages is taken as corroborating evidence for the reconstruction. Repeated sampling may lead to the discovery of an orderly chain of changes, but it can also reveal a number of plausible paths for the group reconstructed. We will consider this point in Section 3.

Beside variation from one dialect to the next, fluctuation in the speech of a single speaker, or between speakers in a homogenous group can also be examined to gain some understanding of the process of change. We will consider this situation in the Tamang dialect of Risiangku.

When the story has been told in detail, thanks to the conjoined use of abstract reconstruction and the concrete study of variants, it can shed light on evolutions from remote periods in the past, for which only abstract reconstruction is possible, by contributing well-verified changes to the portfolio of the historical linguist.

1.2 Intermediate or unstable stages and general linguistics

Apart from their interest as historical links between supposedly well defined stable states, languages which evidence a change in progress are real languages. They function with their variation patterns and odd structures for centuries and must be taken into account in general phonological theory. The definition of what is a tone is a case in point. The TGT languages do not fit well in the most widely accepted typologies of prosodic phenomena (Hyman 2001). We will see that they give us elements for the discussion concerning the validity of analyzing tones as combinations of features or not (Section 3.1) and more generally that they point to the recognition of multi-valued phonological entities (Section 4.2).

1.3 The data and the TGT languages

The TGT languages – so-designated after the initials of the Nepali names of the largest ethnic groups which comprise their speakers, Tamang, Gurung, Thakali, and Manangba² – belong to the vast Sino-Tibetan family. They were adequately grouped by Robert Shafer into one “branch” which he named “Gurung branch” after the name of one of the languages, and which we have renamed “Tamang branch” after the majority endonym used by the speakers of all the languages. This branch, together with a “Bodish branch” (Tibetan) and a “Tshangla branch” formed a “section” which he named the “Bodish section” (Shafer 1955). Higher-level groupings are controversial.³

The language varieties which we compare in this study are close from the point of view of historical comparative linguistics, and rather distant from the point of view of usual dialectal studies, e.g. the dialects of American English. If we take the loss of intercomprehension as the point where two dialects may be considered as different languages in a continuum of differentiation, we can say, impressionistically, that our data go from well-identified dialects (separated by several sound changes) to closely related languages.

Glover presents a brief count of lexical cognates using the Swadesh 100-word list (Glover 1970). He finds 21% shared lexical items at the level of the Bodish section, 61% at the level of the TGT group. A sociolinguistic study conducted on 25 dialects of Eastern Tamang – which includes Taglung and Risiangku among

2. Manang is the name of a valley and of its main village, Manangba is the corresponding adjective, which can designate its inhabitants, and Manang-ke means ‘Manang language’. All three forms are found to designate the language.

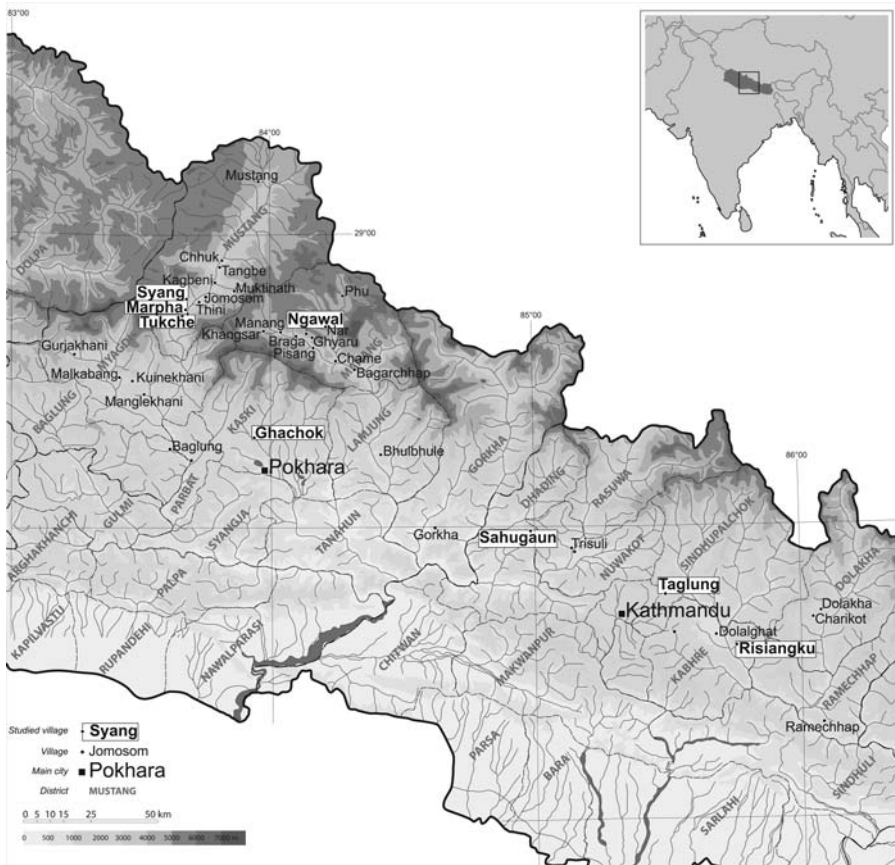
3. A recent discussion of the internal classification of the Sino-Tibetan family can be found in (Thurgood 2003). Tibeto-Burman designates non-Chinese Sino-Tibetan languages.

the dialects in our study – showed from 72% to 97% shared lexical items computed from a list of 270 items (Varenkamp 1996). Intercomprehension was also tested with the aim of selecting one form as a proposed standard. It was reported to be “good overall across the varieties studied” with a percentage of comprehension between 85% and 95% (Varenkamp 1996:67). Intercomprehension between the other languages/dialects of TGTM was not tested.

We will not concern ourselves here with measuring linguistic distance, and will take dialectology with the meaning of “structural dialectology” as defined by Weinreich as “the study of partial similarities and differences between systems and of the structural consequences thereof” (Weinreich 1954). To designate the linguistic systems which dialectology takes for its objects, Weinreich proposes to use the term “varieties”, explicitly in order to avoid the many connotations which accompany the term “dialect”. We will not follow his prudence, and will use “dialect” as equivalent to “variety”. In the present context of the Nepalese hills we follow the speakers’ usage in using the term language to cover the different dialects used by the members of one ethnic group. The precise variety is identified by adding the name of the village where it is spoken, e.g. Risiangku Tamang is the language spoken by Tamang people in the village of Risiangku.

The data used in the present study was mostly collected in the 1970’s, when Nepalese society was more stable than it is now, and the different ethnic groups were endogamous. Among the people who may call themselves Thakali, intermarriage did not occur between the three villages of our study, Tukche, Syang and Marpha. The Tamang can intermarry, but Sahugaon, in the Western side of the Tamang dispersion area, is too far. Only Risiangku and Taglung have intermarriage traditions. Endogamy, added to geographical distance (see map), has limited the possibility of language contacts, and hence of convergence between related languages: what is shared is likely to be inherited. Although efforts have been made since the 1990s to promote minority languages and in that context to establish some form of standard for each, no norm or standard form existed when the data was collected. Speakers of each village, even of each hamlet, were very conscious of what belonged to their own variety and what did not.

A Nepalese village typically consists of hamlets regrouping members of a single caste or ethnic group. Most villages also contain hamlets of Nepali speakers, corresponding to the Indo-Aryan populations who form the highest and the lowest classes of Nepali society, the Tibeto-Burman groups having been assigned a median status in traditional law. Outside of their own area, or in contact with other groups, speakers of Tibeto-Burman languages use Nepali, the national language, as a *lingua franca*. In the 1970’s their fluency in Nepali was very variable, going from very poor for Tamang village-bound women to rather good for Gurung military men.



Map. Localisation of the TGTM villages in the study

Data was mostly collected *in situ* in the villages from speakers who had spent most of their lives in the village. The Gurung of Ghachok village was collected by Warren Glover, Thakali of Tukche by Maria Hari, and Tamang of Sahugaon by Doreen Taylor (Hale & Watters 1973). The other five dialects (Risiangku and Taglung Tamang, Marpha and Syang Thakali, and Ngawal Manangba) were collected by the author.⁴

4. Later collections of Marpha Thakali (Georg 1996), Braga village Manangba (Hoshi 1984), and Manang village Manangba (Hildebrandt 2004, 2005) have appeared. The Tamang branch also includes Chantyal (Noonan 2003b), and the dialects of two small valleys North of Manang, the Nar-Phu languages (Mazaudon 1996; Noonan 2003a).

The analysis is entirely based on production data. No perception tests were conducted, except for standard word identification checking, and “same or different” judgements on minimal pairs. Although elaborate perception tests are certainly revealing in general, it should be pointed out that when dealing with unwritten languages, and unschooled informants, the exercise is so artificial that responses are likely to be unreliable.

1.4 The Asian tonogenesis wave

The Asian continent has been subject to at least two large waves of tonal development: birth of tones in previously non-tonal languages, and multiplication of tones in previously tonal languages. At the beginning of the Christian era, it is supposed that none of the languages of Asia, the ancestor languages of present-day Chinese, Thai, Hmong-Mien, Vietnamese was tonal.

The first wave of tonogenesis, around the beginning of the first millenium AD, led to the transformation of toneless Old Chinese into a Middle Chinese with four tone categories – or three tones on non-stopped syllables plus a toneless category consisting of syllables closed by a stop – (Haudricourt 1954a; Pulleyblank 1962). Vietnamese underwent a parallel evolution, probably under Chinese influence, in the 6th century (Haudricourt 1954b). These developments stemmed from laryngeal oppositions located at the end of the syllable, which transphonologized into contour tones. It is customary to designate these original tones by letters, as *A, *B, *C (for open or sonorant-final syllables) and *D (for stop-final syllables).

A second wave, around the 10th century, affected Chinese, Vietnamese, and Thai, among the well-documented written languages (Maspéro 1912, 1920); it also affected a large number of unwritten Tibeto-Burman and Mon-Khmer languages, at different periods (Haudricourt 1961, 1972). The source of this second wave of tonal developments lay in oppositions of manner of articulation of the initial consonants of the syllable. The most common event was the merger of two (occasionally three) series of initials. In languages which had become tonal during the first wave of tonogenesis, the old oppositions of manner of articulation on initial consonants were transphonologized into tonal contrasts, thus multiplying by two, or sometimes three, the number of existing tones. Typically, the old unvoiced initials gave rise to a HIGH tonal series (noted as A1, B1, C1, D1) and the old voiced initials to a LOW series (A2, B2, C2, D2). In languages which were not already tonal, like the Mon-Khmer languages, the loss of contrast on the initials gave birth to a system of voice registers. These registers, sometimes called “head” and “chest” registers, or simply “First” and “Second” registers, are characterized by “a ‘normal’ or ‘head’ voice quality, usually accompanied by relatively high pitch”, for the First register, and “a deep rather breathy or ‘sepulchral’ voice [...]” and lower pitch,

for the Second (Henderson 1952:151). An associated character is a shift in the vocalic system implying diphthongization and a difference between closer vowel qualities in the breathy register, *vs* more open in the modal voice register. The development of breathiness, as we will see, is shared by languages which underwent a tone split and languages which developed voice registers.⁵ The opposition of two vocalic triangles is not: it occurs only in register languages. (Haudricourt 1965; Ferlus 1979).

Concerning the stops, the merging series were most often *voiced and *voiceless, merging to voiceless, more rarely *voiced and *voiceless aspirated, merging to voiceless aspirated, as in Bangkok Thai. In a number of languages the old initial voiced stops remained voiced, and the phonologization of tones resulted from the merger of old voiced and voiceless continuant series; an example is the variety of the Tho language of the Tai family spoken in Caobang (Vietnam), where *hm, *hn, *ln etc. merged with *m, *n, *l etc., while the old *voiced and *voiceless series did not merge (Haudricourt 1949, 1961).

Although the beginning and end points of these changes are rather well established, the beginning of the evolution is situated in a remote past, and its details are not available for observation. To explain the different outcomes of proto-voiced stops becoming plain voiceless in some dialects of a language and voiceless aspirated in others, Haudricourt postulates the mediation of a “voiced aspirated” stage.⁶

The Tamang languages are situated geographically at the southwestern edge of this wave, and historically at the end of it. With them, we have the possibility of witnessing the change still in progress, and we can observe shared intermediate stages as well as different paths of evolution in different dialects.

1.5 Asian tones and Himalayan tones

In Africanist studies, tone is generally described strictly in terms of F0. In case a melodic contour is heard on a single syllable, this can usually be analyzed as a

5. For completeness, let us mention that some voice-register languages seem to be presently in the process of developing tones, or at least “replacing the register distinction with a prosodic one of pitch-accent, possibly as a stage leading to tonogenesis.” (Abramson, Thongkum & Nye 2004)

6. «L’occlusive sonore aspirée apparaît au cours de l’assourdissement des occlusives sonores ordinaires, puis aboutit, soit à des sourdes aspirées (siamois et laotien dans les langues thai, hakka en chinois, pwo en karen), soit à des occlusives non-aspirées (la plupart des autres langues thai, les dialectes min en chinois, le sgaw en karen). La triade : /t/-/d/-/th/ devient d’abord /t/-/dh/-/th/ pour aboutir à /t/-/th/. » (Haudricourt 1975b)

succession of two tones borne by smaller units, or morae. This type can be considered as occupying one extreme on a continuum where Asian tones would occupy the other end. “African” type of tone systems are not totally absent of Asia (Hyman 2007) but they are the exception.

In the vast majority of Asian tone systems, a single tone is defined, in terms of pitch, by a melody, or contour, which can be noted by its starting and end points (e.g. Mandarin Chinese fourth tone [51] for a fall from the top of a speaker’s range to its bottom). A tone whose beginning and end points are on the same level, is just a particular case (e.g. Chinese Mandarin first tone [55] for a High Level tone). Often an inflexion point needs to be added, as for Mandarin Chinese third tone [312], realized in isolation as a fall from mid to low followed by a rise. Often again other features are needed to describe the tone adequately, as a creaky voice quality for Mandarin Chinese third tone or a strong glottal constriction for two of the Vietnamese tones.⁷

When we reach the Himalayan region another prominent characteristic of tones has to be noted. The tone domain, which Pike’s classical study had defined as the syllable (Pike 1948), is now the morpheme (monosyllabic or polysyllabic), and there is normally only one toned morpheme per word. The pitch characteristics of the whole word are determined by the lexical morpheme it contains. The strict monosyllabicity of morphemes which obtained in most East Asian languages is relaxed in the Southwest to allow sesquisyllabic structures, as in Burmese, or polysyllabic structures as in the Bodish section. It is likely that tones of the second wave developed on already polysyllabic morphemes, from the beginnings and ends not of syllables but of words (Mazaudon 1977:76–90).

2. The reconstruction of the Proto-TGTM tone system

With knowledge of the history of Asian languages as a source of insight, the proto-TGTM tone system can be reconstructed from any one of the dialects by internal reconstruction. Some dialects make this easier than others. But, although internal reconstruction based on the abstract phonological pattern of one dialect is powerful enough to reconstruct the older stage, the significance of that pattern really becomes apparent when it is seen to be repeated, under different phonetic guises, in several dialects. The parallel study of several dialects has a heuristic value for historical reconstruction, somewhat as perception of a figure is aided

7. The tones expressed with the etymological letters mentioned above as tone B2 (Vietnamese nặng) and C1 (ngã). On the phonetic transcription of tones by numbers see Note 10.

when it moves against the background, in that the parts that belong together are revealed. In this section, we will show how we can reconstruct, independently for each dialect but in parallel, the common ancestor of the tone system (recapitulating an analysis found in (Mazaudon 1978). In Section 3 we will examine how the dialects differ, and what the differences tell us.

2.1 Systematic (internal) reconstruction based on Risiangku Tamang

In all dialects of TGTM, there are four contrastive tones. These tones are numbered from T1 to T4 on the basis of their relative pitch in Risiangku Tamang, from highest to lowest. The same numbers are assigned to the etymologically corresponding tones in the other dialects. Their phonetic realization varies in the different dialects of TGTM as shown in Table 5, but their lexical correspondence is almost perfect.

In all eight dialects we observe some cooccurrence restrictions between tones and initial stop consonants. In Risiangku Tamang, word initial consonants consist of one series of continuants (m, n, ŋ, j, r, l, w, s), and two series of stops: unaspirated stops (p, t, ts, ʈ, k) and aspirated stops (p^h, t^h, ts^h, ʈ^h, k^h).⁸

All four tones contrast after initial continuants and after unaspirated stops, whereas after initial aspirated stops only tones T1 and T2 are found (Table 1).

Table 1. Co-occurrence of initials and tones in Risiangku Tamang

Initials/Tones	1	2	3	4
m, n, ŋ, j, r, l, w, s, p, t, ts, ʈ, k	+	+	+	+
p ^h , t ^h , ts ^h , ʈ ^h , k ^h	+	+	–	–

The search for a synchronic phonetic constraint justifying this distribution does not yield a satisfactory explanation. We can observe that tones T1 and T2 have a higher pitch than tones T3 and T4; but an aspiration contrast is found on low tones in many languages. In our geographical area (East and Southeast Asia), modern Mandarin Chinese is a case in point. In the absence of a synchronic incompatibility between aspiration and the characteristics of tones T3 and T4, we look for historical hypotheses.

8. There is no contrastively voiced series of stops. In word-internal position the unaspirated stops are realized phonetically voiced. In syllable final position, as is typical of all Sino-Tibetan languages, only one series of stop is allowed, voiceless unaspirated.

The forbidden co-occurrence of aspirates with T3 and T4 can be synchronically analyzed as a Prague-school neutralization⁹ (or a contextual underspecification). Two competing hypotheses arise: either neutralization of a tone feature (to be identified) in the context of aspiration (Table 2, where I and II designate the archi-tonemes), or neutralization of aspiration in the context of low tones (Table 3, where capital letters designate the archiphonemes).

Table 2. Interpretation of the relationship of initials and tones in Risiangku Tamang as a neutralization of tones in the context of aspirated initials

Initials	Tones			
m, n, ŋ, j, r, l, w, s	1	3	2	4
p, t, ts, ʈ, k	1	3	2	4
p ^h , t ^h , ts ^h , ʈ ^h , k ^h	I		II	

Table 2 expresses the fact that HIGH and LOW tones are not in opposition after aspirated initials. The difficulty with this statement is that we have no synchronic justification for pairing tones T1 with T3 and T2 with T4, as we have done, as the tones whose opposition is neutralized, rather than the cross-pairing (T1,T4) vs (T2,T3) (see below Section 3.1.1). So we are led to adopt the analysis reflected in Table 3, which analyzes the stop initials on low tones as an archiphonemic series, underspecified for aspiration.

Table 3. Interpretation of the relationship of initials and tones in Risiangku Tamang as a neutralization of the aspiration contrast in the context of LOW tones

Tones	Initials		
1, 2	m, n, ŋ, j, r, l, w, s	p, t, ts, ʈ, k	p ^h , t ^h , ts ^h , ʈ ^h , k ^h
3, 4	m, n, ŋ, j, r, l, w, s	P, T, TS, ʈ, K	

9. To avoid misunderstanding, let us underline that “neutralization” is not a synonym of “merger”. In the Prague school structuralist theory which I follow in this respect, a merger is a diachronic process of conflation; a neutralization is a synchronic relation between sub-systems. A system with a neutralization is a system where in a context A a given contrast exists, and where in another context B, that contrast does not exist, i.e. is “neutralized”. Two historical sources are logically possible for such a situation: (1) the contrast used to exist in all contexts and was lost in context B; (2) the contrast did not exist in any context and was created in context A (through some transphonologization).

The archiphonemes P, T, TS, \bar{T} , K are occasionally realized voiced or partially voiced, a weakening which it could be tempting to attribute to the breathy character of the low tones with which they occur, because of the frequent association of these three characters in the world's languages. In fact this partial voicing is a historical trace of the origin of the archiphonemic series as a proto-*voiced series, whose devoicing led to a tonal split.

We reconstruct proto-Tamang as a system with three series of initial stops, and only two tones, *A and *B. We also reconstruct two series of nasals, liquids and sibilants. The devoicing of the stops and the sibilant *z, along with the voicing of the proto-*voiceless nasals and liquids, led to the phonologisation of what used to be raised and lowered variants of the old tones (Table 4). Since nothing merged with the aspirated stops, the old tones A and B remained as unsplit architones, realized as tones of the high series.

Table 4. Historical development of Risiangku Tamang tones

Initials\Proto-tones	*A	*B
p, t, ts, t̥, k, m ^h >m, n ^h >n, ŋ ^h >ŋ, j ^h >j, r ^h >r, l ^h >l, w ^h >w, s	1	2
p ^h , t ^h , ts ^h , t̥ ^h , k ^h	I [1]	II [2]
b>p, d>t, dz>ts, d̥>t̥, g>k, m, n, ŋ, j, r, l, w, z>s	3	4

This evolution is parallel to what has been repeatedly observed in other Asian languages, whether genetically related or not (Haudricourt 1961).

The traces of voicing which are found on the two low tones are a precious clue for reconstruction, but this voicing is occasional, and phonetically partial (Mazaudon & Michaud 2008), so it cannot be retained as the distinctive feature. More importantly, the two series of continuants do not retain any trace of their original contrast in voicing: the nasals and continuants are fully voiced, and the only sibilant (s <*z, *s) is fully voiceless. This complete merger is what phonologized the four-tone system.

At the time of the tonal split, we can assume that the newly-phonologized T1 and T3 were phonetically respectively a higher and a lower version of whatever phonetic value proto-tone *A might have had, similarly for T2 and T4 relative to *B. After the phonologization of the tones, each tone moved across the phonetic space on its own, without its etymological partner. The result of this later evolution is the impossibility to construct a convincing feature-matrix analysis of the modern tones (see Section 3.1.1); the relationship of initials and tones has now been restructured as shown in Table 3.

We will come back to the question of tone features, after considering the other TGTM dialects.

2.2 Systematic reconstruction of the other TGTM dialects

Table 5 presents the phonetic pitch values along with voice quality differences across the dialects.

Table 5. Approximate phonetic realization of the tones in eight dialects of TGTM. Pitch values follow Chao’s system,¹⁰ *h* indicates breathiness [italics indicate remarkable pitch values]

Proto-series	Tone	Tamang			Thakali			Gurung	Manang
		Risiangku	Sahu	Taglung	Tukche	Marpha	Syang	Ghachok	Ngawal
HIGH	1	54	44	55/44	54	43	43	33	33
	2	44	54	43	44/33	45	45	54	45
LOW	3	33/23 <i>h</i>	11 <i>h</i>	33/22 <i>h</i>	11 <i>h</i>	33/22 <i>h</i>	11 <i>h</i>	11 <i>h</i>	54
	4	211 <i>h</i>	32 <i>h</i>	51	121 <i>h</i>	51	33/22 <i>h</i>	12 <i>h</i>	31

2.2.1 Conservative dialects

Four other dialects, Sahugaon Tamang, Tukche Thakali, Syang Thakali, and Ghachok Gurung, exhibit exactly the same abstract pattern as Risiangku Tamang, with the same phonetic correlates. Phonologically, there is a neutralization of the aspiration contrast under tones T3 and T4, so that Table 3 represents the relationship of initials and tones in these dialects too. Phonetically, taking the three features of pitch, breathiness and initial stop voicing together, we observe that these four dialects also present a HIGH vs LOW partitioning of the tone system (represented by a double line in Table 5). Words with tones of the HIGH series, T1 and T2, have a higher pitch than words with tones of the LOW series, T3 and T4. Words under T1 and T2 have a modal voice quality, and their word-initial stops, phonologically aspirated and unaspirated, are pronounced with no phonetic voicing. The tones of the LOW series, symmetrically, have lower pitch than those of the HIGH series, and are accompanied by an occasional redundant feature of

10. Chao Yuen-ren’s classical system transcribes a tone contour by means of two numbers, the first for the beginning of the contour, the second for its end, on a scale where 5 represents the highest point in the speaker’s range, and 1 represents its lowest point (Chao 1930). These numbers should not be confused with the abstract names from T1 to T4 which we have assigned to TGTM tones.

breathy voice on the whole syllable or word. The archiphonemic series of stops which occurs word-initially with T3 and T4 presents traces of voicing.¹¹

2.2.2 *Evolved dialects*

In the other three dialects we observe the same pattern of neutralization of the aspiration contrast under T3 and T4, as represented in Table 3, but the phonetic realization of the tones has changed. In Taglung Tamang and Marpha Thakali, tone 4 has changed from low to high (see the circled values in Table 5). Tone 4 has also lost the phonetic feature of breathiness and it is no longer accompanied by optional voicing of the initial. So the system looks superficially as if it had three HIGH tones against one LOW, hiding the fact that it has, from another point of view, two aspiration-neutralizing tones and two aspiration-non-neutralizing tones. Table 6 presents the system for Taglung Tamang. With a minor modification (reversing T1 and T2 as “high” and “mid”) the same table also represents Marpha Thakali.

Table 6. Initials and tones in Taglung Tamang

		Pitch	Voice quality	Aspiration contrast on initial stops
HIGH	T1	55 High	clear	YES
	T2	43 Mid	clear	YES
	T4	51 High Falling	clear	NO
LOW	T3	22 Low	breathy	NO

From any one of the seven dialects considered so far, the proto-system is recoverable by inspection of the abstract pattern, i.e. the neutralization pattern. Obviously the task would have been more difficult if we had started with the more

11. Drawing on his previous experience of Cham, an Austronesian language of Vietnam, Richard Pittman proposed to reconstruct proto-Tamang-Gurung-Thakali as a “four-box” register language, meaning that “each word-base is interpreted as having had two syllables, each of which had back (tense) or front (lax) tongue-root articulation.” (Pittman & Glover 1970). While the four boxes arrived at (symbolically transcribed as KK, GK, KG, GG) correspond well to the four tones of TGTM, and while the source of the HIGH/LOW series does reside in an older laryngeal – voicing – opposition in word initial position, the reconstruction for all modern monosyllables of a second syllable which would have been lost is not presently supported by comparative evidence. In the present state of our knowledge, the origin of the older two tones A and B of proto-TGTM remains obscure. Benedict suggested reconstructing these two tones at the Proto-Tibeto-Burman level, and even in Proto-Sino-Tibetan (Benedict 1972), but the evidence is insufficient to conclude (Mazaudon 1985).

evolved dialects, Taglung and Marpha, where fewer phonetic clues have survived unchanged.

In the last dialect, Manangba, it is the other LOW tone, T3 which has become high, while T4 remained lowish. Breathiness has disappeared on all tones, and no traces of voicing of initial stops are found. The distribution of initials and tones is upon first inspection different. Aspirated and unaspirated initials occur with tones 1 and 2 as in all other dialects; aspirated initials occur with tone 4, to the exclusion of unaspirated initials; unaspirated initials occur with tone 3 to the exclusion of aspirated initials (Table 7).

Table 7. Co-occurrence of initials and tones in Manangba

Initials/Tones	1	2	3	4
m, n, ŋ, j, r, l, w, s	+	+	+	+
p, t, ts, t̚, k	+	+	+	–
p ^h , t ^h , ts ^h , t̚ ^h , k ^h	+	+	–	+

This is the same archiphonemic distribution as in the other dialects, but with a variable phonetic realization of the archiphoneme conditioned by the tone (a synchronic rule) (Table 8). Here again, we could reconstruct the older 2-tone and 3-stop-series phonological system of Proto-TGTM from the abstract pattern, but with greater difficulty because the phonetic clues left in the other dialects have all been erased. Only the distributional clue remains. We will explain in Section 3.3.3 how the present configuration came to be.

Table 8. Initials and tones in Manang

		Pitch	Voice quality	Aspiration contrast on initial stops
(?) HIGH	T3	54 High Falling	clear	NO (only unaspirated)
	T2	45 Rising	clear	YES
	T1	33 Mid	clear	YES
(?) LOW	T4	31 Low	clear	NO (only aspirated)

3. Differential retention of etymological features in the dialects

In the preceding section we have emphasized the power of Prague school abstract structuralist phonology in establishing the diachronic relationship between an initial stage and a final stage in a transphonologization.

In this section we will examine in more detail the phonetic and phonological structure of the dialects to try to understand the processes of change in their temporal sequence. At least two questions can be asked: (1) Do the dialects line up along a single timeline? (2) Can we use the redundant features observed in different dialects to narrow down hypotheses about the precise path or paths which the transformation has taken? A third, more theoretical, question is: at each step in the evolution, what is the phonological status of the phonetic cues which distinguish meanings?

3.1 The move away from correlations in mature tone systems

An old theoretical discussion, in synchronic phonology, concerning the appropriateness of analyzing tones as matrices of features on the model of the analysis of segmental phonemes has been recently re-opened (Goldsmith et al. 2010). Concerning the languages under study here, we want to consider the feasibility of such an analysis. We will consider its legitimacy and usefulness later.

3.1.1 *Synchronic phonological analysis of the tonal systems of the conservative dialects*

Since the TGTm languages have four-tone systems, an analysis of the tones as matrices of two features could be considered an economical analysis, if feasible. For Risiangku Tamang, Mazaudon (1973) discussed at length the reasons for rejecting such an analysis. To sum up, we cannot find a principled reason for choosing, synchronically, between two opposite alignments of the tones. As we already know, T1 and T2 can easily be considered to share a feature, albeit a complex feature, which T3 and T4 do not share. Without making a decision at this point between what is “distinctive” and what is “redundant”, we can identify a “HIGH” feature consisting of [HIGH/Tense/modal voice], shared by T1 and T2, against a “LOW” feature consisting of [LOW/Lax/breathy voice], shared by T3 and T4. But when it comes to identifying a second feature orthogonal to the first, we are at a loss to identify shared characters between either T1 and T3 vs T2 and T4, or T1 and T4 vs T2 and T3. Height and melody are what distinguish T1 from T2 and T3 from T4 (see Table 5). These can be expressed in terms of “relatively higher” vs “relatively lower” inside each of the two registers, yielding a {T1,T3} vs {T2,T4} alignment (analysis 1). But we could just as well define a “shape” feature, declined as “contour tone” vs “level tone”, yielding a {T1,T4} vs {T2,T3} alignment (analysis 2), as shown in Table 9. Some secondary cues exist, beside all those already mentioned, which help in tone identification; but these are not shared. For instance Risiangku T1 has a particular dynamics, which Pike described as a “ballistic” character, resulting in more brevity (independent of the vowel length contrast which exists on all tones) which none of the other three tones has.

Table 9. Two incompatible feature-matrix analyses for Risiangku Tamang

Risiangku: analysis n ⁰¹			Risiangku: analysis n ⁰²		
	Higher	Lower		Contour	Level
<i>HIGH/Tense/modal</i>	T1 [54]	T2 [44]	<i>HIGH/Tense/modal</i>	T1 [54]	T2 [44]
<i>LOW/Lax/breathy</i>	T3 [33]	T4 [21]	<i>LOW/Lax/breathy</i>	T4 [21]	T3 [33]

Hale and Watters (1973 vol 4: 14–19) offer a four-box analysis of the three languages which they treat: Sahu Tamang, Tukche Thakali, and Ghachok Gurung. They identify the same HIGH/LOW main axis, reversing the “distinctive”/“redundant” relationship between pitch height and voice quality. The analyses for Sahu Tamang and Tukche Thakali are presented in Table 10. As we can see, the identification of a second axis yields a different alignment of tones in the two languages: {T1,T3} vs {T2,T4} in Sahu, {T1,T4} vs {T2,T3} in Tukche. There is no obvious way to recover the etymological relationship of the tones from their modern realization. The alignment given as etymological in Table 2 is based on other arguments, in particular membership in word families.

Table 10. Two different feature-matrix analyses for Sahu Tamang and Tukche Thakali

Sahu Tamang			Tukche Thakali		
	Basically level	Falling		Contour	Level
<i>CLEAR/high</i>	T1 [44]	T2 [54]	<i>CLEAR/high</i>	T1 [54]	T2 [44]
<i>BREATHY/low</i>	T3 [11]	T4 [32]	<i>BREATHY/low</i>	T4 [121]	T3 [11]

The analysis of Gurung suprasegmentals has fluctuated between a tonal and an accentual interpretation. This need not concern us here. Hale and Watters retain a four-box contrast of suprasegmentals defined in terms of “accent” and “voice quality”, with the mention that “accent tends to raise pitch and breathiness tends to lower it”. Thus “CLEAR” and “BREATHY” are equivalent to the complex description of the HIGH and LOW registers in the other languages, albeit with a different equilibrium between the most salient and less salient characters. For monosyllables, the resulting four-box matrix is similar to that proposed for the other languages, as shown in Table 11.

It appears that although four distinctive “tonemes” are established in all conservative dialects and all show a HIGH/CLEAR vs LOW/BREATHY partition, the other axis is hard to define, and if some slight argument favours one alignment in a language, another favours another alignment in another language. This might be seen as a totally acceptable historical development, if the

Table 11. An analysis in terms of accent and voice quality for Ghachok Gurung

Ghachok Gurung		
	Non-accented (low)	Accented (high)
<i>CLEAR/high</i>	T1 [33]	T2 [54]
<i>BREATHY/low</i>	T3 [11]	T4 [12]

arguments for choosing one alignment over the other were not so evanescent. Mazaudon (1988) proposed, as a general rule, that tones are usefully analyzed as a matrix of features only during tonogenesis, when the features contributed by the proto-tones are still perceptibly distinct from those contributed by the effect of the consonants in the syllable margins. Haudricourt had summed up this principle by the proposition : “once it is established, the tonal system evolves without regard for its old etymological pitch levels” (Haudricourt 1972:63). The idea that tones are basically not amenable to a matrix analysis has been recently defended by Hyman (2010) and by Clements, Michaud, and Patin (2010).

3.1.2 *Synchronic phonological analysis of the tonal systems of the advanced dialects*

The three other dialects of our study, Taglung Tamang, Marpha Thakali and Ngawal Manangke, are even less amenable to an analysis into a matrix of features. All three appear as if they had three High tones *vs* a single Low tone, with breathy voice quality used as a cue for only one tone or none (Tables 6 and 8). The only phonological character of the tones which remains shared in a two against two pattern is their role as an active class in conditioning the neutralization of aspiration (Section 2.2.2). In the absence of any phonetic character to support that alignment, a feature-matrix analysis cannot be justified.

3.2 The status and evolution of voicing

Except in Gurung, where later changes have reintroduced a limited voicing contrast, [+voiced] is not a distinctive feature in any dialect in any phonotactic position. Intervocally, in all dialects including Gurung, a voiced variant of the unaspirated stops occurs, often as the most usual variant. In Risiangku Tamang we found over 90% voiced realizations of unaspirated intervocalic stops. Lenition to a fricative or a spirant also occurs massively in the same context (for Tukche Thakali see Hari (1969:9–14); for Risiangku Tamang Mazaudon and Michaud (2008:249–50). These variants are easily explained by general phonetics.

The presence of voicing in word-initial position requires a different explanation. When it occurs, [+voice] on a word-initial stop cannot be a phonetically conditioned variant. Synchronically, it now is a redundant feature or secondary cue to tone – a very important cue for word identification when it is present. Historically, as we have seen, it is a survival. We will now try to determine how much of it survives and how.

In the published sources, data is transcribed phonologically, so that in dialects where tone-linked voicing of word-initial stops occurs, the initial is transcribed as voiceless. For instance, mention is made that stops are pronounced voiceless on HIGH tones and voiced on LOW tones in Sahu Tamang (Hale & Watters 1973: 15), and occasionally so in Risiangku Tamang (Mazaudon 1973: 82), but details of realization word by word, or context by context are not explicated.¹² In Gurung on the other hand, after or during the loss of the primary voicing contrast, a new opposition of voicing was created from the many loanwords from Nepali which have entered that language. So the author of the Gurung dictionary transcribed initial stop voicing when he heard it on native words as well, whether tone-linked or not (Glover, Glover & Gurung 1977). This provides us with some data on the development of proto-*voiced stops in Gurung (see Section 3.2.2).

In the other dialects the appearance of [+voice] on stop initials has not been studied in detail. It is not mentioned in the work on Tukche Thakali, but it may have been subsumed by the author under the breathy character of the syllable, considered as a globally “lax” pronunciation. In my fieldnotes on Marpha Thakali I have transcribed initial stop voicing on some tone-3 words (the tone of the LOW series which has remained phonetically low). In Taglung Tamang I also noted initial voicing on some tone-3 and exceptionally tone-4 words.

The different patterns of distribution of the surviving [+voice] feature may be taken as indicative of the path or paths leading toward its disappearance in the different dialects. I will illustrate two typologically very different developments, free variation in Risiangku Tamang versus contextual conditioning in Gurung, and allude to the possibility of an influence of co-occurring features in Taglung Tamang.

12. Working from early, not yet fully phonemicized, transcriptions of Sahu Tamang, Pittman and Glover mention a complementary distribution which is not mentioned again in later publications. “Tamang GK words [tone 4] without initial stops [i.e. with continuant initials] are breathy, those with initial stops have lost (or never had) breathiness as an exponent of GK; the contrast between Tamang GK stop-initial words and those in the KK [tone 2] and KG [tone 1] boxes is carried by voicing of the initial stop. Breathiness is heard in stop initial GG words [tone 3]” (Pittman & Glover 1970: 12). These early transcriptions reflect a difference in the equilibrium of the two secondary cues to tone, voicing and breathiness, linked to the nature of the initial consonant (stop or continuant) and to the tone (3 or 4).

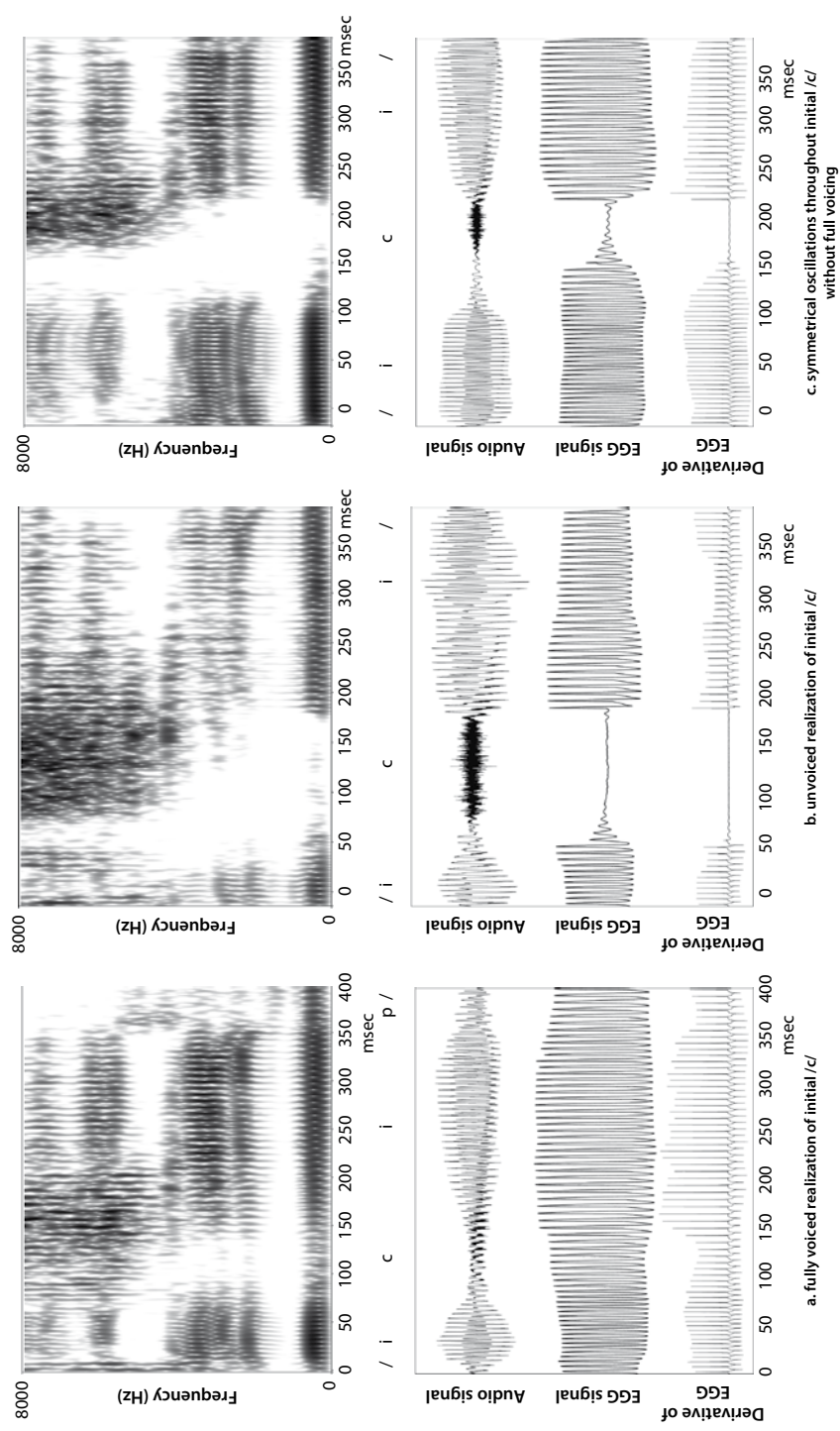


Figure 1. Variable voicing of a word initial stop under LOW tone T3 in Risiangku Tamang: The sequence /i ci:/ from three realizations by speaker M1 of the sentence /²curi ³cipa/ 'It pinches here'.

3.2.1 Patterns of retention of initial stop voicing in Risiangku Tamang

We carried out instrumental research on Risiangku Tamang to identify the conditions (if any) determining the presence and the degree of voicing (Mazaudon & Michaud 2008). Our phonetic analysis of acoustic and electroglottographic recordings of five speakers confirmed that voicing of a stop initial with the low tones is “free” (unconditioned). The electroglottographic study helped us to distinguish full interruption of voicing, full voicing, and a third situation where periodic oscillations continue without full voicing. Figure 1 presents tracings made from recordings of the same word /ci:-pa/ tone-3 ‘to pinch’ pronounced by the same speaker: all three types of voicing are attested.

A statistical analysis of the frequency of each type of voicing was conducted over a sample of 83 lexical morphemes of CV structure, where C was an unaspirated stop, repeated on average four times each, by each of the five speakers. The frequency of each realization for the five speakers is presented in Figure 2. This confirms that voice is absent on the tones of the HIGH series, and that it is absent as well in more than 50% of the utterances of tones of the LOW series. Thus it clearly is not a distinctive feature. Its retention pattern differs across speakers, with a small advantage to tone 4, except with one speaker. In Risiangku Tamang it thus

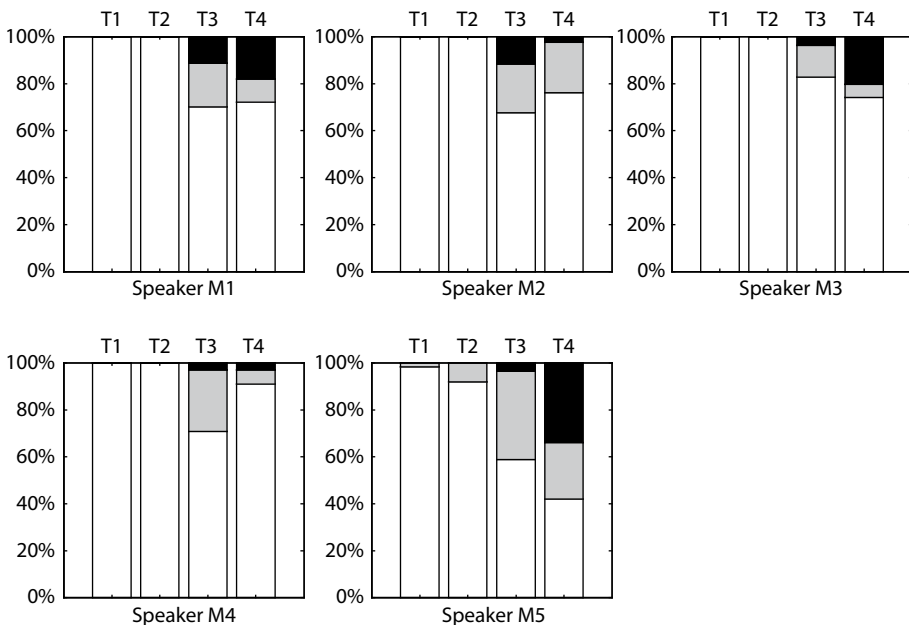


Figure 2. Percentage of each type of voicing for a word initial stop inside a sentence, for five speakers by tone: white = full interruption of voicing; grey = symmetrical oscillations; black = full voicing

appears that voicing is disappearing after becoming a secondary cue that individual speakers use more or less freely.

3.2.2 *Patterns of retention of initial stop voicing in Ghachok Gurung*

In Gurung the situation is totally different. Gurung men have been massively recruited in the Gorkha regiments of the British and Indian army, where Nepali is the common language. Members of the other TGTM groups have not. 40% of the vocabulary in Glover's Gurung dictionary are Nepali loans. Nepali has four series of initial stops, voiceless unaspirated, voiceless aspirated, voiced, and voiced aspirated – a kind of breathy voice. Glover established a single phonemic system for native and loan words, so a voiced series was added in the analysis to the two-series system shared by the other TGTM languages. If we eliminate the Nepali loanwords, a pattern appears in the distribution of voiced initials.

Glover mentioned that in native words there were some restrictions on the occurrence of voiced stops. "Word-initially in indigenous words they occur mainly before high tone breathy vowels [i.e. the higher of the two LOW tones = our tone 4],"¹³ with exceptions (Glover 1969: 17). Rechecking all the native words in the dictionary, we confirmed that, as expected, no voiced initial is found with tones of the HIGH series. With tone 3 no voiced initial is transcribed. With tone 4, simple stop initials are voiced, clusters and affricates are voiceless. Some simple stop initials with tone 4 are voiceless; we have been able to show that they come historically from old clusters (Mazaudon 2012). Historically this implies (1) that initial clusters devoiced earlier than simple initials and (2) that the complete devoicing of clusters preceded their simplification, as in the etymon 'load':

- (1) TGTM *dot [tone II] > Pre-Gur.*dwi [II] > Pre-Gur. *twi [II/4] > Gur. ti [T4] 'a load'

This process (the simplification of clusters) introduced simple voiceless initials on tone T4, which otherwise had only simple voiced initials, creating a potential voicing contrast in this very limited context (Table 12). No minimal pair has been found. A promising source for a minimal pair with the word /ti [T4]/ 'load' would have been the Proto-TGTM root reconstructed, from the other dialects, as TGTM *di [II] 'to transmit fire', which would have become Gurung **di [4]. But this etymon is not found in Gurung. Among all the other etyma which I have reconstructed for proto-TGTM, I could not find another potential pair, let alone a real one.

13. "high tone" here refers to what is called "accent" in Glover's later publications. This opposition is orthogonal to the HIGH vs LOW axis which Glover refers to as "clear" vs "breathy", see Table 11.

Table 12. Distribution of [+voiced] initial stops in Ghachok Gurung

	#C- < *C-	#C- < *CC-	#CC-
Tone 3	voiceless	voiceless	voiceless
Tone 4	voiced	voiceless	voiceless

3.2.3 *Is there a line of evolution between Ghachok Gurung and Risiangku Tamang for the disappearance of etymological voicing?*

It seems that at some point in the historical development of Gurung, without precluding the existence of some free variation, there was a phonologically conditioned distribution: under tone-4, initial clusters were voiceless, simple stops were voiced. Voicing was no more distinctive in Ghachok Gurung than it is in Risiangku Tamang, but the distribution of the variants was very different. The modern-day situation is more difficult to assess. We lack a detailed phonetic study of initial voicing. Under the influence of increased bilingualism with Nepali, re-phonemicization of a voicing contrast may occur, thus strengthening the voiced initials of the thirty-odd words which have them. Without that influence, we could rather expect that voicing would be progressively eliminated from the last context where it survives, and where it does not serve to distinguish words (that function being filled by the tone) except in the potential – unlikely – case where the simplification of a cluster would produce a minimal pair.

To compare Risiangku and Ghachok, it seems that each dialect has followed its own path, Risiangku restricting the frequency and degree of voicing of LOW series initials in all contexts, and Ghachok reducing the contexts where voicing occurs. At the end of their separate evolutions, we expect to observe the same result: the absence of tone-linked voicing.¹⁴ Such is the state of affairs in Manangke.

3.2.4 *Voicing in the other dialects*

In Taglung we did not conduct a specific study of voicing. It was apparent that voice was not distinctive. Some words were noted impressionistically as being more frequently pronounced with a voiced stop initial than others. Lexical diffusion seemed ruled out as an explanation in a context where there was no diglossia. Thus this was noted as an unresolved nagging question. Looking back at the words thus noted, in a list of 56 tone-3 words with a stop initial, we find that 35 words were noted as having a voiceless initial and 21 a voiced initial realization. Of these

14. Unfortunately, because of the rapid increase in bilingualism with Nepali, and the diminution in the use of the local languages in Nepal, the completion of this natural experiment may never be observable.

21, half (11) are bilabials, whereas only a quarter of the voiceless initials (9/35) are bilabials. This very preliminary observation suggests the hypothesis that bilabial articulation preserves voicing. Ohala suggests that aerodynamic constraints render labial stops easier to voice than other stops. (Ohala 1989: 177). If confirmed, this would be yet another path for the old feature [+voice] to disappear after the transphonologisation: it would disappear first when combined with points of articulation which are phonetically less favorable to voicing. As we will see in the next section, an unfavorable combination of cues can also be invoked for the disappearance of breathiness in Taglung Tamang, Marpha Thakali and Manangke.

3.3 Birth and decay of breathiness

We have proposed that breathiness in TGTM is an intermediate, historically, between proto-*voice borne by an initial, and a toneme which might ultimately become a “pitch-only” tone. This intermediate feature seems to be itself decreasing, while [+voice], its “mother-feature” so to speak, although still present, is even closer to being lost. Just as there are different paths to the disappearance of voicing, there are different paths to the disappearance of breathiness.

As we have seen, in the five conservative dialects, breathiness is salient enough that we had to take into consideration the possibility of analyzing voice quality as still being the distinctive feature opposing the HIGH to the LOW series, with the pitch differences as secondary. We have shown that this analysis is to be rejected. On the other hand, voice quality is much more than a “redundant” feature in these dialects, if “redundant” implies “dispensable”.

The pitches of the tones in TGTM are phonetically close, and their ranges overlap. This we showed in an instrumental study for Risiangku Tamang (see Figure 3 top). Auditory observations on the other dialects go in the same direction: in each of the dialects there are at least two tones (different in each dialect) which are difficult to tell apart, be it by ear or by pitch extraction. In this situation, voice quality is an important cue when a token is pronounced within the pitch range of another tone.

We should emphasize that breathiness, although generally recognized as having affinities with low pitch (see Section 3.3.2), is not in TGTM a phonetic effect of pushing the speaker’s pronunciation to the end of his range. Creakiness or harsh voice as well as breathiness are said to occur under such circumstances.¹⁵ In TGTM, however, the range of pitch between the highest and lowest tones

15. Creakiness (or falsetto) was produced by my main Ngawal Manangke informant when she wanted to make her tone T3 extra clear for me in a teaching situation. The usual [54] pitch was in this circumstance pushed to a value which I was tempted to transcribe as [6].

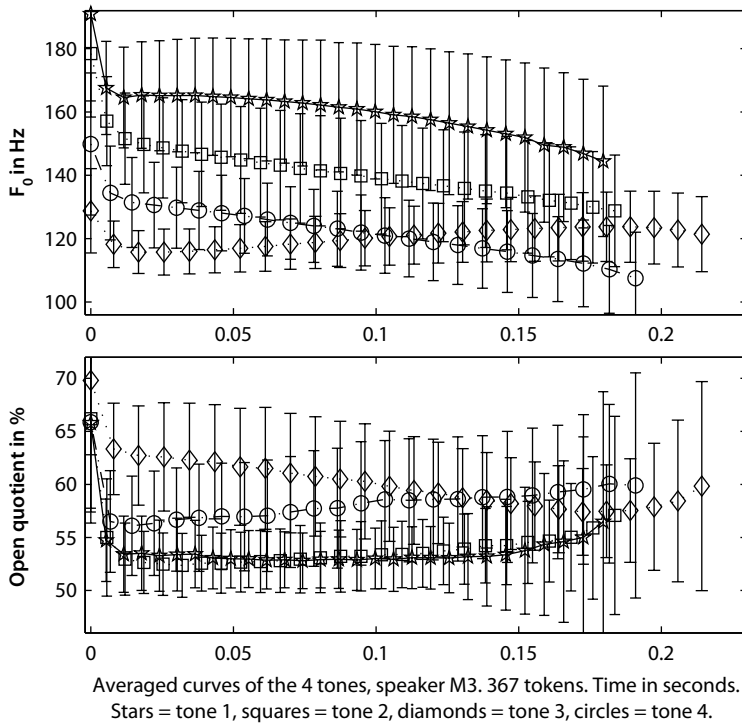


Figure 3. Average curves of the four tones in Risiangku Tamang for one speaker with indication of the variation range; top, pitch; bottom, breathiness: a larger value of the Open quotient indicates more breathiness

is not very large, and would not justify such an effect: in Risiangku Tamang for instance, we find a typical range of 50Hz for a male voice, compared to Vietnamese where the range is on the order of 80Hz for data recorded with a similar experimental setup (Michaud & Mazaudon 2006). In the detailed examination of pitch and voice quality which we conducted on Risiangku Tamang, we find positive evidence that breathiness is chosen independently of the phonetic low pitch of a given token in that breathiness may increase during the pronunciation of a tone 3 syllable, while the pitch is rising. The same observation shows that breathiness is not a mechanical effect of the (sometimes still slightly voiced) initial. Again, tone 3, which is on average more breathy than tone 4, is also on average higher in pitch (compare Figure 3 top and bottom).

Thus breathiness is historically residual but synchronically controlled and is not a phonetic by-product of low pitch. These observations establish that the synchronic fluctuations which we will describe evolve in one direction historically: a progressive replacement of voice and breathiness by pitch.

3.3.1 Patterns of retention of breathiness in Risiangku Tamang

On the same corpus which we used for the study of voicing in Risiangku Tamang, we measured the glottal open quotient (Oq) on electroglottographic recordings as an indicator of the degree of breathiness present (Mazaudon & Michaud 2008). The open quotient is the percentage of the duration of each glottal cycle during which the glottis is open. The Oq allows for the monitoring of vocal fold adduction: a low Oq is indicative of a tight/pressed voice. Oq is known to correlate positively with airflow (Rothenberg & Mahshie 1988), but it is only an indirect cue; the relationship of Oq to airflow is not linear.

Our results show that, although the differences in open quotient are statistically significant, the tones of Tamang do not show the strikingly different phonation types which exist for instance in Vietnamese between the three phonations: extremely pressed, modal and whispery (Michaud 2004; Michaud & Mazaudon 2006). In Risiangku Tamang the average differences in Oq across tones are small in magnitude, and the ranges overlap (see Figure 3 bottom). For the human voice, Oq ranges from roughly 40% (pressed voice) to 75% (breathy voice). In Risiangku Tamang, only part of this range is exploited to distinguish the tonal categories: the averaged Oq values for the four tones only occupy the part of the range between 50% and 65%.

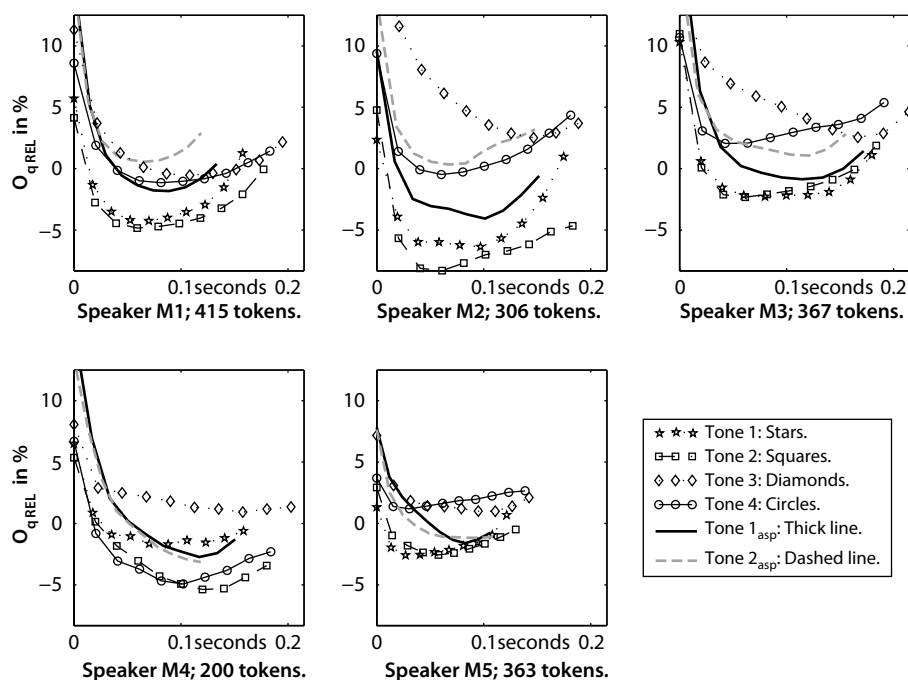


Figure 4. Open quotient values relative to the mean Oq of each speaker for the four lexical tones of Risiangku Tamang, averaged for each speaker

Averaging over the five male speakers tested, the results confirm that the two low tones have more breathiness than the two high tones. But they also show a different use of breathiness from speaker to speaker (see Figure 4). Two of the speakers (M2 and M4) have markedly higher Oq with tone 3 than with tone 4. One speaker (M4) has the same low value of Oq for tone 4 as for tone 2; tone 3 alone qualifies as “breathy” in his data. Our second speaker (M2) makes more use of differences in glottal stricture to distinguish tones, and conversely has a very compact F0 space for the realization of his tones (see Figure 5). M4, whose tone 4 is not breathy, realizes it lower and more falling than the other speakers. So it is not the case that pitch and breathiness stand in a simple relation of “the lower the more breathy”. Instead, there are in fact some hints to the contrary relationship in Risiangku Tamang: speakers who use a larger range of pitch can afford to use less breathiness, and vice-versa.

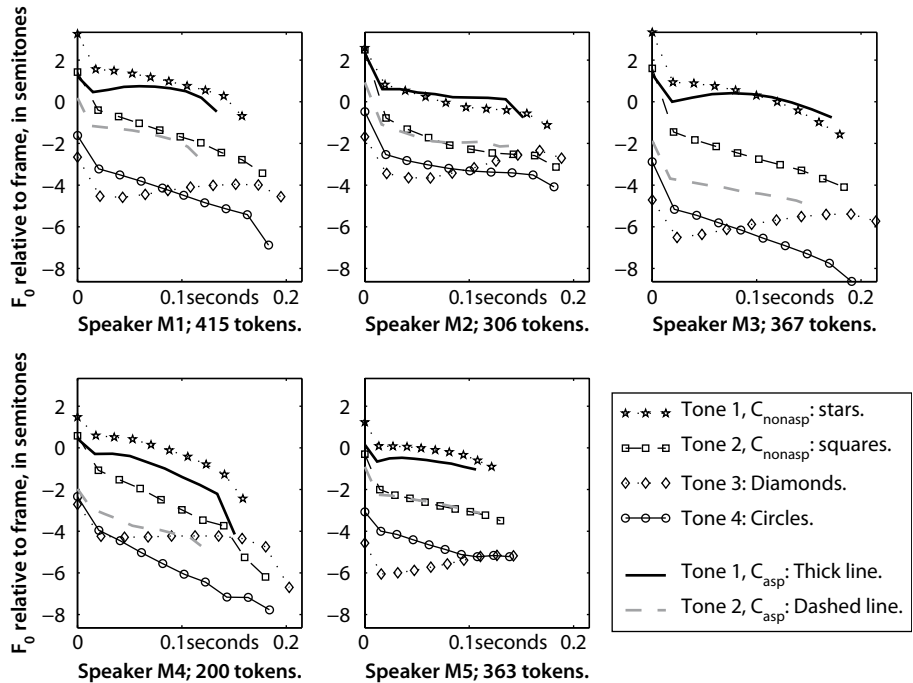


Figure 5. F0 values relative to the F0 value of the frame of each utterance (in semitones) for the four lexical tones of Risiangku Tamang, averaged for each speaker

Allophony, or allotony between pitch and non-pitch features is found in languages other than Tamang. In Latvian, for example, Lehiste says, “Laryngealization is the one consistent phonetic feature associated with the so-called third tone,” (Lehiste 1970: 90) and again, “Laryngealization [...] may also function [...]

as an allotone of low pitch.” In Lhasa Tibetan we even find an alternation between pronouncing an etymological final stop, and realizing a falling pitch (Sprigg 1955). In Risiangku Tamang it would be inexact to claim a reverse correlation between F0 and Oq; the equilibrium between the use of breathiness and F0 varies between individual speakers.

This distribution of realization of the two cues, breathiness and pitch, argues for an analysis in which tone is an abstract entity, marked by a set of cues, all of which contribute to its identification. For Risiangku Tamang, voicing of the initial consonant has to be included in that set, as well as some other idiosyncratic features which we have not studied in detail, such as the particular dynamics of tone T1 which we mentioned earlier.

3.3.2 *Patterns of retention of breathiness in Taglung Tamang and Marpha Thakali*
In the two dialects where tone 4 has become realized as a fall from high to low [51], that tone is pronounced with a clear voice. Breathiness is retained on tone 3, which is realized as a level tone with a lowish pitch.

This distribution tends to show that breathiness is retained only as long as its coarticulation with the F0 pattern characteristic of the tone is not too cumbersome. Abandoning breathiness as a secondary cue to tone when the melody has become sufficient to distinguish words is not urgent if the characteristic gestures for the production of the tone and for breathiness enhance each other, or share enhancing gestures. For instance it has been reported that lowered larynx and laxed vocal folds each enhance both low pitch and breathiness (Silverman 1997: 141 sqq). When the tone has become high, it becomes a useless burden to realize breathiness as a secondary cue to the tone.

In these two dialects the etymological distribution of the system into two halves (High and Low) no longer obtains; breathiness is retained as an idiosyncratic character of tone 3 alone.

From a typological point of view, Risiangku Tamang was considered by Silverman (1997: 195) as one of two “true exceptions” (the other being Mpi, another Tibeto-Burman language) to his thesis that when tone and phonation type are independent (“cross-classifying”) features in a phonological system, they are “phased”, meaning that some portion of the duration of a non-modal vowel is pronounced with modal voice to allow for optimal perceptibility of the pitch contrasts, which are less audible when the phonation is not modal. In Risiangku Tamang breathiness is realized on the complete duration of the vowel, and can even spread to the second syllable of a dissyllabic word, in case the intervening consonant is a sonorant (glide, liquid or nasal). As I discussed in (Mazaudon 2005), if Silverman had followed my analysis (Mazaudon 1973) of breathiness and pitch as co-contributing cues to tone rather than Maddieson’s reanalysis of the data in terms of two independent features

(Maddieson 1984: 132), this exception to his theory would disappear. On the other hand, the typology of TGTm conservative dialects remains exceptional for his classification of the world languages into only two types: “laryngeally complex”, where tone and phonation type are independent features, and “laryngeally simplex” languages, which are all the other languages.¹⁶ In that scheme, a language where pitch and phonation are co-contributing cues to a single phonological element – the fourth type of “laryngeally simplex” languages – can only have one tone in which breathiness appears, whereas two tones have some breathiness in the conservative TGTm dialects. Note that modern Taglung Tamang and Marpha Thakali have come to fit into Silverman’s “laryngeally simplex” language category, since they now have only one tone accompanied by a non-modal phonation.

3.3.3 *Loss of breathiness in Manang*

In Manang, the tone which has become high falling [54], the etymological tone 3, has similarly lost its breathiness. Tone 4, which has remained lowish falling [31], has also lost breathiness – unlike tone 3 in Taglung and Marpha – but initial stops on this tone, originally of the *voiced series, are all realized as unvoiced aspirates; no unaspirated stop is found with this tone (Tables 7 and 8). The airflow which continued to accompany tone-4 words, while it had disappeared with tone 3, was reinterpreted as aspiration.

Thus Manang can be considered to have completed the transphonologization of voicing and breathiness into pitch, and to have a fully tonal system, in the sense of a pitch-only tone system.

The aspirated reflexes of proto-voiced stops in Manangke are very important for the understanding of what we might want to posit as a general pattern in tonogenesis: proto-voiced initials yield low tone indirectly, via an intermediate stage of breathiness. Manangke aspirated reflexes are the proof of the previous existence of a breathy stage, as in the other TGTm languages. Without that trace of the presence of airflow, we could have hypothesized that Manang had had a completely separate evolution, where pitch contrasts had developed directly from voice.

3.3.4 *A single path for the disappearance of breathiness?*

If we take a typological point of view, there is a progression with at one end the conservative dialects, where breathiness is still strongly present. Risiangku Tamang perhaps represents a slight evolution towards its weakening on tone 4. The next

16. “Laryngeally simplex” languages comprise four types: (1) no tone, no phonation contrasts, (2) tone, no phonation contrast, (3) phonation contrast, no tone (4) tone and phonation contrasts which do not cross-classify, as in Hmong or Vietnamese.

two dialects have kept breathiness on only one tone. The most evolved dialect has lost it completely.

Looking at the detail though, we cannot consider the system of Taglung and Marpha as the ancestor type for Manang. A different tone has gone from low to high and become the highest tone. Spectacular movements of tones across the F0 range are not rare in contour tone languages; anticipating or delaying the realization of a pitch curve easily results in an opposite pitch or curve. This has been known from comparative studies for a long time.¹⁷ We should consider that, after the common tonal split was completed, the tone shifts in Taglung, Marpha and Manang occurred independently of one another. The loss of breathiness in these cases is a consequence of the pitch evolution.

Thus, the slow disappearance of breathiness is confirmed by all dialects, but, as in the case of voicing, there are several paths.

3.3.5 *The time relationship between the secondary cues of voicing and breathiness*

So what does the study of dialects teach us about the chronology of change? First let us note that we are comparing relatively distant dialects. Closer varieties might reveal more intermediate steps.

At any rate, we can observe that older distinctive features disappear very slowly. In the relationship of voicing and breathiness, we see that the oldest feature, voicing, is retained as a secondary cue for a period during which the breathiness feature, issued from the devoicing process, has itself started to disappear. There is overlap in time between features which take over from each other. During that same period, the HIGH vs LOW pitch contrast which originated as a single register feature is progressively replaced by independent pitch contours. But during the evolution of this last-created feature, the oldest feature, voicing, and the intermediate feature, breathiness, linger on and keep diminishing very slowly.

3.3.6 *A parallel with Chinese*

The history we can reconstruct for the TGTM languages parallels in several ways, on a shallower scale, the evolution of Chinese languages. The argument we made about an obligatory passage through a breathy stage on the way to tone in Manangke is reflected in the history of Chinese. The fact that breathiness was an intermediate stage between voicing in Old Chinese and tone in modern Chinese is evidenced by old transcriptions of foreign words, especially from and

17. Data quoted by Pittayaporn (2007) show a spectacular change in the tones of Bangkok Thai between the first acoustic measurement of the tones done in 1908 and nowadays.

to Sanskrit, by Chinese loans in Vietnamese, by descriptions of the “voiced” initials of Middle Chinese as “muddy” in contemporary sources, and by traces in modern Wu dialects (Pulleyblank 1978: 179). Modern Wu dialects, like the conservative TGTm dialects, although they have fully phonologized their tone system thanks to continuant initials, have not yet merged the old “muddy” series of initial stops with either the voiceless aspirated or unaspirated series. Haudricourt suggested that this series could be synchronically analyzed in Wu, as we did in TGTm, as an archiphonemic series where the opposition of aspiration is neutralized (Haudricourt 1975a).

An experimental study has shown that in stressed syllables “muddy” initials are pronounced with a voiceless onset followed by breathy voice [pʰ] (Cao & Maddieson 1992). This pronunciation is one of the main variants we found in Risiangku Tamang. Cao and Maddieson also showed that there is contextual variation between two realizations: when the consonant is the initial of an unstressed syllable, i.e. the second syllable of a word, it is realized fully voiced, without any breathiness on the vowel, and the tone is either neutral or of the HIGH series, that is, there is no HIGH vs LOW tone contrast on the syllable. So in Wu we could say that there is, for the realization of the distinctive element, a replacement relationship between the oldest feature of voice in one context, and the combination of the intermediate and recent features (respectively breathiness and pitch) in another context.

In the TGTm languages we found a similar variation between segmental and non-segmental features of tone, with the difference that the variation in Wu is determined by the position of the syllable in the word, while the variations we encountered in TGTm were either free or determined by characteristics of the syllable itself – position in a consonant cluster in Gurung, or place of articulation of the initial consonant in Taglung.

4. Discussion and conclusions

The first contribution of dialectal studies to historical linguistics is local. Although we have said that the neutralization patterns that we observe in Manangke could theoretically lead to the reconstruction of the proto-TGTm system, it would in fact be very difficult to arrive at this result, and to have confidence in it, without the testimony of the other TGTm languages. The fact that hypothesized intermediate states are actually present in neighboring languages makes it possible to reconstruct them with confidence. Slightly less locally, we believe that the stages of evolution exemplified in the TGTm dialects and the story they tell can serve as a model for older changes where intermediate stages have been erased, as in

the Chinese languages. More generally, without exaggerating the importance of a single case study, we find that the study of the TGTM evolution has relevance for the discovery of generalities of phonological change, or panchronic phonology (Hagège & Haudricourt 1978; Mazaudon & Michailovsky 2007), and that it raises some questions for phonological theory in general.

4.1 Dialect comparison and panchronic phonology

In the dialects of our study we have found that the transphonologization of the old opposition of voicing borne by initial consonants into tone has yielded synchronic systems which can be considered as phonologically equivalent. However, the differences in the patterns of variation show that several paths were taken in the implementation of the change, all leading to the progressive elimination of older phonetic and phonological material as pitch becomes the main cue to tone identification. The commonalities which we have found under these differences suggest that the changes may be governed by three “laws” of evolution whose extension should be tested.

- (1) the phonologization of phonetic material follows the order : voice > breathy > phonologized F0.

It is a tantalizing question whether breathiness is an obligatory passage in the phonologisation of tone from voice, as distinct from the automatic lowering of F0 described after voiced consonants (Hombert, Ohala & Ewan 1979).

In the evolution of Asian languages, there is a bifurcation between those which transphonologized the old voice/voiceless opposition into “register complexes”, like Mon-Khmer, where phonation oppositions are prominent, accompanied by vowel timbre differences and very marginal pitch effects on the one hand, and most Sino-Tibetan languages which transphonologized the same old voicing opposition into tones, with marginal phonation differences on the other. Pulleyblank (Pulleyblank 1978), Cao and Maddieson (Cao & Maddieson 1992), Yip (Yip 1978), Ferlus (Ferlus 1998) and others have already suggested the hypothesis that both lines of evolution shared a stage where the opposition involved phonation types, even in languages which show no trace of this today. The TGTM dialects certainly corroborate this hypothesis. And we can at least propose law (1) as an areal feature for Asia over the last two millennia.

Elsewhere in the world, linguists have proposed that voiced initials have given rise directly to Low tone, with no intervening breathiness, precluding the universal generalization of law (1). A case in point is the Oceanic languages Yabem and Bukawa, where no breathiness is present. But in this particular case tonogenesis

is triggered by accent as well as loss of voicing.¹⁸ More research is needed before a general typology of tonogenesis from voicing can be attempted.

The second “law” we have encountered is not independent but has a different focus.

- (2) in the context of tonogenesis, the phonetic change of stop initials from voiced to voiceless aspirated is not direct and goes through a breathy stage: voiced > breathy > aspirate.

Across the world’s languages, the creation or multiplication of tones when it results from events at the beginning of a syllable or a word rests on the confusion of two¹⁹ series of phonemes which differ in what is traditionally called strength. This can be the reduction of older geminates or consonant clusters leading to their merger with the simplex series as in New Caledonian languages (Haudricourt 1968; Rivierre 2001), the merger of glottalized with non-glottalized initials (stops or continuants), or the merger of voiced with voiceless initials – from voiced to voiceless concerning the stops, from voiceless to voiced concerning the continuants – as we have seen in TGTM. These can all be one-step phonetic changes which can be considered to be motivated by the disappearance of a “marked” feature. They can be understood as simplifications, and they can all be observed elsewhere in the world in phonological changes which do not involve the creation of tones. Certainly, although we would like to claim that *D>Dh>T is the normal pathway of change in tonogenesis, *D>T is a very common change elsewhere.

The merger of *voiced with *aspirated stops is also a frequent source of phonemicization of tone. This is harder to present as a simplifying change, and is probably not attested as a one-step process outside of the domain of tonogenesis. It seems that in tonogenesis, too, the change is mediated. Haudricourt explained the change of proto-Thai *voiced stops to voiceless aspirated in southern Thai (in particular Bangkok), as against plain voiceless in Northern Thai, by contact with Mon-Khmer “register” languages (Haudricourt 1965). In Nepal there is no contact

18. In Yabem, two tones, high and low, are in opposition forming minimal pairs on words containing continuant consonants, as in /olí/ ‘body’ vs /oli/ ‘wages’, but in complimentary distribution on words containing stop consonants as in /ka-kún/ ‘I called out’ vs /ga-gùn/ ‘I speared something’ (with voicing harmony among stop consonants). In the neighbouring language Bukawa, tone has become phonologically contrastive on words containing stops, through a process which is not a transphonologization of the voice contrast into tone, although the result is, indirectly, the same: Ross explains that initials of strong syllables all became voiceless, and initials of weak syllables all became voiced (Ross 1993).

19. Exceptionally three series are hypothesised to have merged simultaneously leading to a tripartition of a previous tonal system (Haudricourt 1961).

with register languages. So we posit the reinterpretation of breathy voice as aspiration independently of contact.

The third law is more general and more tentative. It requires for its corroboration or disproof a precise evaluation of the phonological stage of the evolving languages.

- (3) when breathiness is not, or is no more, a separate feature orthogonal to a tone system, but has become a feature of the tone, it does not survive when the tone becomes phonetically high.

That breathiness and high pitch cannot be said to be antagonistic *per se* is shown by languages which make use of a breathy vs modal contrast on all tones – what Silverman names “laryngeally complex” languages. Examples include the Otomanguean languages of Meso-America (Silverman 1997: 133) or the Nilotic language Dinka (Remijsen & Ladd 2008). Nonetheless the position of the throat for breathy vocal register is described as follows: “the vocal folds are slack, airflow is large and the larynx may be either lowered or neutral” (Edmondson & Esling 2006). Since this setting of the laryngeal articulators is also favorable to low pitch, the association of breathy with Low tone is usual, **in cases where the two features are not independent phonologically**. It makes articulatory sense that breathiness should be abandoned, diachronically, as it has been in evolved TGTm dialects, when the pitch characteristics of the tone it was associated with have moved outside of the zone where pitch and vocal register enhance each other. If an enhancing feature becomes a burden, get rid of it!

The history of TGTm appears to recapitulate the passage from phonological to redundant status for breathiness. During the phonologization of tone (before the complete merger of the continuants) breathiness in proto-TGTm (or a combination of voice on the initial consonant and breathiness on the vowel, or variation between the two features) had independent phonological status in relation to the proto-tones A and B. Nowadays, although two tones have, to a varying degree, breathiness as part of their definition in some of the dialects, we have shown that this feature is part of the tone, and not orthogonal to tone. It is this lack of phonological independence which allows its phonetically motivated loss on tones which have become secondarily high.

4.2 Features or cues: Phonological change and the theory or definition of the phoneme

“Although coarticulatory variation is largely systematic, and serves as useful information for listeners, such variation is nonetheless linked to sound change.” (Beddor 2009). As a complement to this remark, we have tried to show here that there is a stage in phonological development when variation, which had earlier

been coarticulation-based is no longer coarticulation-based, but serves, all the same, as useful information for listeners. The question raised is the phonological status of such variation, and of the complex phonological elements which are encountered at that stage of diachronic evolution.

Most linguists would accept the idea that languages are in a constant process of change. It follows that observations made on features and their relations in apparently transitory states should be accounted for in a general theory of phonology. We are ready to concede that laryngeal features may have a longer lifetime in transphonologisation than other articulatory features, so that their evolution may be atypical of other areas of phonology. But extreme or rare cases are a good test of the generality of a theory.

From a Praguean structuralist point of view, as soon as one pair of initial phonemes has merged completely phonetically – as is the case for *s,*z > s, or *hm,*m > m in the TGTM languages – whatever voicing may remain on the stop initials, even if phonetically salient, is to be considered as “redundant”, that is “conditioned” by the tone. This is an abstract statement of course; it does not mean that there is a reversal of phonetic coarticulation effects. It would seem useful though to establish clearly in phonological theory the distinction between redundancy of features due to coarticulation effects, and thus universal and predictable, from the situation which obtains in the aftermath of a transphonologization, where we would suggest that the previously distinctive and newly “redundant” features are rather part of a bundle of cues which all contribute to the definition of the new phonological element, tone in the present case. Inasmuch as voicing of an initial is not automatically conditioned by the F0 curve on general phonetic grounds – quite the opposite is demonstrated by the historical evolution – it is clear that this is not a matter of coarticulatory variation and that the presence of voicing of Ci (or of breathiness) has to be learned and chosen by the speaker just as much as the pitch.

It should be clear that the concept of a bundle of cues, some realized on the consonant and some on the vowel (or on the whole word as we have seen in Section 3.3), is different from Halle and Stevens’s idea of a single universal set of features unifying laryngeal characters of consonant and tone²⁰ (Halle & Stevens 1971). Beside other difficulties analyzed in (Anderson 1978), that system is static and would wrongly predict that tone influences initial consonants as much as initial consonants influence tone. The idea of a bundle of cues is dynamic; it implies

20. The same settings of the four parameters of their theory defines the opposition of /p/ to /b/ and of high tone to low tone, so for instance voicelessness and high tone are both: {[-spread glottis], [-constricted glottis], [+stiff vocal cords], [-slack vocal cords]}.

a relationship between the cues which does not appear immediately natural, and is certainly not universal. It does not say that the same cues are present on the consonant and the vowel, but that some cues to a single distinctive element are realized on the consonant and others on the vowel. In the dialects of our study the progressive replacement of one feature by another in diachrony, with an overlap of different features born at successive times, has led in synchrony to variation patterns between cues to tone which can go as far as a replacement relationship between the cues, as is found also in Wu or in Tibetan.

The notion of a “register complex”, first introduced by Eugénie Henderson, is used by phoneticians (Abramson, Thongkum & Nye 2004). It does not seem to have a status in phonology. Our TGTM data suggest that “tone complex” is also a useful concept.

These two concepts fit with some difficulty into traditional structuralist phonology, European or American, or into generative phonology, since neither accepts that a cluster of cues should define a phonological element. They may find their place in the “emergence” theories (Blevins 2004; Mielke 2008) where the diachronic development (“emergence”) of new patterns is linked to a constantly renewed emergence (calculation) of patterns by speakers and where “features may be more or less important in defining [a] category, but no feature is redundant and thus dispensable” (Bybee 2001:33). On the other hand, our explanation of the reinterpretation of breathiness as aspiration in Manang rests crucially on the existence of a structured phonological system, which argues against the idea that lexical items should be simply stored in memory in their phonetic shape(s). To account for language change it seems that we need to posit both the existence of a structured phonological system, and its constant re-emergence from the data. There is no *a priori* incompatibility between these two models, as there is no necessity to believe either that features should be innate, or that a speaker’s phonological system must be extracted from the input data once and for all in early childhood. This is compatible with the studies from Labov’s school which have demonstrated change in adulthood (Labov 2007).

Coming back to the definition of tone, it may be useful to consider pitch-only tone systems as a limiting case in a more general theory of multiple-cue tones. The fact that the “general case” is not realized in the majority of tonal languages, which favor a simpler structure, may be an effect of some general human cognitive preference for simplicity. Hyman half jokingly estimates that tones have many “advantages” over consonants and vowels: they present “few if any articulatory difficulties”; they are “acoustically (hence perceptually?) simple, F0”; and they are learned early by babies. So, he asks, why don’t all languages have tone? (Hyman 2010:50). Part of the answer could be that tones are not born simple, their birth is,

in many cases, complex. Could this be a hindrance to their generalization in the languages of the world?

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