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SYNTACTIC CONDITIONS ON SUPRASEGMENTAL PHONOLOGICAL RULES IN CHINESE AND ENGLISH

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As the title suggests, the present paper is not so much a comparison of supersegmental phonological rules in Chinese and English as a comparison of the **syntactic** conditions underlying the application of these rules.

One of the most important and interesting developments in phonology in the **1980's has been** the research **on** the **interaction between** phonology and syntax **(cf. Selkirk 1984 & 1986, Kaisse 1985, Mohanan 1986,** inter alia). Though the **field is still in a state of flux and there is no consensus on a number of issues,** it is generally accepted that there are two major types of phonological rules: (1) those that are conditioned by purely phonological environments (which include the allophonic rules of classical phonology); and (2) those that are conditioned by morphological or syntactic structure. It is the latter that concerns us here.

The present paper will not deal with morphologically conditioned rules, which apply in the lexicon in conjunction with word-formation processes, e.g. the spirantisation and palatalisation rules that derive *electricity* and *electrician* from *electric*. Our focus will be on postlexical phonological rules which are sensitive to syntactic structure. These include such suprasegmental phenomena as tone sandhi in Chinese, intonational phrasing in English, and stressing and destressing in both languages.

In making comparisons between Chinese and English, I shall draw on data from my own research on tone sandhi processes in a number of Chinese dialects (cf. Hung 1987). I shall attempt to show that suprasegmental processes in these two languages, though very different on the surface, are conditioned by broadly similar syntactic factors.[1]

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[1] Or rather, syntactico-semantic factors, as syntax and semantics are interrelated rather than autonomous, even if, for reasons of economy and simplicity, models of syntactic structure are used in the present description.

Chinese TS is conditioned not by syntactico-semantic factors alone, but by prosodic and other (e.g. pragmatic) factors as well. The fact that the present paper focuses exclusively on the former is not meant to imply otherwise.

Firstly, a few words of explanation about **tone sandhi,** which is by far the most important suprasegmental phonological process in the Chinese dialects. Practically all morphemes in Chinese are monosyllabic, and practically every syllable carries a lexical or distinctive tone. The tone of a syllable may, however, undergo modification in juxtaposition with another syllable. This process is known as tone sandhi (hereafter TS), and is illustrated by the following examples from two Chinese dialects, Mandarin (1) and Fuzhou (2):[2]

(1)	hao	jiu
	good	wine
	(214>35	214)
(2)	sie	kie – loung
	eat	egg
	(4>31	44>52 242)

The phonological unit within which TS applies may be called the **tone group** (enclosed between round brackets above). Different dialects have different tone systems and TS rules, but in most dialects, it is the last syllable in the group which retains its original tone, while those preceding it undergo tone change.

As can be seen from examples (1-2), TS applies not only within polysyllabic words and compounds (as in *kie-loung,* 'egg'), but between words in phrases as well (as in 'good wine' and 'eat eggs'). It is not the case, however, that whenever two syllabes are in juxtaposition, TS is eligible to apply. Its application is in fact subject to certain intricate syntactic conditions. Considerable research over the past few years has been devoted to discovering just what syntactic relations (if any) must hold between two constituents for TS to apply between them – or, to put it another way, what syntactic conditions govern which TS applies (cf. Chen 1987, Shih 1986).

We begin with tone sandhi in Fuzhou, one of the most interesting of all Chinese dialects from the phonological point of view. In this dialect, TS applies between two constituents only if certain syntactic relations hold

[2] Tone values are represented on a scale of 1 (low) to 5 (high). Thus, [35] is a mid-rising tone, and [214] a low fall-rise. The sign '>' indicates tone change; thus [214>35] (for instance) shows that a [214] tone changes to a [35] in the given context. The sign '#' between two tones indicates that tone change is blocked (i.e. cannot apply) between them. Square brackets [...] signify syntactic boundaries, and round brackets (...) tone group boundaries. '*' indicates an unacceptable reading.

IPA symbols are used for Chinese dialects other than Mandarin. For the latter, the more familiar Pinyin alphabet is adopted.

between them: crucially, the relations **head, argument** and **modifier.** (In recent theories of phrase structure, an argument is an obligatory complement of the head (e.g., subject and object are arguments of the verb), while a modifier is an optional adjunct. Cf. Jackendoff 1977.)

In Fuzhou, a modifier which precedes the head undergoes TS. Thus, in (3), the attributive adjective 'new', which premodifies the noun 'house', and the degree adverb 'very', which premodifies the adjective 'expensive', both change their tones:

(3)	[sing	ts'uo]NP	[ia	kui]AP
	new	house	very	expensive
	(44>52	213) #	(31>44	213)
	'New houses are very expensive'			

In (4), all the adverbs and auxiliaries which premodify the verb 'eat' (which is head of the verb phrase) undergo TS:

(4)	[tu	e	luang	sie?]VP
	all	can	anyhow	eat
	(44>31	242>31	242>44	4)
	'can all eat indiscriminately'			

It is, however, not the case that *any* constituent that precedes a head can undergo TS. The crucial difference between modifiers and arguments is illustrated in (5) and (6) (which, incidentally, have identical tonal and metrical structures). TS applies only in (5), where a modifier 'early' precedes the head 'sleep', but not in (6), where an argument, the subject 'I', precedes 'sleep':

(5)	[[tsa]	k'oung]VP
	early	slepp
	(31>44	213)
	'sleep early'	

(6)	[[nguai]	k'oung]S
	I	sleep
(a)	(31) #	(213)
(b)	*(31>44	213)
	'I sleep'	

That the restriction in (6) is more general than one which merely applies between subject and verb is shown by (7-8), which are both adjective phrases.

TS applies to 'iron' in (7), where it is a modifier of 'hard', but not in (8), where it is an argument of 'made':

(7)	[[t'ie?]	taing	i]AP
	iron	hard	NOM
	(23>44	242)	O
	'iron-hard'		
(8)	[[t'ie?]	tso	i]AP
	iron	made	NOM
(a)	(23)	(213)	O
(b) *	(23>44	213	O
	'iron-made'		

Thus far, we have seen that, in Fuzhou, pre-head modifiers – but not pre-head arguments – can form a tone group with the head and undergo TS. In post-head environments, however, exactly the reverse situation holds. A post-head argument can form a tone group with its head, with the result that the head (being the preceding syllable) undergoes TS. Thus, verbs followed by their objects (which are arguments) can undergo TS, as in (9) and (10):

(9)	[k'ang	[tieng - nging]]VP
	see	movie
	(213>31	242>52 31)
(10)	[sie	[po – lo]]VP
	eat	grape
	(4>31	52>31 52)

By contrast, heads which are followed by postmodifiers cannot form a tone group with them and hence cannot undergo TS, as in the following verb and adjective phrases where the heads ('see' and 'fast' respectively) are followed by adverbial modifiers:

(11)	[k'ang	[so	ui]]VP
	see	once	
(a)	(213) #	(4>31	52)
(b) *	(213>31	4>31	52)
	'see (something) once'		
(12)	[k'a	[ia	la]]AP
	fast	much	more
(a)	(213) #	(31>44	242)
(b) *	(213>31	31>44	242)
	'much faster'		

It will be noticed that the final constituent in all of the above tone groups is either a head or an argument, but not a modifier. Phonologically, the final syllable is more prominent than the other syllables in the tone group not only because it retains its full original tone, but because it carries greater stress and duration.

Complex as it may seem, in permitting pre-modifiers (but not post-modifiers) and a head, or a head and a post-head argument (but not pre-head argument), to form a tone group, thereby ensuring that the latter constituent occupies the final position in the tone group, what Fuzhou TS does is to assign greater phonological prominence to heads over modifiers, and to arguments over heads. From a syntactico-semantic point of view, this is well motivated, as modifiers are dependent on heads, and heads on arguments.

From this perspective, there are certain similarities between the syntactic conditions on Fuzhou TS and on such phonological phenomena in English as the assignment of focus in [modifier + head] and [argument + head] constructions. As exemplified by (13), taken from Selkirk 1984, heads receive greater prominence than modifiers, but arguments receive greater prominence than heads (in unmarked contexts, excluding contrastive focus):

(13) (a)	*Modifier-HEAD*	(b) *ARGUMENT-Head*
	waist HIGH	FROST bitten
	world FAMOUS	WAGE earning
	crystal CLEAR	GERM resistant
	dirty CHEAP	BREATH taking
	stone DEAF	BLOOD thirsty

Turning to TS in Mandarin, the best known of all Chinese dialects, we find that syntactic relations are also relevant, though in a somewhat different way. Mandarin TS[3] applies cyclically from the lowest cycle upwards, and the domain of application at each cycle is determined (at first glance) by syntactic constituency. This can be seen by comparing (14) and (15), both of which have the same succession of tones, but with different TS applications:

(14)	mai	[hao	jiu]
	buy	good	wine
Cycle 1:	214	(214>35	214)
Cycle 2:	(214	35	214)
	'buy good wine'		

[3] Mandarin has, essentially, one TS rule, which changes a [214] tone into a [35] tone when it precedes another [214].

(15)	[mai	hao]	jiu	
	buy	PERF	wine	
C1:	(214>35	214)	214	
C2:	(35	214>35	214)	
	'have bought wine'			

However, the constituents of a tone group in Mandarin are not restricted to immediate syntactic constituents, as long as they form what may be called (to borrow a term from Selkirk 1984) **sense units:** i.e. if they stand in a head-modifier or head-argument relation to each other. Thus in (16), the utterance can be divided into two symmetrical tone groups, 'I buy' and 'good wine', because each forms a sense unit (even if the first does not consist of immediate syntactic constituents):

(16)	wo	mai	[hao	jiu]
	I	buy	good	wine
	[ARG	HEAD]	[MOD	HEAD]
	(214>35	214)	(214>35	214)
	'I buy good wine'			

On the other hand, (17), which consists of exactly the same sequence of tones, cannot be divided identically into tone groups, because the first two and last two words simply do not form sense units of any sort:

(17)	zhu	[liang	wan]	mi	
	cook	two	bowl	rice	
(a) *	(214>35	214)	(214>35	214)	
(b)	214	(214>35	214)	214)	cycle 1
	214	(35	214>35	214)	cycle 2
	'cook two bowls of rice'				

There is thus a basic similarity between TS in Mandarin and Fuzhou: both require that the constituents of a tone group stand in either a head-modifier or head-argument relation to each other (though Mandarin TS makes no further distinctions between the two). In other words, tone groups in these dialects must satisfy the sense unit condition, which Selkirk defines in (18):

(18) Sense Unit Condition (Selkirk 1984):

Two constituents Ci, Cj form a sense unit if (a) or (b) is true of the semantic interpretation of the sentence:
(a) Ci modifies Cj (a head)
(b) Ci is an argument of Cj (a head).

This condition, Selkirk claims, applies to intonational phrasing in English. Thus, in (19), all the possible intonational phrases (a-f) are sense units, while those that violate the condition (g-h) are unacceptable:

(19) (a) (Jane gave the book to Mary)
(b) (Jane) (gave the book to Mary)
(c) (Jane gave the book) (to Mary)
(d) (Jane gave) (the book) (to Mary)
(e) (Jane) (gave the book) (to Mary)
(f) (Jane) (gave) (the book) (to Mary)
(g) * (Jane) (gave) (the book to Mary)
(h) * (Jane gave) (the book to Mary)

We now turn to a different type of tonal phenomena in Mandarin, namely the **neutral tone** (hereafter NT), i.e. the loss or absence of a distinctive tone. In Mandarin, this may be obligatory or optional.

Obligatory NT applies to grammatical morphemes and particles (e.g. the aspectual markers *le* and *zhe*), which are inherently toneless and normally unstressed. This bears obvious resemblance to grammatical morphemes in English, which are also normally unstressed, and often reduced (e.g. *is* [z], *can* [kn]).

More interesting, however, is optional NT in Mandarin, whereby a syllable which normally carries a full tone and stress may optionally become destressed and lose its tone.

The contexts in which optional NT occurs in Mandarin have yet to be fully explored. I have made an investigation into verbs and come up with the following generalisation (Hung 1987):

(20) Rule for neutral-toned verbs in Mandarin:

A sentence-final verb in an adjunct clause may be in the neutral tone if its implied object is identical to an overt NP in the same sentence.

This is illustrated by (21-22), where the neutral-toned syllables are indicated by a preceding dot.

(21)	jie	.ben	shu	.kan	(.=neutral tone)
	borrow	CL	book	read	
	'borrow a book to read'				

(22)	mai	.wan	fan	.chi
	buy	bowl	rice	eat
	'buy a bowl of rice to eat'			

The motivation for Mandarin NT is apparently one of predictability. Given the context of the main clause, the information conveyed by the verb in a sentence-final adjunct clause is relatively predictable, if its implied or semantic object is identical to an NP already mentioned (e.g. 'book' for 'read' and 'rice' for 'eat' in the above examples).

Strikingly similar phenomena are to be found in sentential stress in English. As Newman (1946) and others (e.g. Bolinger 1985 & 1972) have observed, the final verbs in examples like (23) and (24) are normally unaccented, because (like Beijing NT verbs) they are, in the given contexts, highly predictable:

(23) I \have bread to eat.
(24) I \have instructions to leave.
(i.e. I have to leave some instructions)

As in the case of the Mandarin NT examples, these sentence-final verbs are preceded by their semantic objects ('bread' and 'instructions' respectively).

In contrast, the same verbs in (25) and (26) are accented because they are much less predictable in context:

(25) I have a \desire to \eat.
(26) I have \instructions to \leave.
(i.e. I am instructed to leave)

Likewise, in Mandarin, the verb cannot be reduced to NT in similarly unpredictable contexts:

(27) ta rang wo kan
he let I see
'He let me see'

(28) wo mei kong chi
I not-have time eat
'I have no time to eat'

There are further parallels to be noted in tone sandhi in another Chinese dialect, Shanghai. Phonologically, Shanghai TS is quite unusual in that, within a given tone group, the tones of all the syllables except the first are deleted, and the tone of the first syllable "spreads" rightward over the entire tone group. It is therefore essentially a process of tonal neutralisation. E.g.:

(29) si ka da tso
51 35 15 35 (underlying tones)
(5 3 3 1) (shandi tones)
'world war'

All the non-initial syllables in a tone group are also destressed.

Besides applying at the lexical level (as in the above example, which is a compound), Shanghai TS also applies at the phrase level. A lexical or content word (or compound) marks the beginning of a tone group, and can incorporate all non-lexical or function words to its right into its tone group, as in (30) (cf. Jin 1985):

(30) pa? ngo yi? peng si
give me one CL book
5 15 5 35 51 (underlying tones)
(5 5 3 1) # (51) (sandhi tones)
'Give me a book'

In (30), the lexical word 'give' is followed by the function words 'me', 'one' and *peng* (a classifier), which are tonally neutralised and incorporated into one tone group by 'give'; the next word, which is a lexical word 'book', begins another tone group on its own. (31) shows a similar example:

(31) yi ji le? yi? peng syo-su?-si pa? ngo
he send ASP one CL novel to me
( ) # ( )
'He sent me a novel'

In spite of surface differences (tonal or otherwise), Shanghai TS seems at a deeper level much like the destressing and reduction of function words (pronouns, prepositions, conjuctions, auxiliaries, etc.) in English. The English equivalents of (30-31) will have the same words (e.g. *me,a, to*) destressed and reduced as those tonally neutralised in Shanghai. Furthermore, the tone group in Shanghai, which consists of one lexical word plus adjacent non-lexical words, is identical in principle to the clitic group which some phonologists (e.g. Hayes 1984) postulate as an intermediate prosodic unit in English between the phonological word and the phonological phrase:

(32) Clitic group formation in English (Heyes 1984):

a. Every content word (lexical category) belongs to a separate clitic group;
b. The host of a clitic group is the content word it contains;
c. Clitic words are incorporated leftward or rightward into an adjacent clitic group.

Finally, the contexts in which content words (such as verbs) may optionally be tonally neutralised in Shanghai are remarkably similar to those of

Mandarin and English, as can be seen by comparing the destressing/tonal neutralisation of the verb 'eat' in examples (33-35):

(33) gei wan fan wo .chi (Mandarin)
give bowl rice I eat
'Give me a bowl of rice to eat'

(34) pa? yi? wo vE ngo .chi (Shanghai)
give one bowl rice I eat
'Give me a bowl of rice to eat'

(35) Give me a bowl of rice to eat.

To sum up, suprasegmental phenomena in Chinese dialects, in spite of their surface differences, are conditioned by a remarkably similar set of syntactic factors as those of English. In particular, (1) tone sandhi in Fuzhou and Mandarin applies within tone groups which must satisfy the sense unit condition, which also governs intonational phrasing in English. (2) The difference in phonological prominence between arguments and modifiers is manifested in Fuzhou TS as well as in focus assignment in English head-modifier and head-argument constructions. (3) In Mandarin neutral tone and Shanghai tone sandhi phenomena, nonlexical or function words, as well as lexical words of predictable semantic content, are tonally neutralised, while their counterparts in English are destressed and reduced.

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