Studies in Chinese Linguistics
中國語文研究

Tone in Chinese: Preserving Tonal Melody in Strong Positions

Hisao Tokizaki and Kuniya Nasukawa
Sapporo University and Tohoku Gakuin University

Abstract

It has been argued that Shanghai Chinese has a smaller tonal domain than other Chinese dialects including Standard Chinese, Xiamen, and Taiwanese. The difference has been analyzed by setting an edge parameter (Selkirk and Shen 1990) or by ranking edge-alignment constraints (cf. Truckenbrodt 1999) at the syntax-phonology interface. Unlike these analyses, this paper argues that differences between tonal domains derive from different phonological settings for maintaining Structure Preservation in strong positions, which are defined as the most embedded parts of syntactic constituent structure (cf. Cinque 1993). We claim that Shanghai puts complement in a different tonal domain (in which Tone Deletion suppresses tones following the first contour tone) from head, in order to preserve the citation tone of complement in the strong position. In contrast, tone sandhi rules in other dialects change all the tones except the final tone in a domain; the tone of complement in the strong position is kept intact even when head and complement are in the same domain. This renders both the edge parameter and the ranking of edge-based constraints unnecessary. Thus, tone in Chinese ensures the universal validity of Structure Preservation in strong positions, which has been widely attested in cross-linguistic research.

Keywords

structure preservation, strong position, tonal domain, tone sandhi, Shanghai Chinese

---

Studies in Chinese Linguistics, Volume 35, Number 1, 2014, 31-46

1. Introduction

This paper argues that all Chinese dialects define their tonal domains so as to conform to the universal constraint of Tone Preservation in strong positions, which is defined by morphosyntactic structure. It is argued that we can dispense with parameters on the syntax-phonology interface (e.g. edge parameter by Selkirk and Shen 1990) and the ranking of edge constraints that refer to syntactic structure (Truckenbrodt 1999).

In section 2, we briefly review the phenomena of tonal domain in Chinese dialects. Section 3 discusses the previous analyses in terms of edge parameter and edge constraint. In section 4, we present our analysis based on tonal melody preservation in strong positions. Section 5 compares our analysis with Duanmu's (2005) analysis based on Non-head Stress. Section 6 concludes the discussion.

2. Tonal Domain in Chinese Dialects

Chinese dialects have been claimed to have different tonal domains based on the data shown in (1) and (2), where a pair of square brackets represents a tonal domain (Chen 1987; Selkirk and Shen 1990; Chen 2000).

(1) Shanghai: [V] [NP], [P] [NP]

a. ʻzaw ʻmo
toward horse
(LH) (LH)

b. peq ʻmo tshaw
give horses vegetables
(MH) (LH) (MH)

(2) Xiamen: [V NP], [P NP]

a. yi tsiong hit pun ts'q # sang hoo tang-oq
he Obj that Cl book give to schoolmate
'he gave that book to his schoolmate.'

b. yi kap tang-oq # kai-siao tsit e lu-ping-yu
he to schoolmate introduce one Cl girlfriend
'he introduced a girlfriend to his schoolmate.'

Here a hash mark represents a boundary between tonal domains. It has been claimed that these data show that the tonal domain in Shanghai (NP in VP or PP) is smaller than that in Xiamen (a whole VP or PP). Yip (2002, p. 118) also shows the following data to illustrate the difference in tonal domains between Shanghai and Taiwanese (cf. Chen 1987, p. 112).

(3) Shanghai:[V] [NP]
taN # ‘niN
hit people
‘hit people’

(4) Taiwanese: [V NP]
pang hong-ts’e
fly kite
‘fly kite’

These data are claimed to show that Shanghai Chinese has two tonal domains [V][NP] or [P][NP] within the syntactic domain VP or PP, while Standard Chinese and Xiamen/Taiwanese have a single domain [V NP] or [P NP]. Assuming that all the Chinese dialects have basically the same syntax, we need to explain the difference in tone sandhi patterns in terms of the syntax-phonology interface or phonology of these dialects.[1] In the next section, we will briefly review the previous analyses based on the phonological edge parameter and the edge alignment constraint. In section 4, we will present an alternative analysis based on the principle of phonological preservation in strong positions.

3. Phonological Edge Parameter and the Edge Alignment Constraint

As a way of relating tonal phenomena among Chinese dialects to prosodic and syntactic domains, the literature often refers to parameters/constraints such as the phonological edge parameter (Selkirk and Shen 1990) and the edge alignment constraint of syntactic and prosodic phrases (Selkirk 1995; Truckenbrodt 1999, Wee 2004). The differences in tonal behaviour between Shanghai Chinese and other Chinese dialects including Standard Chinese (Beijing dialect), Xiamen and Taiwanese can, for example, be typically analysed by referring to an interaction between prosodic domains and the directionality of the edge parameter/constraint.[2]

(5) *The Edge Parameter* (cf. Chen 1987; Selkirk and Shen 1990)
Domain edge = Left/Right of XP
Shanghai: Left, XP [V] [NP], [P] [NP]
Standard Chinese, Xiamen and Taiwanese: Right, XP [V NP], [P NP]

In a framework which employs edge alignment, for example, Shanghai has two tonal domains [V][NP] within the syntactic domain VP where the constraint Align-XP Left dominates, while Standard Chinese has a single domain [V NP]

---

1 In fact, there are some syntactic differences between Chinese dialects such as word order in compounds, *ba*-construction and aspect markers. As Hashimoto (1978) argues, these syntactic differences may well be related to phonological differences. This correlation of dialectal variations is quite interesting, but we will not go into detail here.

2 The tone sandhi domain of [$_{VP}$ V [$_{PP}$ P NP]] is [V P] [NP] in Shanghai. We will argue that NP, which contains the most deeply-embedded element in VP, needs to retain its citation tone.

where Align-XP Right is dominant.

(6) *Ranking of Alignment constraints* (cf. Selkirk 1995; Truckenbrodt 1999)
Align-XP Left/Right
Shanghai:
Align-XP Left > Align-XP Right [V] [NP], [P] [NP]
Standard Chinese, Xiamen and Taiwanese:
Align-XP Right > Align-XP Left [V NP], [P NP]

This type of analysis is descriptively adequate, but offers no explanation for why Shanghai and Standard Chinese, Xiamen and Taiwanese employ the different prosodic domains: the former refers to the immediate constituents of VP and the latter to the VP itself.

4. Tonal Melody Preservation in Strong Positions

4.1 Prosodically Strong Site

Without having to refer to the edge selections in Shanghai and Standard Chinese, we provide an alternative approach to the facts in question. We assume that, like Cinque's (1993) argument for stress assignment rules based on syntactic structures rather than separate prosodic ones, the most deeply embedded part (constituent) of a given XP is a prosodically strong site for tonal phenomena.

For a long time the notion of prosodic strength has played a central role in accounting for a variety of phonological phenomena such as segmental distribution and alternation, tone and pitch-accent patterns and historical sound changes (Carvalho, Scheer and Ségéral 2008; Backley and Nasukawa 2009). For instance, the immunity and susceptibility of segmental processes are often explained by referring to strength relations between prosodic positions: 'weak' positions are typically subject to processes while 'strong' positions are not. Typical examples are found in languages such as Japanese, Ibibio and English, in which consonant lenition takes place typically in intervocalic position – a context which is regarded as prosodically weak – whereas word/foot-initial positions are prosodically strong and immune to lenition and other processes. In many dialects of Japanese, for example, consonant lenition takes place foot/word-internally but never word-initially: e.g. *sa**k**a* 'slope' → *sa**ɣ**a* but ***k**asa* 'umbrella' → **__ɣ__asa* in Southern Tohoku Japanese (Nasukawa 2005); *mi**t**a* 'saw' → *mi**ɾ**a* but ***t**aki* 'waterfall' → **__ɾ__aki* in Koshikijima Japanese (Nasukawa 2010). In Ibibio, spirantisation takes place intervocalically: e.g. *di**p*** 'hide' → *di**β**e* 'hide oneself' and *fʌ**k*** 'hide' → *fʌ**ɣ**ɔ* 'hide oneself' (Harris 1997). In the same context, a number of English systems exhibit *t*-tapping: e.g. ci[*t*] y → ci[***ɾ***]y.

The literature provides a number of explanations for why word/foot-initial sites are regarded as prosodically strong and immune to processes. For example, Beckman (1997) and Kager (1999) put forward the phonetic argument that positional faithfulness tends to be preserved in word-initial position because this

is perceptually more salient than other positions, as well as being more stable in terms of lexical contrast. They do, however, formalize their argument using ranked violable constraints.

Meanwhile, a widely supported phonological explanation is offered by Harris (1994, 1997), who argues that strength relations are prescribed by the prosodic hierarchy and implemented via a network of dependency (licensing) relations holding between prosodic positions. According to this approach, differences in the hierarchical structure of dependency relations are mirrored by differences in the strength of segmental contrasts. In order to intrasegmentally license melodic features, a position inherits licensing potential from its head position (Licensing Inheritance: Harris 1992, 1994, 1997). A position located relatively distant from the ultimate head of a domain may receive less potential to license melodic features. As a result, languages such as Japanese and Ibibio suppress some features (e.g. [occlusion] and [noise] in Japanese, [occlusion] in Ibibio) in those positions which receive less feature-licensing potential.

On the face of it, the kind of word/morpheme-internal analysis just described would appear to contradict Cinque's (1993) argument for stress assignment rules based on syntactic structures, which claims that the most deeply embedded constituent in a domain receives the 'strongest' stress. However, we assume here that corresponding relations between dependency and prosodic strength are reversed in syntax: a head constituent is prosodically weak while its dependent is prosodically stronger. In fact, since the time of SPE this kind of difference between phonology and syntax has been widely accepted within linguistic circles. In phrases such as DP, VP, and PP, the right-hand constituent, which is a dependent (complement) within the phrase in question, is typically stronger in terms of stress assignment (Cinque 1993, cf. Chomsky and Halle 1968, Liberman and Prince 1977). This paper simply adopts the most widespread view that a head-dependent relation in syntax is assumed to be interpreted prosodically as a weak-strong relation. We then assume that in Chinese the most embedded constituent in a given XP is the 'strong' constituent, and as such, exhibits an immunity to tonal change. This will be demonstrated in sections 4.2 and 4.3.[3]

The preference for preserving the properties of a prosodically strong position at all levels of representation is associated with the principle of Structure Preservation (cf. Harris 1997; Nasukawa and Oishi 2001; Takahashi 2004; Nasukawa 2005 for detailed discussions). In order to avoid underparsing any properties in the strong constituent, we will assume the following principle (Nasukawa and Oishi 2001):

---

[3] Regarding the relation between dependency structure and melodic complexity, a mismatch between two different levels is also found within the phonological component. For example, the syllabic head (nucleus) tends to be melodically less complex than its dependent onset (cf. Harris, 1994; Backley, 2011). A similar situation also arises in the case of the asymmetry between compounding stress assignment and phrase stress assignment (Chomsky and Halle, 1968, et passim).

(7) *Preserve (strong)*
Parse all lexically active properties in prosodically strong sites.

This principle prescribes that all lexically specified properties must be parsed in prosodically strong sites, and furthermore, that the addition and deletion of properties are banned (cf. Beckman 1997 for a similar constraint called IDENT-IO in the framework of Optimality Theory). Coupled with the notion of strength relations and the principle of Structure Preservation, we analyze the phenomena in question in the remainder of this paper.

4.2 Tonal Melody Preservation in Shanghai Chinese

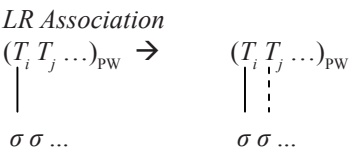
In the case of Chinese dialects, NP, the most deeply-embedded part of VP, for example, is a prosodically strong site for the phrasal behavior of tones.[4] In accordance with Structure Preservation, both Shanghai and Standard Chinese retain lexically-given tonal melodies in the strong constituent, NP of VP. According to the present analysis, the difference between these dialects is assumed to lie not in the edge parameter/constraint, but in the different phonological operations, specifically deletion and sandhi. In Shanghai all the tones following the first tone in a domain are deleted. Extending a domain to VP would delete the lexically-given tone in strong position (NP). Thus, Shanghai divides VP into two domains to observe Structure Preservation.

First, let us consider tonal phenomena in Shanghai. Selkirk and Shen (1990) show three rules applying in a Prosodic Word: Obligatory Tone Deletion, LR Association and Contour Tone Association. They formulate Obligatory Tone Deletion as in (8).

(8) $(T_i\ T_j \ldots\ T_k \ldots)_{PW} \quad \rightarrow \quad (T_i\ T_j \ldots)_{PW}$

This rule deletes all the tones following the first pair of tones in a prosodic word domain. LR Association associates the second tone with the second syllable in a prosodic word, as shown in (9).

(9) *LR Association*

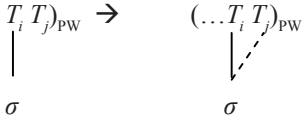


Contour Tone Association associates the last pair of tones $T_i\ T_j$ with the last syllable in a prosodic word, as shown in (10).

---

[4] To be more precise, the most deeply-embedded element in VP is a word in NP (X in [VP V [NP X ...]]).

(10) *Contour Tone Association*



Duanmu (2008) argues that Shanghai, which has CV syllables only, shows tone split, where contour tones break into level tones. Tone split is illustrated as in (11).[5] We underscore the word in the strong position in a constituent.

(11)	Surface	[H	L]	[L	H]	[L	H]
	Citation	[HL	0]	[L-H	0]	[L-H	0]
		fii	lə˨	see	lə˨	zee	lə˨
		fly	PERF	break	PERF	earn	PERF
		‘flew’		‘broke’		‘earned’	

If Shanghai had the same tonal domain as Standard Chinese, Xiamen and Taiwanese, the complement noun in PP or VP would lose its citation tone LH and receive the last half of the preceding contour tone LH.

(12)	Surface *		[L	H]	Tone Split
			[LH	~~LH~~]	Tone Deletion
	Citation		[LH]	[LH]	
		[PP [P	‘zaw]	[N ‘mo]]	
			toward	horse	
			‘toward a horse’		

In (12), the second contour tone LH in citation form is deleted by Tone Deletion (8) if the tonal domain is widened to the whole PP, and then the last half of the first contour tone LH, namely H, is split to be realized on the N. However, the surface form in (12) violates Structure Preserving in strong position. Then the only phrasing observing Structure Preservation is [V] [NP] or [P] [NP], which keeps the citation tone of NP, as shown in (13).

(13)	Surface		[LH]	[LH]
	Citation		[LH]	[LH]
		[PP [P	‘*zaw*]	[N ‘*mo*]]
			toward	horse

Thus, Shanghai must have small tonal domain in order to keep the tone of complement.

Tone preservation also explains the cases where NP in VP is polysyllabic.

---

[5] By ‘tone preservation’, we mean that a citation tone is not deleted in a domain and may be spread over the domain. In (11), the first part of the contour tone (H or L) is on the verb and the second part of the contour tone (L or H) is spread to the aspect marker *le*. The contour tone of the verb is preserved in the sequence.

In [$_{VP}$ V [$_{NP}$ X Y]], where X and Y represent a syllable, the first syllable X retains its citation tone and the second syllable Y loses its citation tone, as shown in (14) (taken from Zhu, 2006: 49).

(14) a. *cao*^{34} *chin*^{51} *cae*^{34} → *cao*^{34} *chincae* $^{:55\ :22}$
fry green vegetable 'to fry a green vegetable'
b. *boe*^{14} *xuong*^{14} *kò*^{51} → *boe*^{14} *xuongko* $^{:11\ :44}$
mix cucumber (with sauces) 'to make cucumber salad'

We assume that X is the most deeply embedded element in NP and the whole VP (see Tokizaki (2011)).[6,7]

4.3 Tonal Melody Preservation in Standard Chinese, Xiamen and Taiwanese

On the other hand, tonal sandhi in Standard Chinese, Xiamen and Taiwanese changes all the tones preceding the last tone in a domain; a lexically-given tone in strong position (NP) is opaque to the process when the domain is extended to VP. Let us look at some examples. First, Standard Chinese has stable tone, as shown in (15).

(15) Standard Chinese

Surface	[HL (L)]	[LH (L)]	[L H]
Citation	[HL 0]	[LH 0]	[L-H 0]
	mai lə	lai lə	mai lə
	sell PERF	come PERF	buy PERF
	'sold'	'came'	'bought'

Standard Chinese changes the sequence of third tones immediately preceding the final third tone as shown in (16).

(16) Surface [MH L]
Citation [L L]
mai ma
buy horse
'buy a horse/horses'

---

6 In this paper, we focus on the strong positions in VP and PP. However, one might wonder how we can predict more than one strong position in larger units such as a sentence. A reviewer points out that in a Shanghai transitive sentence both the subject and the object ought to be strong, since their underlying tones are preserved. One possible answer to the question is to assume the phase theory of syntactic derivations (Chomsky 2001, 2008), which proposes that VP is sent (Spelled-Out) to PF (phonetic form) at the first phase while the rest of IP (i.e. the subject and *v*) is sent to PF at the second phase. Then, the object is the most deeply embedded element in VP at the first phase, and the subject is the most deeply embedded element in the residue of IP at the second phase.

7 A reviewer points out the effect of word length on tonal domains: when both Ns in NN compounds are disyllabic (2+2), then the second N forms its own domain, where the tone of the first syllable is preserved; when V in VN is disyllabic (as in 2+1 or 2+2), the tone of the first syllable of V is preserved. This word length effect on tonal domains is explained by the formulation of Tone Deletion (19), which specifies its domain as "prosodic word". A prosodic word consists of at most two syllables in Chinese. A disyllabic N or V makes a prosodic word by itself, and Tone Deletion applies to its second syllable.

The tonal sandhi in Standard Chinese does not affect the tone on the complement, which keeps its citation tone. Thus, Standard Chinese observes Strong Preservation in strong position if tonal domain is expanded to VP or PP.

Tone sandhi in compounds might seem to be a problem for this analysis. For example, in *mi jiu* 'rice wine', the modifier *mi* 'rice', instead of the head *jiu* 'rice wine', changes its citation tone (the third tone) to the sandhi tone (the second tone) in Standard Chinese. However, we argue that 'compounds' such as *mi jiu* are in fact noun phrases [$_{NP}$ A N]. We follow Cinque (1993), who argues that noun phrases in English have the structure [$_{NP}$ A [$_{FP}$ F N]]: N is the most deeply embedded word in the noun phrase and is in the strong position.[8] Thus, the head noun *jiu* keeps its citation tone according to Tone Preservation.[9] Bona fide compounds such as *tongxi* (east + west = 'thing') have stress on the first word and neutral/light tone on the second word. Note that Tangxi, a Wu dialect, keeps the citation tone of the non-head (i.e. modifier) in a compound (Zhang 2007: 263).

Xiamen and Taiwanese also have similar tonal sandhi rules to Standard Chinese, which change the sequence of tones immediately preceding the final tone in a tonal domain, as shown in (17) (cf. Chou and Chen 2010).[10,11]

(17) Xiamen/Taiwanese: [V NP], [P NP]

Surface	HL	M	H
Citation	L	H	H
	pang	hong-ts'e	
	release	wind zither	
	"to fly a kite"		

Thus, the tone sandhi in Standard Chinese and Xiamen/Taiwanese is

---

8 Cinque (1993) does not discuss the nature of the functional category F in [$_{NP}$ A [$_{FP}$ F N]]. We can think of A in [$_{NP}$ A N] as a restrictive modifier and A in [$_{NP}$ A [$_{FP}$ F N]] as a non-restrictive modifier. [NP A N] corresponds to a noun modified by a restrictive relative clause as in (i); [$_{NP}$ A [$_{FP}$ F N]] corresponds to a noun phrase accompanied by a non-restrictive relative clause as in (ii) (underscore shows stress in the subject) (cf. Chomsky 1965: 217).

9 The stress on head in compounds is a problem for Duanmu's (2005) Non-head Stress rule, which assigns stress on non-head including specifier as well as complement. Non-head Stress wrongly assigns stress to the modifier A, which is the specifier and non-head, in any of the structures [$_{N}$ A N], [$_{NP}$ A N] and [$_{NP}$ A [$_{FP}$ F N]. In this sense, our analysis is preferable to Duanmu's Non-head Stress.

10 The tone sandhi in Xiamen/Taiwanese is usually described with the height of pitch (cf. Chou and Chen, 2010):

Citation tone	55	24	53	21	33	32	4
Sandhi tone	33	33	55	53	21	4/53	21

Following Tsay, Myers, and Chen (1999, Table 1), in (17) I use H, M and L instead of pitch height numbers in order to be consistent: 55 (H), 33 (M), 53 (HL), 21 (L).

11 The citation tone of the verb *pang* is L or 21 in the number notation, which we could call a contour tone. As shown in (17), the second part of this tone 21 (i.e. 1) does not spread to the end of the verb phrase *-ts'e*, which has H or 55 (cf. Chou and Chen 2010: 2).

formalized as (18), where S shows sandhi tone and C citation tone (cf. Chen 1987).

(18) $(C\ C\ C\ ...\ C)_{\text{prosodic phrase}} \rightarrow (S\ S\ S\ ...\ C)_{\text{prosodic phrase}}$

This contrasts with Shanghai Tone Deletion formulated here as (19).

(19) $(C\ C\ C\ ...\ C)_{\text{prosodic word}} \rightarrow (C\ C\ \cancel{C\ ...\ C})_{\text{prosodic word}}$

The difference between Shanghai (19) and Standard Chinese and Xiamen/ Taiwanese (18) is that the tone on the right edge is kept intact in (18) but is deleted in (19). Thus, we can explain broad tonal domain in Standard Chinese and Xiamen/ Taiwanese. They can preserve the tone of the complement, which locates at the end of tonal domain.[12,13]

In sum, the difference in tonal domain between Shanghai and Standard Chinese and Xiamen/Taiwanese is due to the difference of phonological rules, i.e. tone deletion and tone change. Duanmu (2008) ascribes the difference of sandhi rules to the difference of syllable structure. He argues that a syllable in Shanghai is CV while other dialects have CVX. Thus, a syllable in Shanghai makes a foot with the next syllable forming a prosodic word with tone spreading, while a syllable in other dialects can make a foot by itself without tone spreading. If this analysis is on the right track, the tonal difference between Chinese dialects can be ascribed to the syllable structure.

4.4 Narrow tone sandhi in Shanghai

So far, we have discussed how tonal domain in Shanghai is smaller than that in other Chinese dialects. However, Shanghai also has another tonal domain, which is larger than the domain we have seen above. Chen (2000: 314), citing examples from Xu, Tang et al. (1988), points out that Shanghai has 'tone simplification' in the phrasal construction illustrated in (20).

(20) a. tsʿɔ vE "to fry rice" (phrase)
(MH) (LH)
(H) (LH)
b. *dzi* *i* "to quit smoking"
(LH) (HL)
(M) (HL)

Chen formalizes this process as shown in (21).

---

12 In (17), the first tone on the complement *hong-ts'e* is changed from H to M. This shows that Structure Preservation on strong position prohibits deletion of the tone(s) on the complements, and allows sandhi tone(s) for the tone(s) preceding the tone on the right edge.

13 Note that our proposal is different from edge parameter, which simply specifies the right or left edge of a phrase as shown in (5). Our (18) refers to a prosodic phrase while (19) refers to a prosodic word. As we argue in section 4.4, Shanghai also has a larger tonal domain for "narrow tone sandhi", which corresponds to a prosodic phrase (18).

(21) a. HL → H
b. MH → H
c. LH → M
d. MHq → Hq (checked)
e. LMq → Lq (checked)

This process is also called narrow tone sandhi, by Xu, Tang et al. (1988) (cf. Bao 2003; Takahashi 2011), in contrast with broad tone sandhi described above. Zhu (2006: 46) also claims that Shanghai has right-dominant tone sandhi in phrases, as well as left-dominant tone spreading in compounds, as in (22).

(22) a. *pì* *sìr* [52 + 52] → [:44 52]
compile book 'compile books'
b. *ma* *jieu* [14 + 34] → [:33 34]
buy wine 'buy wine'

Note that this process also occurs in subject-predicate constructions as shown in (23) (taken from Xu, Tang et al. 1988: 42, 44).

(23) a. fiy du
rain strong 'The rain is strong.'
b. ɕin zø
heart good 'Heart is good.'

Here the subject (underlined) has sandhi tone while the predicate keeps its citation tone.

In all the examples in (20), (22) and (23), the first syllable loses its citation tone and receives a neutralized mid-level tone. In this sense, the domain of this tone sandhi is VP or the whole sentence. Compare this narrow tone sandhi (20), (22) and (23) with the broad tone sandhi (1) and (3). If these observations are right, we do not have to assume that tonal domain in Shanghai is smaller that that in other Chinese dialects.[14] Then, Shanghai is different from other dialects only in that it allows tone spreading to the right syllable(s); other dialects use neutral/ light tone on weak positions instead of tone spreading. Importantly, the citation tone of the syllable in the strong position, i.e. N in (20) and (22) and the predicate in (23), is kept intact in this narrow tone sandhi. Thus, our analysis based on tone preservation correctly predicts the tonal facts in (20), (22) and (23) as well as those in (1) and (3).

5. A stress-based account by Duanmu (2005)

Finally, we will compare our analysis with Duanmu's (2005) stress-based approach to tonal difference between Chinese dialects (cf. Duanmu (2007) for a

[14] For a phonetic analysis of narrow tone sandhi, see Takahashi (2011), who argues that narrow tone sandhi is phonetic rather than phonological in nature

more generalized principle of information-stress). Duanmu proposes Non-head Stress, which assigns stress on non-head (i.e. complement and specifier) rather than head, and foot formation rules to explain tonal domains of Chinese dialects. Duanmu argues that for tone sandhi, Shanghai uses foot boundaries and Mandarin uses cyclic domain (a foot plus adjacent free syllables). For example, NP and VP have different tone sandhi domains, as shown in (24).

(24)	a.	*chao fan*		b.	*chao fan*	
		fry rice (phrase)			fry rice (compound)	
		'fry rice'			'fried rice'	
	Shanghai	( )			( )	foot
	Mandarin	[ ]			[ ]	cycle

His analysis is basically similar to our analysis in that it uses phonological strength defined by syntactic structure. However, our analysis has four advantages. We will take each in turn below.

First, it is not clear whether Duanmu's analysis can explain the narrow tone sandhi in Shanghai we have seen above. Duanmu (2005: 243) defines the boundary for tone sandhi as a foot boundary in Shanghai and as a cyclic domain (a foot plus adjacent free syllables) in Mandarin. Narrow tone sandhi in Shanghai goes beyond a foot boundary in Shanghai, as can be seen from (20a) and (21a).

Second, Non-head Stress wrongly assigns stress to the modifier in compounds such as *mi jiu* 'rice wine', where the modifier *mi* changes its tone while the head *jiu* keeps its citation tone, as we have seen in section 4.3. Duanmu (2005: 250) argues that a foot can shield its internal syntax and that a bisyllabic compound is treated as a word to which Nonhead Stress does not apply. However, this solution is ad hoc, considering the fact that Tangxi, a Wu dialect, keeps the citation tone of the non-head (i.e. modifier) in a compound (Zhang 2007: 263).

Third, Non-head Stress wrongly assigns stress to the subject in subject-predicate constructions (23). Predicate is a head and subject is a specifier of a phrase. Thus, Non-head Stress predicts that subject receives stress and keeps its citation tone. However, as we have seen in (23), subject changes its tone and predicate keeps its citation tone. Duanmu's (2007) principle of information-stress associated with discourse might explain this case, but it must be shown why Non-head Stress does not work in this case. Our analysis, which defines the most deeply embedded element as the strong position, correctly predicts that citation tone is kept in predicate, not in subject.

Fourth, Duanmu's analysis depends on stress in foot formation in Chinese dialects. However, the presence of stress in Chinese is controversial (cf. Chen 2000: 285-295, Iwata 2005). Wang (2004) and Feng (2004) argue that foot formation is not based on stress assignment but on syntactic closeness or directionality of foot formation. Our analysis employs positional strength, which is defined in terms of syntactic structure, and does not depend on foot formation in terms of stress.

Thus, although our analysis, based on Strong Preservation, shares some basic insights on the universality of the syntactically strong position with Duanmu's Non-head Stress, our analysis has some advantages over his stress-based analysis.

6. Conclusion

The present analysis makes it possible to do away with the edge-based constraints and gives us a principled explanation of why Chinese dialects have different tonal domains in spite of the fact that they have the same morphosyntactic properties, such as word order. Tone in Chinese provides support for the universality of Structure Preservation in strong positions.

Acknowledgments

This is an extended version of the paper that appeared in *McGill Working Papers in Linguistics: Proceedings from Phonology in the 21st Century: In Honour of Glyne Piggott* (Volume 22.1,Winter 2012), ed. by J. Loughran and A. McKillen (http://www.mcgill.ca/mcgwpl/files/mcgwpl/tokizaki2012_0.pdf). We would like to thank the participants of the conference in 2011, especially Laura Downing, Harry van der Hulst, Larry Hyman, Michael Wagner, who gave us valuable comments and suggestions. Our special thanks go to the anonymous reviewers, whose comments and suggestions have greatly improved this paper. This work was supported by MEXT/JSPS KAKENHI Grant Numbers B 22320090, B 26284067, C 22520507 and Sapporo University (2012-2013).

References

Backley, Phillip. 2011. *An Introduction to Element Theory*. Edinburgh: Edinburgh University Press.

Backley, Phillip, and Kuniya Nasukawa. 2009. Headship as melodic strength. In *Strength Relations in Phonology*, ed. Kuniya Nasukawa, and Phillip Backley, 47-77. Berlin and New York: Mouton de Gruyter.

Bao, Zhiming. 2003. Tone, accent and stress in Chinese. *Journal of Linguistics* 39: 147-166.

Beckman, Jill N. 1997. Positional faithfulness, positional neutralisation and Shona vowel harmony. *Phonology* 14: 1-46.

Carvalho, Joaquim Brandão de, Tobias Scheer, and Philippe Ségéral, eds. 2008. *Lenition and Fortition*. Berlin: Mouton de Gruyter.

Chen, Matthew Y. 1987. The syntax of Xiamen tone sandhi. *Phonology Yearbook* 4: 109–150.

Chen, Matthew Y. 2000. *Tone Sandhi: Patterns across Chinese Dialects*. Cambridge: Cambridge University Press.

Chomsky, Noam. 1965. *Aspects of Theory of Syntax*. Cambridge, MA.: MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In *Ken Hale: A Life in Language*, ed. Michael Kenstowicz, 1-52. Cambridge, MA.: MIT Press.

Chomsky, Noam. 2008. On Phases. In *Foundational Issues in Linguistic Theory*, ed.

Robert Freidin, Carlos Otero, and Maria-Luisa Zubizarreta, 133-166. Cambridge, MA.: MIT Press.

Chomsky, Noam, and Morris Halle. 1968. *The Sound Pattern of English*. New York: Harper and Row.

Chou, Chao-ting Tim, and Tsung-ying Victor Chen. 2010. Multiple spell-out and Xiamen tone sandhi. Paper presented at Sound, Structure, Meaning: Explorations at the Interface, Georgetown University, Washington, D.C., 12-14 February.

Cinque, Guglielmo. 1993. A null theory of phrase and compound stress. *Linguistic Inquiry* 24: 239-297.

Duanmu, San. 2005. The tone-syntax interface in Chinese: some recent controversies. In *Proceedings of the Symposium Cross-Linguistic Studies of Tonal Phenomena: Historical Development, Tone-syntax Interface, and Descriptive Studies*, ed. Shigeki Kaji, 221-254. Research Institute for Languages and Cultures of Asia and Africa (ILCAA), Tokyo University of Foreign Studies.

Duanmu, San (端木三). 2007. 重音，信息，和语言的分类. [Stress, information, and language typology]. 语言科学[Linguistic Sciences]. 6.5: 3-16.

Duanmu, San. 2008. *Syllable Structure: The Limits of Variation*. Oxford: Oxford University Press.

Feng, Shengli. 2004. Dong bin daozhi yu yunlu goucifa [Verb-object inversion and prosodic morphology]. *Yuyan Kexue* [Linguistic Science] 3.3: 12-20.

Harris, John. 1992. Licensing inheritance. In *UCL Working Papers in Linguistics 4*, ed. Hans van de Koot, 359-406. London: University of College London.

Harris, John. 1994. *English Sound Structure*. Oxford: Basil Blackwell.

Harris, John. 1997. Licensing Inheritance: an integrated theory of neutralisation. *Phonology* 14: 315-370.

Hashimoto, Mantaro. 1978. *Gengo-Ruikei Chiriron* [Typological and Geographical Linguistics]. Tokyo: Kobundo.

Iwata, Ray. 2007. Comments on "the tone-syntax interface in Chinese: some recent controversies" by San Duanmu. In *Proceedings of the Symposium Cross-Linguistic Studies of Tonal Phenomena: Historical Development, Tone-Syntax Interface, and Descriptive Studies*, ed. Shigeki Kaji, 255-267. Research Institute for Languages and Cultures of Asia and Africa (ILCAA), Tokyo University of Foreign Studies.

Kager, René. 1999. *Optimality Theory*. Cambridge: Cambridge University Press.

Liberman, Mark, and Alan Prince. 1977. On stress and linguistic rhythm. *Linguistic Inquiry* 8: 249-336.

Nasukawa, Kuniya. 2005. *A Unified Approach to Nasality and Voicing*. Berlin and New York: Mouton de Gruyter.

Nasukawa, Kuniya. 2010. No consonant-final stems in Japanese verb morphology. *Lingua* 120, 2336-2352.

Nasukawa, Kuniya, and Masayuki Oishi. 2001. Inaccessibility of the domain-initial nucleus in high-pitch agreement. In *Formal Approaches to Japanese Linguistics* 3, MIT Working Papers in Linguistics 41, ed. Maria Cristina Cuervo, Daniel Harbour, Ken Hiraiwa and Shinichiro Ishihara, 127-144. Massachusetts Institute of Technology.

Selkirk, Elisabeth. 1995. Sentence prosody: Intonation, stress, and phrasing. In *The Handbook of Phonological Theory*, ed. John A. Goldsmith, 550-569. Cambridge, MA.: Basil Blackwell.

Selkirk, Elisabeth, and Tong Shen. 1990. Prosodic domains in Shanghai Chinese. In *The phonology-syntax Connection*, ed. Sharon Inkelas, and Draga Zec, 313-337. Chicago: The University of Chicago Press.

Takahashi, Toyomi. 2004. Syllable theory without syllables. Doctoral dissertation, University College London.

Takahashi, Yasunori. 2011. Shanghai-go seicho-oninron-ni okeru sakuyoshiki- henchono chii [The status of narrow tone sandhi in Shanghai tonology].*Chugoku Gogaku* [Chinese Linguistics] 258: 99-114. The Chinese Linguistic Society of Japan.

Tokizaki, Hisao. 2011. The nature of linear information in the morphosyntax-PF interface. *English Linguistics* 28: 227-257.

Truckenbrodt, Hubert. 1999. On the relation between syntactic phrases and phonological phrases. *Linguistic Inquiry* 30: 219-255.

Tsay, Jane, James Myers, and Xiao-Jun Chen. 1999. Tone sandhi as evidence for segmentation in Taiwanese. In *The Proceedings of the 30th Annual Child Language Research Forum*, ed. Eve V. Clark, 211-218. Stanford, CA: CSLI.

Wang, Hongjun. 2004. Shilun hanyu de jiezou leixing--songjin xing [On the metrical type of Modern Standard Chinese--a type based on looseness]. *Yuyan Kexue* [Linguistic Science] 3.3 : 21-28.

Wee, Lian Hee. 2004. Inter-tier correspondence theory. Doctoral dissertation, Rutgers, The State University of New Jersey.

Xu, Bao-hua, Tang Zhen-zhu et al. 1988. *Shaghai Shiqu Fangyan Zhi* [Urban Shanghai Dialects]. Shanghai: Shanghai Jiaoyu Chubanshe.

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

Zhang, Jie. 2007. A directional asymmetry in Chinese tone sandhi systems. *Journal of East Asian Linguistics* 16: 259-302.

Zhu, Xiaonong. 2006. *A Grammar of Shanghai Wu*. Muenchen: LINCOM Europa.

Hisao Tokizaki
Mailing address: Department of English, Sapporo University
Sapporo, 062-8520, Japan
Email: toki@sapporo-u.ac.jp

Kuniya Nasukawa
Mailing address: Department of English, Tohoku Gakuin University
Sendai, 980-8511, Japan
Email: nasukawa@mail.tohoku-gakuin.ac.jp

Received: October 31, 2013
Accepted: May 23, 2014

中國語的聲調－聲調保存在強位置

時崎久夫、那須川訓也
札幌大學、東北學院大學

提要

上海話比中國其它地方的語言的聲調域都要小一些，例如普通話，廈門方言和台灣話。這種差異是由邊緣參數或者制約用優選理論來分析決定的。本文認為聲調域的差異來自不同的音韻規則來保存聲調的在強位置，這被定義為句法成分結構的最根本條件。我們主張上海話在聲調域從中心語中把輔助語分離出來，這個音韻規則刪除掉出了第一聲調的其餘聲調，因此，輔助處於強位置並且保持引用聲調。與此相反，漢語其他的方言除了最後聲調沒有改變，其餘的聲調均發生規則改變，輔助語在同一聲調中與中心語保持一致。這使邊緣參數和邊緣制約變得無關緊要。

關鍵詞

構造保持，強度關係，聲調領域，連續變調，上海話