Template-induced Tone Sandhi in Northern Chinese Dialects

- A Top-down Approach

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The history of phonological theory has been oscillating between abstractionist models and concrete phonology. After OT which has been occupying the mainstream of phonological theory in the 90s, in recent years, the swing goes back to concrete phonology, i.e. phonetically-based and exemplar-based approaches, where the hierarchical structure is determined bottom-up. Concerning tone sandhi in Chinese dialects, the proponents of phonetically-based phonology generally assume that, in a right-dominant language, the first syllable, metrically-weak, cannot bear a contour tone, and is thus subject to sandhi (Zhang 2002), as in (1):

(1) Mandarin a. 213+55/35/51 → 21. 55/35/51 b. 213+213 → 35.213

While this analysis can explain the simplification of a contour tone on the first syllable, it also opens a door to a contradiction that its proponents strive to exclude. In (2), a contour tone surfaces on the first syllable, metrically weak, in sandhi, and in (3), there is no tone sandhi at all:

(2) Tianjin 11+11 → 24+11 (Chen 2000)

(3) Yantai 214+33 → No change! (Bao 1990)

The present work aims to propose a top-down approach to account for diverse sandhi phenomena in Northern Chinese dialects. We claim that phonological processes are constrained by the structure of the language. More specifically, there is a concordant relationship between tonal inventory and tone sandhi behavior of a language. In (4) for instance, the number of pitch changes is reduced in the output in Mandarin, and there can be no more than three pitch changes on two syllables. It can be observed from the tone system of Mandarin that there is a complex contour tone $\widehat{213}$, with two pitch changes, in citation form. The same pattern is observed in Dalain, another northern Mandarin dialect, in which there is a complex contour tone $\widehat{213}$ in citation form, and there are no more than three pitch changes on two syllables, as exemplified in (5). We propose that, in Mandarin and Dalian, the number of pitch changes is inferior or equal to the number of syllables + 1 in a disyllabic sequence:

(6) TEMPLATICCONSTRAINTS (Mandarin & Dalian) :

a. $N \leq S + 1$ *: the number of pitch changes is inferior or equal to the number of syllables + 1 ;*

The proposed constraint predicts that, in a language with no complex contour tones, the number of pitch changes is inferior or equal to the number of syllables in a disyllabic sequence. This conjecture is borne out in Tianjin, where four lexical tones are observed in citation form: 11, 55, $\widehat{24}$, $\widehat{53}$. Actually, the following tone pattern is observed (Chen 2000):

(7) a. $\widehat{53}$+$\widehat{53}$ → 33.$\widehat{53}$

The immediate dividend of this approach is to explain why a complex tone can appear on the first syllable, metrically weak, in (2): the number of pitch changes does not exceed two in 24+11 in Tianjin. Concerning (3), there are three lexical tones in citation form in Yantai, i.e. $\widehat{31}$, $\widehat{214}$, 55. Consequently, there can be maximally three pitch changes on two syllables; hence there is no tone sandhi in 214+33.

The present analysis has an interesting result compared with a bottom-up approach, in which phonetics shapes phonological processes. The templatic constraints proposed here are intrinsically constrained by the tonal structure of the language. This conception is reminiscent of structural linguistics (Trubetzkoy 1939, Jakobson 1941) and the *priming effect* proposed by Kiparsky (1995): phonological processes such as compensatory lengthening, tone split, and consonant germination, occur primarily in a language where there is a pre-existing node in the structure to host it.

(4) Tone sandhi rules in Mandarin Chinese

	Mandarin			
Tonal inventory	55, 35, 213, 51			
Maximal pitch change	*N ≤ S + 1:the number of pitch changes is inferior or equal to the number of syllables + 1 ;*			
Tone sandhi rules	Input	pitch changes	Output	pitch changes
	213+213	4	35. 213[1]	3
	213+55	3	51.55	2
	213+35	4	51. 35	3
	213+51	4	51.51	3

(5) Tone sandhi rules in Dalian (Liu 2009)

	Dalian			
Tonal inventory	51, 35, 213			
Maximal pitch change	*N ≤ S + 1:the number of pitch changes is inferior or equal to the number of syllables + 1 ;*			
Tone sandhi rules	Input	pitch changes	Output	pitch changes
	213+51	4	21.51	3
	51+215	4	55.213	3
	213+35	3	21.35	3
	213+213	4	35.213	3

Selected references:

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[1] There is a universal intonation tendency to begin a declarative sentence with a high tone and finish it by a low tone. Several physiological explanations have been proposed in terms of the lowering of larynx height and the gradual reduction of subglottal pressure (Collier 1975, Ohala 1978). Consequently, in the present analysis, a falling pitch across word boundaries is not counted as a pitch change.