Contour spread: Encoding precedence in tonal representation and beyond

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A widely accepted model of tonal representation in Chinese tonology is that of Bao 1999, which posits two binary features to allow for four distinct tonal levels. The feature [±upper] divides the tonal space into two registers. The value [+upper] refers to the higher register and is abbreviated with the symbol H, whereas the value [-upper] refers to the lower register and is abbreviated with the symbol L. The feature [±raised] is interpreted within each register, for example, [-upper, +raised] refers to a tone in the higher part of the low register. The value [+raised] is abbreviated *h*; the value [-raised] is *l.* The symbols thus combine as in the table for four level tones. Contour tones involve, in Bao's system sequences of values for raised within a register. For example, a falling tone within the upper register can be abbreviated H,*hl*, and rising tone in the same register is H,*lh*. A rising tone can also appear in the lower register, represented as L,*lh*. Thus, despite the fact that H,*lh* and L,*lh* represent contours in different registers, the representational system treats the two kinds of rising tones as a natural class. They each contain an *lh* **contour.** This useful result allows Bao's system to account for **contour spread** in the Zhenhai dialect.

upper	raised
H	*h*
H	*l*
L	*h*
L	*l*

Bao's decomposition of tone into the features [±upper, ±raised] not only provides insight into contour spread, as we will see, but, by positing binary features for tone, it also contributes to the idea expressed by Hyman (2011) that tonal phonology is just normal phonology, with rules and representations that are just like segmental phonology at the right level of abstraction. However, we will argue that Bao's model is overly rich, and that Bao's own assumptions are sufficient to account for Zhenhai contour spread without his proposed CONTOUR node, which is adopted by subsequent authors.

Contour spread is apparent in the tone sandhi of Zhenhai compounds. A clear example occurs in compounds in which the first member has the underlying tonal features L,*lh*, that is a rising tone in the lower register; and the second member has one of the following four underlying contour tones: H,*hl*; H,*lh*; L,*hl*; L,*lh*. So the four inputs we are as follows:

INPUT	a. L,*lh*- H,*hl*	b. L,*lh*- H,*lh*	c. L,*lh*- L,*hl*	d. L,*lh*- L,*lh*

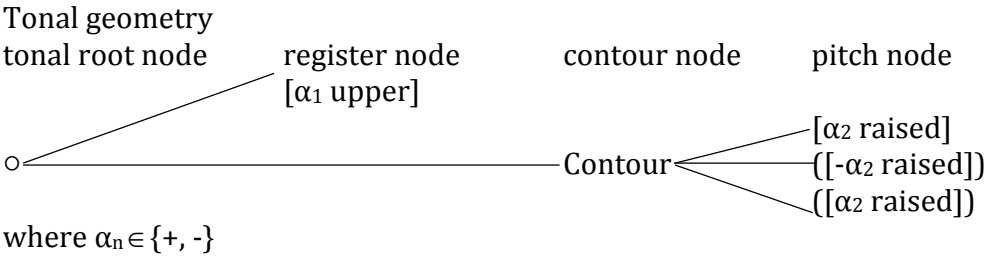
There are two neutralizations in the output of these four inputs. First, the values of [raised] that constitute the contour on the first syllable (*lh* in our examples) surface, in the same order, on the second syllable. So, all four forms under consideration end up with an *lh* contour on the second syllable. Second, after it has been copied, the underlying contour on the first (weak) syllable of a compound is replaced by the non-contour simple value *l* ([-*raised*]), regardless of the input tones.

OUTPUT	a. L,*l*- H,*lh*	b. L,*l*- H,*lh*	c. L,*l*- L,*lh*	d. L,*l*- L,*lh*

The crucial aspect of this data is that the feature values for [raised] are copied from the first syllable to the second even though the register feature value is not. (Other data makes it

clear that this is copying, and that *lh* is not a default.) For example, in all the forms, the source of the contour is a first syllable in the L register ([-upper]), but in column (a), the *lh* contour replaces the second syllable's underlying *hl* but leaves the second syllable's underlying register value, H, intact. The contour acts as an independent unit.

Bao and others have concluded that this example demonstrates the need for a feature geometric model that includes a node CONTOUR that dominates values of [raised]:



We argue that this node is in fact unnecessary, since all the information needed to generate contour spread is already encoded. Yip (2002) "conclude[s] that the powerful model of feature structure suggested by Bao may well be needed to account for the full range of spreading, copying, and association facts." However, we argue that Bao's contour node is definitely NOT needed since the multiple values of [raised] that constitute a contour on a given syllable must be linearly ordered explicitly (to distinguish rising from falling contours); and that this tier specific ordering is sufficient to account for contour spread.

In the absence of contours, it would be tempting to assume that the only precedence relations needed in phonological representations would be those encoded on the timing tier—all others would be derived via association to the timing tier. However, the existence of contours is evidence for Goldsmith's (1979) original view on autosegmental phonology, which claims that values on each tier (the string of values for each feature in a representation) are fully ordered with explicit precedence relations (see Raimy 2000 for rich discussion of precedence encoding in phonological representations). We argue for an intermediate position that posits just enough explicit ordering: The feature occurrences associated with a segment (what we call a *tier segment*) must be fully ordered, but across tier segments (between the occurrences associated with different X-slots) there's no explicit ordering. In other words, we posit only the minimal amount of ordering needed to get contours and contour spreading. We develop a notation and show how it can be generalized to understand edge and anti-edge effects in both contour tone phonology and other complex representations, such as affricates and diphthongs. We are able to maintain Bao's binary features [raised] and [upper], but streamline the overall model by getting rid of the Contour node without losing any empirical coverage.

References

Bao, Zhiming. 1999. *The Structure of Tone*. Oxford: Oxford University Press.
Goldsmith, John A. 1979. *Autosegmental Phonology*. New York: Garland.
Hyman, Larry M. 2011. Tone: Is it different?. In J. Goldsmith, J. Riggle, and A. C. L. Yu (eds.), *The Handbook of Phonological Theory*, 2nd edn., 197-239. Chichester: Wiley-Blackwell.
Raimy, Eric. 2000. *The Phonology and Morphology of Reduplication*. Berlin: Mouton de Gruyter.

Yip, Moira. 2002. *Tone*. Cambridge: Cambridge University Press.