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STUDYING LEVEL-TONE SYSTEMS IN ASIA: THE CASE OF THE NAISH LANGUAGES

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ABSTRACT

This paper discusses the prosody of Naxi, Yongning Na and Laze, three Sino-Tibetan languages of the Naish subgroup. These three languages have three level tones (High, Mid and Low). Level tones are not unattested in China and Southeast Asia, but have received somewhat less attention than the phonetically complex tones typically found in Sinitic and other families in the area. The study of level-tone systems in Asia appears as a promising field of research, now still in an early stage of development. Central issues concern these languages' place in prosodic typology, and the ways in which intonation interacts with level tones. The paper explains how answers to these questions gradually emerged. The three languages considered here illustrate the great diversity of situations that one may expect to encounter in the field: the tones of Laze and Yongning Na fall squarely in the level-tone type, whereas Naxi is somewhat of an outlier among level-tone systems.

Keywords: Sino-Tibetan, Naish, prosodic typology, tone systems, level tones.

1. INTRODUCTION

This paper discusses the prosody of three Sino-Tibetan languages of the Naish subgroup: Naxi, Na and Laze. How should their tones be described and modelled? Where do they fit in prosodic typology? How do tone and intonation interact in these languages? Some answers are proposed through a confrontation of fieldwork observations with earlier descriptions, in particular [11], [15].

One of the potential uses of this paper is as an introduction to the type of complexities encountered in **level-tone** systems. Such a topic appears relevant for a conference devoted to "Phonetics of the Languages in China". With few exceptions, linguists exploring the languages of China are familiar with Mandarin and/or other Sinitic languages that possess systems of phonetically complex tones. Fewer are familiar with languages that have level-tone systems: such systems are not unheard of in China and Southeast Asia, but tend to be less extensively documented. The study of level-tone systems in Asia appears as a promising field of research, now still in an early stage of development. The three Naish languages considered here illustrate the great diversity of situations that one may expect to encounter in the field: the tone systems of these three languages are all based on three level tones (High, Mid and Low), but the tones of Laze and Yongning Na fall squarely in the level-tone type, whereas Naxi is somewhat of an outlier among level-tone systems.

This paper also addresses issues of intonation. The prosodic system of a tonal language includes tone, intonation and their interaction: in particular, how

utterances are divided into smaller chunks (i.e. how junctures are manifested), and how information structure is conveyed by suprasegmental means (backgrounding vs. foregrounding, as in contrastive emphasis). "The fieldworker must consider how to distinguish between intonation and tone and discover how intonation interacts with the existing lexical prosodic features of an utterance" [7, p. 273]. Analyses of intonation (phrasing and information structure) and tone complement each other.

2. APPROACHING THE TONES OF NAXI: ON THE ANALYSIS OF CONTOURS

The first language on which I conducted fieldwork, starting in 2002, was Naxi, as spoken in a village (A-Ser) located close to the city of Lijiang (Yunnan, China). My main source of information on the language prior to fieldwork was the sketch by He Jiren and Jiang Zhuyi [15], which described the four tones of Naxi on the Chao five-point scale as ⁵⁵, ³³, ³¹ and ¹³: high, mid, low-falling, and low-rising, respectively (in tone-letters: 1, 1, 1 and 1). I had also read a diachronic study on Naxi that suggested that there were only two tones at an earlier stage, preserved as the mid and low-falling tones, ³³ and ³¹, whereas the high tone, ⁵⁵, had developed later, perhaps as a result of prefixation [3], and the rising tone, ¹³, had appeared as a recent innovation. This made sense in view of the lexical distribution of the tones: the decreasing order of frequency was ³³, ³¹, ⁵⁵ and ¹³.

Figure 1 shows the four tones of Naxi averaged over 160 tokens in a carrier sentence, by speaker M5.

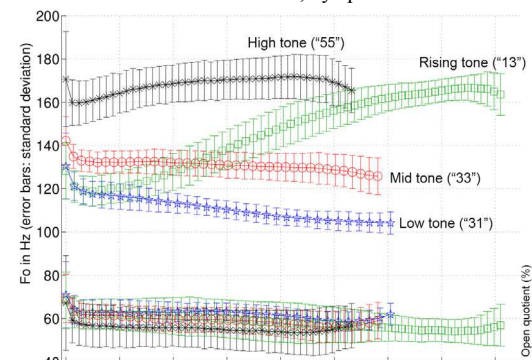


Fig. 1. The four tones of Naxi. Averaged over 160 syllables in carrier sentence. Speaker M5.

The carrier sentence is:

ʃʰwɿ	ʃʰwɿ	kʰaɿ	_____
3SG	DEM	moment	<i>target syllable</i>
ʃʰwɿ	ndzyɿ	pəɿ	ŋwɿ
DEM	character	to write	ASPECT.ongoing

"(S)he is writing the character _____."

The top part of the figure shows F_0 curves, clearly bringing out the four-way tonal opposition. The bottom part of the figure shows glottal open quotient values, which overlap strongly, providing an indication that phonation-type characteristics are not part of the lexical tones' specification. (Both F_0 and open quotient values were computed from an electroglottographic signal.) For this speaker (M5), there is a slight tendency towards an inverse correlation between F_0 and open quotient: on average, the high tone has slightly lower open quotient, i.e. more pressed voice, and the low tone slightly higher open quotient, i.e. closer to flow phonation/whisper, but (i) this difference is not statistically significant and (ii) an inverse tendency is found in data from other speakers [23].

When we met in 2002, the Naxi linguist He Jiren explained (p.c.) that other notations would be phonetically acceptable for the rising tone, such as ²⁴, and for the falling tone, such as ²¹. He explained that he had chosen to transcribe these two tones as ¹³ and ³¹ respectively because it brought out what he considered was the underlying organization of the system, with two level tones (high and mid) and two symmetrical contours, as shown in Table 1.

Table 1: The organization of the Naxi tone system according to the linguist He Jiren.

<i>level tones</i>	high: ⁵⁵ (l)	mid: ³³ (t)
<i>contour tones</i>	rising: ¹³ (l)	falling: ³¹ (t)

He Jiren uses the Chao five-point scale [6], which was taken up in the International Phonetic Alphabet and is the standard way to transcribe tones in universities and research centres in China. Like other IPA symbols, tone letters are in-between phonetic notation and phonemic analysis. Notations along the five-point scale constitute a stylization of perceived contours, serving as labels for the tone categories brought out by distributional analysis. Tone-letter notations refer to tones as distinctive units; they do not reflect an analysis of the phonological specification of each tone.

To return to the example of the Naxi tone system, the fact that the rising tone ¹³ (l) is extremely rare apart from Chinese loanwords makes one wonder to what extent the symmetrical system shown in Table 1 really reflects the organization of the Naxi tone system. If one provisionally leaves aside the rising tone, there remain *high*, *mid* and *low-falling*. Colleagues working on other languages report that a phonetic downward tilt on a low-tone syllable is a common observation in level-tone languages; this tilt is clearest at a major juncture ("prepausally"). In level-tone systems, it is in fact unusual for a low tone to have a level F_0 contour, rather than a falling F_0 contour. In the Bantu language Oku, for instance, L tones normally have a falling F_0 contour; the absence of this falling F_0 contour points to the presence of a floating tone [17].

It thus appeared worthwhile to abstract away from the phonetic downward tilt of the Naxi tone transcribed by He Jiren as ³¹, and to explore the possibility that the three basic tones of Naxi were to be interpreted phonologically as three levels: High, Mid and Low. This is the notation that will be used henceforth: H(igh) /a^h/, M(id) /a^m/, and L(ow) /a^l/. This is strictly equivalent to Africanist notation as /á/, /ā/ and /ǎ/, but the tone-letters can be typographically easier to handle: despite Unicode standardization there can still be problems with combinations of diacritics over vowels. At the time of writing (2013), a MH tone on a nasalized vowel comes out as a messy heap of diacritics (ǎ̃) in most text-

processing software, so it appears reasonable to stick with /ǎ^h/.

The hypothesis that all the tones of Naxi were based on levels required verification. At my first elicitation session, I recorded words (in isolation and within carrier sentences), sentences, narratives, a dialogue, and specific data sets on topics of special interest for my research: (i) short dialogues adapted into Chinese from an English questionnaire for investigating intonation; and (ii) example sentences from He and Jiang's book illustrating phonological changes, including a few cases of tonal change [15, pp. 12-15]. I needed to find out to what extent these tonal changes could shed light on the structure of the tone system.

In keeping with He and Jiang's description, it appeared that lexical tones generally surface unchanged in continuous speech: tonal alternations are not easy to get by. It is an issue how to obtain evidence on the nature of such "inert" tones. The first task consisted in collecting examples of tonal alternations, and examining them individually. They fell into the following categories: (i) compound nouns whose tones were not just a concatenation of the tones of their constituting elements, (ii) reduplicated expressions, (iii) numeral-plus-classifier phrases, and (iv) synchronic alternations in which a morpheme with High tone underwent complete segmental elision and caused a change in the preceding syllable, causing its tone to become a rising contour.

Among these four sets, the first contained exceptional cases, since there are no synchronic rules of tone change in compounding and affixation in Lijiang Naxi. Words such as [ʃsu^hl-p^həʃ] 'white earth' (compare [ʃsu^hl] 'earth', with mid-level tone, and [p^həʃ] 'white') are exceptional, and learnt as such. When I did fieldwork, I found a couple more examples from narratives, but these did not provide cues to the possible origin of these exceptional patterns. Language shift to Chinese is under way, and some younger speakers who are less proficient in the language regularize such exceptions and say [ʃsu^hl-p^həʃ]; this can be taken as confirmation of the fact that the tone pattern of compounds such as [ʃsu^hl-p^həʃ] is lexicalized, and not the output of a productive rule. The second and third sets looked more promising. Reduplication often provides important evidence on the structure of sound systems, including tone [e.g. 10, pp. 467-473]. Tone patterns on numeral-plus-classifier phrases are another staple of tonology in languages that have classifiers [see e.g. 10, pp. 469-473]. There seemed to be neat tonal changes, for instance [wa^hl p^he^hl] 'five slices': compare [wa^hl] 'five' and [p^he^hl] 'slice'. During my first fieldwork on Naxi (2002), I checked the data from He and Jiang's book, built complete series (numerals from 1 to 25 plus various classifiers), and made recordings.

The reduplication patterns turned out to be quite unlike anything one would expect in terms of level-tone systems in a typical Bantu language. The H, M and L tones yield H+M, M+M and M+L, respectively. If this were a case of tonal spreading, one would expect H+H (from H); if it were a case of default assignment of M tone to the second syllable, one would expect L+L (from L), not M+L.

My best guess on this topic (to this day) is based on phonetic observations about reduplicated expressions. I thought that these transformations may originate in the phonologization (transformation into a categorical phenomenon) of a phonetic factor which is still well-attested in synchrony: the intonational marking of boundaries (junctures) between words and between

phrases. These boundaries are indicated by a clear lowering of fundamental frequency, superimposed on the lexical tones. I had prepared a list beforehand, on the basis of He and Jiang's book on Naxi; when I elicited these tokens, I was struck by the discrepancy between the realization of

the first and second halves of reduplicated expressions. This was at its clearest on four-syllable, ABAB phrases, such as /pʰəɟsæɯ~pʰəɟsæɯ/ 'very white', as illustrated in Figure 2 (from [27]).

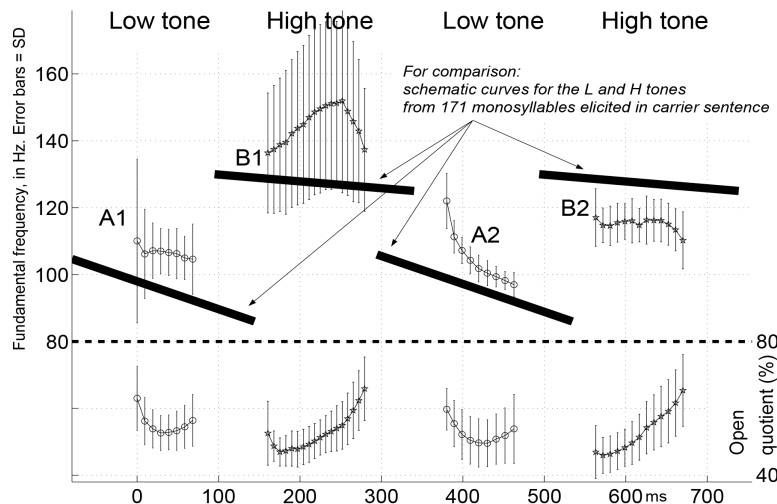


Figure 2. Average F0 curves (normalised by average duration) of the L and H tones in 10 reduplicated disyllabic expressions, compared with curves for L and H tones on monosyllables in carrier sentence (schematised from 171 items, same speaker).

The last two syllables are weaker (shorter, and with overall lower F_0 contour) than the first two. This suggested a possible scenario concerning the origin of the H+M, M+M and M+L patterns on disyllabic expressions. I thought that total reduplication, a simple process that is common cross-linguistically, could be taken as a hypothetical starting-point: in this perspective, one is led to the conclusion that the change that took place since that stage is a change from H+H to H+M, and a change of L+L to M+L. This gives reduplicated expressions a downward melodic pattern, whereby the first syllable is higher than the second. In view of the auditory impression reported above, I thought that these transformations may originate in the phonologization (transformation into a categorical phenomenon) of a phonetic factor which is still well-attested in synchrony: the intonational marking of boundaries (junctures) between words and between phrases. (This could also be described as de-stressing of the second part of reduplicated expressions.) In Naxi, the marking of boundaries manifests itself at several levels, those of the lexical word, the phrase, the sentence, and broader discourse units. In Naxi, the examination of narratives or dialogues clearly shows the presence of a downtrend within each constituent: a gentle decrease in F_0 in the course of the constituent at issue (e.g. in the course of the phonological word), followed by a faster and stronger downward tilt in F_0 at the end of the constituent [23, pp. 41-84]. This observation was probably facilitated by the personal speaking style of my first language consultant (M1), who spoke in a calm, slow and deliberate way, bringing out junctures clearly – a style which is reminiscent of that which obtains in reading tasks, for languages that have a written tradition.

As a methodological aside: useful observations can be made in the course of vocabulary elicitation sessions, as a speaker repeats a word with different intonations. For instance, if an impatient speaker from whom I elicit an umpteenth repetition of a H-tone syllable says it with a higher F_0 and a sharp fall (with an unmistakable hint of

finality and impatience – meaning: “Let this one be the last one”), instead of the even F_0 contour found in more neutral realizations, this is valuable information about the language's intonation. It gives you information on the tones' latitude of variation, as well as hints on the factors that determine this variation. By recording all elicitation sessions (a luxury that became accessible in recent years due to the increase in digital storage capacity), it is possible to keep a trace of these precious glimpses.

3. Verification through experimental phonetic methods

The hypothesis that intonational differences could – under certain conditions – be heard as differences in tonal category required verification. How was this to be done?

Important evidence on such issues can be obtained from audio recordings that are made available online. Recording abundant audio data, and investing the time and effort that are necessary to describe these data (i.e. provide metadata) and make them available to colleagues, creates a solid basis for research. When doing recordings, it is common to collect more than is strictly necessary for one's immediate research purposes. Beyond the study of tone systems, the data are available for further research on a variety of topics. Concerning reduplicated forms, I had lots of recordings, from several speakers (these are gradually being made available through the Pangloss Collection, http://lacito.vjf.cnrs.fr/pangloss/index_en.htm). These were not enough to meet the requirements of a state-of-the-art experiment, however.

In order to be conclusive, phonetic experiments require the adoption of rigorous procedures for data collection and processing, including perception tests as well as production data. All the conclusive, groundbreaking phonetic experiments I know of were extremely time-consuming; so it appears advisable to launch into a phonetic experiment only when one has a precise point to demonstrate, for which experimental evidence is necessary. We need not

“go experimental” in the sense of conducting a phonetic experiment to support every claim we make: that is impossible practically. (About the precautions that need to be taken in perception tests about tone, see in particular [33], [34]).

Referring to the conclusions of fieldwork as “impressionistic” because of the absence of full-fledged phonetic experiments is unduly dismissive: these results are based on scientific methods of phonological analysis, and on expert listening. In my first paper in a phonetics journal [22], I was asked to change my mention of Boyd Michailovsky’s findings on the Sino-Tibetan language Hayu [21] from “in Hayu, final stops are accompanied by simultaneous glottalization” to “in Hayu, final stops are reported impressionistically to be accompanied by simultaneous glottalization”. The information on how this conclusion was reached should rather be the following: “where final stops are reported, on the basis of expert listening, to be accompanied by simultaneous glottalization”. Importantly, data are available online (from the Pangloss Collection), allowing any interested reader to draw spectrograms to look further into the phonetic facts.

Returning to Naxi reduplication, the results on production and perception [27] are compatible with the original idea – that intonational factors can lead (under certain conditions) to the categorical reinterpretation of tones. Cross-dialect comparison was also useful, as it revealed that the H tone reduplicates to H+H in the Naxi dialect of Fengke, a finding which is compatible with the hypothesis that reduplication was originally total (H yielding H+H, etc.) and was later eroded in Lijiang Naxi due to specific factors.

Returning to the issue of the phonological structure of the tone system, the facts from reduplication did not yield decisive evidence on the nature of the tones themselves. Tonal changes in numeral-plus-classifier phrases [25] also turned out to be little use on this topic: they are highly idiosyncratic, and not the output of synchronically productive rules. I left reflections on these irregular patterns aside for several years, and only took them up recently in light of comparative evidence from two closely related languages, Laze and Yongning Na, where the tone patterns of numeral-plus-classifier phrases have structural similarities with those of Naxi. Among the numerals from ‘1’ to ‘10’, three pairs emerge: ‘1’ and ‘2’ always have the same tonal behaviour; likewise, ‘4’ and ‘5’ share the same tone patterns, as do ‘6’ and ‘8’. Even those tone patterns that are irregular in view of the synchronic phonology of the languages at issue are no exception to the structural identity within these three pairs of numerals. In view of the paucity of irregular morphology—and indeed of morphological alternations in general—in these languages, these structural properties appear interesting for phylogenetic research. The interpretation proposed is that the observed similarities between Naxi, Laze and Yongning Na originate in morpho-phonological properties that the three shared at least as early as the stage preceding the separation of Naxi, Na and Laze, referred to as the Proto-Naish stage [25].

The third set of tonal changes reported in He and Jiang’s book proved to be the most interesting from the point of view of synchronic phonology. The morpheme /ta/ ‘only’ can be reduced: the entire segmental contents of the syllable are deleted, and the tone of the preceding syllable undergoes a change. This process was described by He and Jiang as changing the mid and low-falling tones to the low-rising tone. Under a phonological analysis into

levels, the process could be rephrased as: reassociation of a H tone to a preceding L- or M-tone syllable, creating a contour. In turn, this raised the issue whether the resulting /LH/ and /MH/ contours were neutralized (as suggested by He and Jiang’s description of both as ¹³) or remained distinct.

To investigate these issues, I went through narratives that I had recorded and transcribed, sifting for examples of syllable reduction leading to the creation of contours. I had three months for my initial fieldwork, with the perspective of a second field trip a couple of years later, and I aimed to develop a reasonable command of the language. If you have a similar perspective, it is strongly recommended to begin recording and transcribing sizeable pieces of continuous speech (typically narratives) at an early stage. The process of transcription is extremely useful to understand various aspects of the language: the context offers a good starting-point for further elicitation.

Then I set up a small-scale phonetic study [26] to see whether the resulting /LH/ and /MH/ contours were perceptually distinct. It turned out that they were, a finding which fits in nicely with the level-tone analysis. However, extra complexities and issues also cropped up.

He and Jiang failed to distinguish the /MH/ and /LH/ sequences resulting from morpho-phonological processes, transcribing both as [¹³]; this raised the issue whether the lexical tone that they likewise transcribed as [¹³] was a homogeneous category or contained two or more different sets, such as /LM/, /LH/ and /MH/. The way to check this was a classical “odd-man-out” distributional test that I had learnt from Martine Mazaudon (it is called “monotony test” by [13, pp. 302-304], and is also used by [17]): making a list, eliciting all the items in succession, and listening for tonal differences. It turned out that all the syllables with a lexical rising contour, including Chinese borrowings, were tonally alike. There is in fact no convincing evidence for analyzing this tone synchronically as a combination of two tonal levels. If one tries nonetheless to push a level-tone account as far as possible, is the rising tone (seen in Figure 1 above) to be transcribed as /LM/, /LH/, /MH/, or some other notation? Phonologically, this tone could be described as the neutralization of the two contours that are otherwise attested in the language, /LH/ and /MH/. If diachronic evidence is considered relevant, it points in this direction: the three pronouns [ŋa¹³], [na¹³] and [ʰa¹³], referring to ‘my kin, your kin, his kin’, are related to the simple pronouns [ŋɿ] ‘1sg’, [ŋu] ‘2sg’ (both with L tone) and [ʰuɿ] ‘3sg’ (with M tone). Phonetically, the rising tone is longer than the three other lexical tones, and it sounds more like /LH/ than /MH/ to me due to a relatively low onset, but direct comparison with the /LH/ and /MH/ contours resulting from tonal reassociation is not possible due to the difference in contexts of appearance. I finally chose notation as /LH/ for the rising tone, but I was well aware that this was a less than ideally motivated choice.

Also, unlike for the H tone, there were no cases of L- or M- tone reassociation. Mid- and Low-tone syllables reduce to [ə] and [ə̃], respectively, and coalesce with the preceding syllable (in Naxi, syllabic structure is consonant + glide + vowel). Unlike High-tone syllable reduction, this process stops short of complete tonal de-linking. Thus, while phenomena of H-tone syllable reduction suggests that the notions of floating tones and tonal reassociation can be usefully applied to the Naxi data, the general picture is not really symmetrical. Tibetan dialects present comparable borderline cases, where level-tone analyses are applicable but must be conducted with great care. One of the best

specialists of this topic warns that “tone-spreading or melody-mapping analyses, useful as they are for languages like New Shanghai, should be utilized only where they are really called for with languages like Tibetan” [32, p. 516].

To conclude, Naxi is somewhat of an outlier among level-tone systems. (This observation arguably relates to greater influence from Chinese: among Naish languages, Naxi is the one that received the most continuous, direct and intense Chinese influence.)

By the time I arrived at this conclusion, I felt that I had made some headway in the study of Naxi prosody. There are three phonologically relevant tonal heights: High, Mid and Low. Phonetic falling contours are intonational allotones of the level tones. Phonetic rising contours reflect phonological rising contours, either due to tonal reassociation or to a lexical rising tone. The description of these facts had grown into a bulky paper (over 80 pages) that included (i) an account of all the cases of rising contours that I had been able to find in the lexicon and in connected speech, (ii) a phonetic study of contours resulting from tonal reassociation, (iii) materials for a comparative (cross-dialect) analysis, and (iv) a tentative analysis of the structural reasons why M- and L-tone syllables did not de-link and create falling contours. I felt that these dimensions were complementary, and that a good description should cover them all. But reviewers of the paper made it clear that I was trying to say too much at one go and that the paper could not be published in that form. So I split it into several parts. The detailed description of cases of rising contours in Naxi was published in a journal with a focus on the language family at issue, *Linguistics of the Tibeto-Burman area* [24]; and the phonetic experiment on tonal reassociation and coalescent syllables was published in the *Journal of the International Phonetic Association* [26]. This had positive consequences in terms of the degree of detail that was achieved for these two dimensions: morphosyntactic and lexical detail on the one hand, phonetic detail on the other. A less positive consequence is that the observations that did not fit neatly in either of the papers remained unpublished. This included reflections about intonation in Naxi, which in my view were an important part of the general picture of Naxi prosody. The whole process made me aware of a potential bias of research papers: they must focus on a few points (ideally, just one major point), remain short, and read easily. This can lead one to leave aside observations about the fuzzy edges of phonological phenomena. For instance, reporting only on the neat cases of H-tone reassociation in Naxi would have made a nice phonological point, but it would amount to “cherry-picking” the data, and it would give a biased view of the prosodic system of this language. It is important not to simplify our analyses for the sake of *making the point*. We should keep in mind the observations that do not find their way into our papers, and we should eventually devise a model that takes these observations into account.

In future work, I hope to add extra depth to my work on Naxi, Na and Laze by (i) continuing the synchronic description of the tone system, which in the case of Na requires a serious grammatical description, since tone is an important part of the morpho-phonology and morphosyntax of this language; and (ii) conducting comparative work aiming at documenting the origin and diachronic evolution of tones in this subgroup of Sino-Tibetan. These dimensions must be kept distinct, of course – it should always be clear which dialect one is describing, and

whether the approach is synchronic or diachronic – but they definitely shed light on each other.

4. CONCLUSIONS

4.1. About the typological range of tone systems found in Asia

It is extremely useful to have expectations about possible tone systems when setting out to study one particular system – keeping in mind that (i) there does not yet exist a final typology of tone systems, and (ii) “structural categories of language are language-particular, and we cannot take pre-established, a priori categories for granted” [14]. In Asia, one may be facing complex tones, as in much of the Sinitic domain: tones defined by an undecomposable F_0 contour, sometimes also comprising phonation-type characteristics [1], [2], [9], [19], [20], [28], [29], [31]. One may be facing systems which phonological analysis soon shows to be based simply on a small set of pitch levels. Or one may be facing still other types of systems: for instance, tone systems where phonation type is a distinctive feature orthogonal to tone, as in some Oto-Manguean languages [8], [12]. Then again, one may be confronted with borderline cases.

There has been a measure of mutual distrust between specialists of different types of tone systems. Eugénie Henderson, who is familiar with complex tones, warns that “... ‘tone’ is seldom, if ever, a matter of pitch alone” [16]; this “if ever” amounts to casting doubt on the validity of tonal descriptions that do not mention phonation type and other potential phonetic correlates of tone [see also 30]. However, it should now be clear, in view of the accumulated evidence, that there exist level-tone systems in Asia, not only systems of phonetically complex tones. To me, it is equally clear (i) that the tone system of Na and Naxi is based on three level tones: H, M, and L, and that contours observed in these two languages are to be analyzed as sequences of levels, and (ii) that not all tone systems are based on levels: for instance, “there are no objective reasons to decompose Vietnamese tone contours into level tones or to reify phonetic properties like high and low pitch into phonological units such as H and L” [4], [5], [18] (the same argument applies to Sinitic languages).

4.2. Some issues of prosody awaiting further investigation in the languages of China

The study of level-tone systems and of tonal morphology in Asia appear as promising fields of research. Studying the intersection of the former and the latter may open up especially interesting perspectives: comparing tonal morphology in systems of level tones (such as Yongning Na) and in systems that are based on phonologically complex tones (such as the Wu dialects of Sinitic/Chinese). Various descriptions of languages of China mention tonal changes that clearly deserve further investigation. Examples include languages of the Loloish (a.k.a. Yi, Ngwi) branch of Lolo-Burmese, such as Bisu [35]. Book-length descriptions of tonal morphology remain relatively few in number; there remains much work to be done in describing and analyzing morphotonology, including among the more widely studied languages, such as Wu and other dialect groups within Sinitic.

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