An historical argument against tone features

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Abstract

It is generally assumed that sound changes target classes of features, rather than phonemes. Here I shall argue that while this is true of segmental features, tone changes (with one exception) do not take place by feature. This leads us to claim that tones should not be defined in terms of features, but instead should be viewed as indivisible units. If the widely held view were correct that tones should be represented by matrices of features (and that contour tones consist of sequences of such matrices), we would expect historical change to affect tones AS SERIES, as it does in the case of consonants. The extensive literature and my own comparative field work on the evolution of tonal systems in Asian languages show that tones typically evolve independently of one another. The one exception occurs when the merger of two (rarely three) series of initial consonants leads to the phonologization of a pitch feature on a vowel. In this case, analyses such as Yip (1988) and Clements (1983), where one feature represents the proto-tonal opposition and another feature represents the feature contributed by the consonant, can be maintained. However, once the tone system is fully constituted, each tone follows its own path and this individual evolution constitutes a counter-example for a feature analysis of purely tonal systems.

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Most theories of phonology adopt a feature analysis for tone, as they do for segments. The main concern that is reflected in such an analysis is simplicity: if we can show that the tones of a language can be reduced either to a succession of more basic tones (primary tones), as in the case of contour tones analyzed as sequences of level tones, or if we can define the tones of a system as matrices of features, then we can reduce the inventory of distinctive elements in the language. Of course economy in the inventory comes at the cost of an increased number of statements that need to be made on the possible combinations of elements.

So the simplicity criterion cannot just be the shortening of a list, and the arguments that are adduced to support a feature analysis have to do with the possibility of making global statements about "processes" in a language. In other words, if segments share a feature, we expect that this feature will define a class of segments that will behave together in one or another area of the phonology.

Ideally, a feature analysis on a given language should be corroborated by two kinds of arguments: identical behavior under synchronic rules, and historical development as a class. For the analysis of segments (and particularly consonants) as matrices of features (or in Trubetzkoy's terms members of correlations), there is abundant evidence, both synchronic and diachronic.

For tones the evidence is contradictory. I will touch on the synchronic arguments only very briefly here to concentrate on the diachronic point of view. I will take my examples from Asian languages.

1. The scenario

In table 1 , I have sketched a scenario of the historical relationship which I postulate between types of tone systems in three stages which I have named A, B and C, and I will show that only stage B types of tones call for a feature analysis.

We start with stage A, an hypothetical tone system with 2, 3 or 4 tones, which function as unanalysable units. We do know, in Asian languages, where most of these systems come from, but this is not our topic here. We will see later that stage A is typologically similar to stage C.

Stage A2 is typologically identical to stage A1, but with redundant pitch and/or voice quality differences conditioned by laryngeal features of the initial consonant.

> The phonetic process is simple and well-documented: the transitions between the initial consonant and the following vowel differ according to the laryngeal features of the initial consonant (voice, voicelessness, breathiness, aspiration etc.). The differences are important enough to be picked up by the hearer, so that in the course of time they come to constitute contextually conditioned redundant features of the tone of the vowel, syllable or word (whichever is the phonological domain of tone in the particular language).
>
> At this stage, tones A B and C are each defined by an idiosyncratic feature which can be called respectively a, b, and c. There is no feature matrix: the [+raised] feature is redundantly assigned by rules in the context of [-voiced] (respectively [+voiced]) at the PHONETIC implementation level.

Stage B tones arise from the restructuring of the feature matrices:

The merger of any two initial consonants, (I have taken m^h vs m as an example in table 1) with loss of the distinctive feature of voicing at the phonological level, leads to a total restructuring of the feature systems of the language, for initials and for tones. The tones have now acquired as a fully specified feature the once conditioned [±raised] feature, and they can be defined by the combination of the old a,b,c features contributed by the old proto-tones, and the new [±raised] feature contributed by the initials.

> Typically one of the more unstable consonants, or series of consonants, loses a very "marked" feature (i.e. simplifies). As a consequence the old laryngeal feature on the consonant becomes redundant, and all the initial consonants become underspecified for that particular feature, which is now assigned by later rules (contextually determined by the tone). The tones, on the other hand, acquire the previously conditioned redundant feature (generally [±raised]) as a fully specified feature (a distinctive feature).

A situation like Stage B is what I call a "transitional" tonal system. Note that it can last for hundreds of years.

At Stage C, I claim that the tonal features, which were present in the preceding stage, have fused into a new set of idiosyncratic features which I have represented in the table by a series of Greek letters.

Table 1 - The cycle of tone types: a rough sketch in 3 stages

Stage A tones:

- Stage A1: ***An hypothetical three-tone system*** **(**it could be 2 or 4**)**

A B C

- Stage A2: ***Historical origin of the "transitional" tone systems: Contextually conditioned allotones***

initials	*tones:*	A	B	C
voiceless: p, t, k, s, p^h, t^h, k^h, m^h, n^h, r^h ...		A raised	B raised	C raised
voiced: b, d, g, z, m, n, r ...		A lowered	B lowered	C lowered

Corresponding feature analysis of the segments:

p^h	p	b	m^h	m
+lab	+lab	+lab	+lab	+lab
+asp	asp			
nas	nas	nas	+nas	+nas
	vd	+vd	vd	+vd

Corresponding feature analysis of the tones:

tone A [+a]

tone B [+b] *Where* a,b,c *are unanalyzable*

tone C [+c]

Stage B tones:

Restructuring of the feature matrices (Prague school "transphonologization") & creation of a tonal system of the "transitional" type

Merger of 2 segments (or series of segments) = complete loss of a feature at all levels including phonetic

*m^h	+lab					p	+lab	
	+vd						asp	
	+nas						nas	
		>	m	+lab	===>			
*m	+lab			+nas		b	+lab	
	+vd						nas	
	+nas			[+vd] becomes underspecified for m				

===>

New feature definitions for all segments and tones in a 6-tone system of the "transitional" type

[+vd] is redundantly assigned to **b** in the context of the [-raised] tones

A^1	+a		B^1	+b		C^1	+c	
	+raised			+raised			+raised	
A^2	+a		B^2	+b		C^2	+c	
	-raised			-raised			-raised	

Whether the voicing feature disappears completely (all the way to the phonetic level) or is retained redundantly on some or most segments, has no influence on the feature analysis of either segments or tones.

Stage C tones:

A^1 [+] B^1 [+] C^1[+] A^2 [+] B^2 [+] C^2 [+]

2. The historical evidence

The historical evidence for these different analyses is presented in tables 2 and 3.

In table 2, I present some diachronic evidence for the existence of tone classes in a "transitional" tone system.

> During this transitional period, when tones ARE defined by a matrix of features (with the columns in the charts representing the feature contributed by the proto-tone, and the rows the feature contributed by the proto-consonant), tonal mergers occur along the rows and columns of a feature chart. This means that, at this stage, classes of tones are formed according to features. We have many examples of this from the history of Middle Chinese, Karen, Vietnamese, and many Tibeto-Burman languages (Haudricourt 1961).

Table 2 - Stage B tone systems

Diachronic evidence for the existence of tone classes in a "transitional" tone system : ***early mergers, after a tonal split, occur according to shared features (in rows and columns).***

Tai (dialect of Trang)	*A*	*B*	*C*
kh>k, th>t, ph>p, hn>n, hm>m	545	545	55
k,t,p,ʔb,ʔd	323	323	33
g>k, d>t, b>p, n, m	42	24	11

Lahu	**3*	**1*	**2*	**-K*
ʔb>p, ʔd>t, ʔg>q	33	33	11	45
ph, th, kh	33	33	54	54ʔ
b>p, d>t, g>q	33	21	54	21ʔ

Table 3, on the other hand, presents evidence for what I claim is the DE-structuring of the old feature system in stage C tones. At that stage, historical changes in phonetic values of the tones, as well as patterns of mergers, either seem random (Table 3.a) or display a different kind of regularity, which cannot be described in terms of evolution as a class (Table 3.b).

Note that, in synchrony, replacive types of tone sandhi show the same kind of either apparent randomness, or a regularity which could be best phrased in terms parallel to Labov's "routes" for chain shifting of vowels.

Table 3 - Stage C tone systems

Diachronic evidence for the de-structuring of the old feature system in Stage C tones: historical changes do not occur by classes

a. historical changes seem random

Cantonese Chinese (Dialect of Popei): shuffling of the pitch values resulting in several apparent tonal inversions

	ping	*shang*	*qu*
p, ph, t, th, k, kh	44	12	53
b > p~ph, d > t~th, g > k~kh, m, n, l	24	45	31

Shan of Burma: shuffling of pitch values and "disorderly" merger

	A	*B*	*C*
p, t, k, hm > m, ...	334	11	22
b > p..., m...	55	22	44

Lahu: merger, by younger speakers, of tone 11 and 21 (see table 2 above). Note that these two tones have no "etymological" connection

South-West Mandarin dialects general case: merger unconnected to etymology

	ping	*shang*	*qu*	*ru*
*voiceless	1a level	2a H fall	3a rising	4a glott.fall > **L fall**
*voiced/breathy	1b **L fall**	2b H fall	3b rising	4b glott.fall > **L fall**

b. or they display another kind of regularity: "Chain-shifts" in some South-West Mandarin dialects (Baron 1975)

Early SW Mandarin (possible value)	*1a level (*44)*	*1b L fall (*31)*	*2 H fall (*53)*	*3 rising (*35)*	*4 ʔfall (*31ʔ)*
Zhanyi	44	42<*31	53	35	31<*31ʔ
Binchuan	33	42<*31	53	35	31<*31ʔ
Yanjin	55	53<*31	42	213	31<*31ʔ
Xundian	44	53<*31	31<*42	13	42<*31ʔ

3. Comparative evidence in a case study

In table 4, I have sketched the historical relationship which I believe obtains between the two types of tone systems, taking as an example a group of closely related languages from the Tamang group of languages in Nepal.

The tones are labelled, on the left side of the table, by numbers from 1 to 4 corresponding roughly to their absolute pitch from highest to lowest in the first dialect in the table.

In the left half of the table, I have represented the feature analysis which I reconstruct for "stage B" in these languages: the a and b features are the ones

Table 4 - A detailed case-study:

Comparative and historical data from Tamang (Tibeto-Burman, Nepal)

Stage B tones Feature Analysis at the transitional stage		***Late Stage B and early Stage C tones*** Modern pitch values for the 4 tones in 8 dialects							
		TAMANG			THAKALI			GURUNG	MANANG
		Ris	Sah	Tag	Tuk	Mar	Sya	Ghachok	Ngawal
/1/	[+a, +raised]	54	44	55/44	54	43	43	33	33
	?[+upper] <*A								
/2/	[+b (or -a), +raised]	44	54	43	44/33	45	45	54	45
/3/	[+a, -raised]	33/22	11	33/22	11	33/22	11	11	**54**
	?[-upper] <*B								
/4/	[+b (or -a), -raised]	211	32	**51**	121	**51**	33/22	12	31

Ris = Risiangku Sah = Sahu Tag = Taglung Mar = Marpha Sya = Syang

contributed by the two proto-tones *A and *B which I reconstruct at the previous stage, and the [±raised] feature comes from an old voicing contrast on the initial consonant. The daughter languages represented in the right half of the table include systems that could be considered as still being in the "transitional" period, and others which are clearly already what I will call "properly tonal".

From a synchronic point of view, in most of the dialects (all but Taglung, Marpha and Ngawal) we can see that tones 1 and 2 are clearly higher than 3 and 4, and could be claimed to have retained the etymological feature [+raised] vs [-raised]. But the OTHER etymological feature — the one inherited from the two proto-tones A and B — is more elusive in all dialects. Sahu, Syang and Ghachok all have 2,4 comparatively higher than 1,3. So we could posit a [±upper] feature. In Risiangku the values of this feature would be reversed. In Tukche the values are skewed, so that the class membership as defined by shared features is changed: 1 and 4 have to be associated as "relatively higher" against 2 and 3. The variability of the second feature across dialects tends to show that etymological features are not retained either phonetically or phonologically, but it would not prevent us from positing a re-structuring of the system by a grid of new features, instead of the de-structuring which I claim has occurred. A detailed study of the dialects shows that from a synchronic, system-internal point of view, the choice of other phonetic parameters also linked with the tones (contour for instance) would yield other pairings of the tones. The choice is arbitrary. (For more details see Mazaudon 1973:79-85,1978.)

More important is the fact that even those tones which seem to share an etymologically well-attested and phonetically well-motivated feature, namely [-raised], do not EVOLVE together. In Taglung and Marpha, tone 4 has evolved from a low pitch

value to a fall from very high to very low, while tone 3 has not changed. In Ngawal, tone 3 has evolved from low to high-falling, while tone 4 has not changed. (Note that tones 1 and 2 in these three dialects have not changed significantly either).

So aside from the fact that a feature analysis within each dialect does not yield a unique compelling partition of the tonal system into classes, it appears also that diachronic change has affected isolated tones, rather than classes.

4. Conclusion

What does this mean? If the tones were still organized in a correlation in Trubetzkoy's terms, or represented by matrices of features (in generative terms), we should expect them to evolve as a class. But typically each tone evolves either alone or in a chain type relationship to the other tones in the system.

I would like to suggest that this is the "properly tonal" (or purely tonal) stage, and is typologically different from the transitional stage. I would propose that the DE-structuring of an incipient tonal system is what makes it fully supra-segmental: when the tones lose their etymological anchoring in the consonantal system, they also lose their structuring in feature matrices.

It seems to me that tones are simply DIFFERENT from segments and should be treated differently in the phonology. Placing them on a separate plane, as auto-segmental phonology has done, is the first step, but I think that the internal structure of that plane is not parallel to that of the segmental plane. My best present proposal would be that tones do not break up into features until the phonetic level, and that consequently these "features" (which I propose to call "parameters" to distinguish them clearly from DISTINCTIVE features) are inaccessible to the phonology.

I would like to emphasize that the identification of a tonal system as "purely tonal" is in no way based on a phonetic definition. Whether the parameters of a tonal system be essentially pitch, or melody, or phonation, or length, or even some redundant features carried by consonants, a system is, by my definition, "properly tonal" if (1) it functions on a separate plane from the segments and (2) the tones that constitute it function as indivisible units at the phonological level.

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