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1 *Setting the stage*

This introductory chapter is intended to provide the necessary background for our investigation of tone sandhi. After a brief description of the genetic grouping of the languages of China, from which we draw the bulk of our primary data (section 1), I give a thumbnail sketch of the tone system of Middle Chinese (circa AD 600) and its evolution into the diverse patterns we see in modern dialects (sections 2–3). Historical tonal categories furnish us with a common frame of reference as we move from one dialect to another. I then set tone sandhi in the context of various types of tonal perturbations in connected speech, including tonal coarticulation, intonational effects, and morphologically conditioned tone changes (section 4). Tone sandhi processes often strike the analyst as arbitrary and totally lacking in phonetic or functional motivation. Section 5 shows that we can make sense of, if not explain, certain puzzling synchronic facts if we look at them from a diachronic perspective. This chapter closes with some terminological clarification (section 6).

1 Languages and dialects of China

According to *Major Statistics of the 1982 Census*, published by the People's Republic of China State Statistics Bureau (Beijing, October 1982), China (including Taiwan) has a population of 1,026 million.[1] Of these, 977.2 million or 95.2% speak one form or another of Chinese. The remaining 46.2 million are distributed over a wide variety of language families/stocks, spoken mostly on the periphery of China, with a high concentration of speakers of "minority" languages across the southwestern provinces. *Language Atlas of China* (Longman, Hong Kong 1987), compiled by the Australian Academy of the Humanities and the Chinese Academy of Social

[1] Quoting official statistics, *Language Atlas of China* (A-1) puts the population at 1.1 billion by April 1989.

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Sciences, affords us a glimpse of the linguistic diversity within the political boundaries of China, that includes Sinitic as well as Tibeto-Burman, Kam-Tai, Miao-Yao, Austronesian (Formosan), Mon-Khmer, Altaic, and even Indo-European languages.

Of more immediate interest is the classification of the Chinese languages, more commonly referred to as "dialects." We can make meaningful typological generalizations not only about individual dialects, but about dialect groups. For instance, the "southern" dialects typically have larger tonal inventories than the Mandarin group (see Cheng 1973b, 1991 for statistical data). More importantly, the Jin, Wu, Min, Hakka, and some Mandarin dialects display highly complex tone sandhi, while Xiang, Gan, and especially Yue show only limited tonal alternations. Furthermore, sandhi processes take different forms in different dialect (sub)groups: tone deletion and tone spread, widely attested in Wu, are all but unknown among Mandarin and Min dialects.[2] It has been often noted that while northern Wu has a left-prominent prosodic structure, Min, Mandarin, and southern Wu exhibit a right prominence. This difference in rhythmic organization entails far-reaching consequences in tone sandhi behavior. As these and other generalizations hold across groups of dialects, it is often useful to identify the group membership of a particular dialect under discussion.

While Yuan (1960) still serves as a standard reference and most informative overview of Chinese dialectology, more recent surveys can be found in Egerod (1967), Norman (1988), and You (1992). Intensive research in the genetic classification and geographical distribution over the last two decades or so has culminated in *Language Atlas of China* (1987). The *Atlas* divides Chinese dialects into ten groups as shown in table 1.1. Mandarin, spoken by roughly 65 percent of the entire population of China, covers the largest area – basically the entire region north of the Yangzi river and the southwestern provinces (Yunnan, Guangxi, Guizhou, Sichuan). The compilers of the *Atlas* have separated the dialects spoken in Shanxi and adjacent regions of Hebei and Shaanxi from the surrounding Mandarin dialects, and put them under the Jin group. The remaining eight groups – sometimes collectively known as the "southern" dialects – are all concentrated in the southeastern corner. Aside from its main "homeland" located at the borderland where Jiangxi, Fujian, and Guangdong meet, pockets of Hakka speakers are found in Guangxi, western Guangdong, Taiwan, and

[2] That is, outside of the well-known so-called "neutral tone" phenomena.

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Table 1.1. *Chinese dialects*

Group	Speakers (in millions)	Location (Provinces)	Representative Dialects
Mandarin	662.2	north of Yangzi rivers, and south-west provinces	Beijing, Tianjin, Ruicheng
Jin	45.7	Shanxi, north Shaanxi, west Hebei	Pingyao, Changzhi
Wu	69.8	south Jiangsu, Zhejiang, south-east Anhui	Shanghai, Suzhou, Danyang, Chongming, Zhenhai, Tangxi, Wenzhou, Wenling
Hui	3.1	south-east Anhui, west Zhejiang	Tunxi
Gan	31.3	Jiangxi, east Hunan	Nanchang
Xiang	30.9	Hunan	Changsha
Min	55.1	Fujian, Taiwan, east Guangdong, Hainan (south-east Asia)	Fuzhou, Xiamen, Chaozhou, Taiwanese, Wenchang
Yue	40.2	Guangdong, east Guangxi (south-east Asia, Americas)	Cantonese, Taishan
Pinghua	2.0	south Guangxi	Nanning
Hakka	35.0	south Jiangxi, west Fujian, east Guangdong, parts of Taiwan	Meixian, Changting, Pingdong

scattered over a large area of Sichuan. Even more far-flung is the Min (super)group. Specifically, varieties of southern Min are spoken not only on the mainland (Fujian and eastern Guangdong), but have spread over much of the islands of Taiwan and Hainan, and the Leizhou peninsula in southwestern Guangdong.

Citing *Renmin Ribao* (Overseas edition, March 11, 1989), R. Li (1989: 164) estimates overseas Chinese population at somewhere between 26.8

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and 27.5 million, most of them living in southeast Asia (25 million) and the Americas (1.8 million), with the rest being scattered over Europe (380,000), Oceania (180,000) and Africa (80,000). Most of the overseas Chinese speak one or other Chinese dialect, in descending order of numerical strength: Yue (including Cantonese, 11 million), Southern Min (including Xiamen, Chaozhou, 8.6 million), Mandarin (3.5 million) and Hakka (0.75 million).

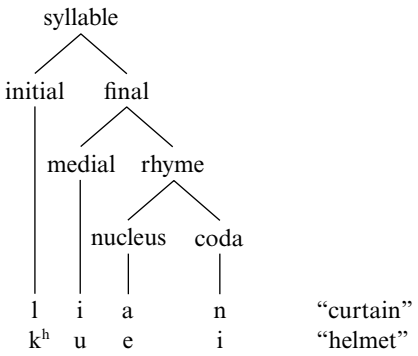
2 Historical background

For reasons that will become apparent (see section 5), an elementary knowledge of historical Chinese phonology is indispensable as a background to the understanding not only of tone sandhi, but of tonal systems in modern dialects. Not only do traditional tonal categories provide us with a handy common frame of reference that holds relatively constant across dialects, but in some cases tone sandhi rules are unstatable without reference to the same classical categories (see section 5.1).

2.1 Middle Chinese tonal categories

We start with the syllable. In most Chinese dialects, the maximal syllable consists of CGVX, that is, a consonantal onset, a prenuclear onglide, the nucleus, and a coda (which can be either an offglide, a nasal, or a voiceless stop). The hierarchical structure of the syllable is captured by the following diagram, labeled with the traditional terms commonly used in Chinese philological literature:

(1)



The "initial" is, of course, the onset. The "final" includes the medial (onglide) as well as the rhyme. The rhyme consists of a nucleus and a

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coda, which can be either an offglide or a consonantal ending.[3] The nucleus is the only obligatory syllabic element: thus bare vowels [i] "to heal," [u] "house," [ü] "rain," [a] (a prefix), [ə] "hungry" etc. all constitute legitimate syllables in Standard Mandarin. There remains some ambiguity regarding the status of the medial: whether the prenuclear glide belongs with the onset, or forms part of the final. For the on-going debate regarding subsyllabic constituency, I refer the reader to Lin (1989), Duanmu (1990a), and Bao (1990b, 1996a).

For our purposes, it suffices to note that syllables fall into two classes: (i) "**checked**" **syllables**, namely syllables ending in an occlusive coda (-p,t,k, often reduced to a glottal stop -q); (ii) "**smooth**" or "**slack**" **syllables**, namely either an open syllable CV (possibly with an offglide), or a syllable closed by a nasal stop. This dichotomy, whose tonological significance will become transparent immediately below, is quite robust not only in Chinese, but across other tone languages of southeast Asia, notably Kam-Tai and Miao-Yao, where the two syllable types are known by more colorful and expressive terms such as ***staccato*** vs. ***legato***, or ***dead*** vs. ***live*** syllables (cf. Gandour 1974, M. Hashimoto 1984, Thongkum 1987, Thurgood 1992). For short, I will sometimes use CVq and CVN to symbolize these two types of syllables.

Four tonal categories, referred to by their traditional nomenclature as *ping*, *shang*, *qu*, and *ru*, have been firmly established since Middle Chinese (hereafter MC; approximately from AD 200 to 900), as reflected in the pronouncing dictionary *Qieyun* (AD 601), a landmark in the history of Chinese phonology.

(2) Middle Chinese tone categories

	traditional name	gloss
I	*ping*	"level"
II	*shang*	"rising"
III	*qu*	"departing"
IV	*ru*	"entering"

Tone IV occurs exclusively with checked syllables, while tones I, II, and III are associated with smooth syllables. This cross-classification of tones

[3] Sometimes both. Thus, the northern Min dialect of Fuzhou has in its syllable inventory words like [souŋ] "sour," [keiq] "orange," etc. (-q = glottal stop).

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and syllable types is motivated by the observation that checked syllables tend to have an impoverished tonal inventory, and exhibit markedly different sandhi behavior compared to smooth syllables, as will become amply evident in the ensuing chapters. For this reason, Chinese linguists often talk about "**smooth tones**" (*shu sheng* = tone I, II, III) and "**checked tones**" (*ru sheng* = tone IV). Throughout this book, I will suffix the symbol -q to the tone letters representing a "checked tone," while leaving the "smooth tones" unmarked. Thus, 55q, 13q etc. stand for a high level and low rising tone linked to a checked syllable CVq.

Based chiefly on the Japanese monk Annen's description in *Xi-tan zang* (or *Shittan zô*; written in AD 880), Mei (1970:109–110) reconstructs the following tonal values for MC (around 8th century):

(3) Middle Chinese tone values

	categories	reconstructed phonetic values
I	Level (*ping*)	long, level, and low (with two allotones)
II	Rising (*shang*)	short, level, and high
III	Departing (*qu*)	longish, probably high and rising
IV	Entering (*ru*)	short, with uncertain pitch and contour

Some of the descriptive terms for pitch height and contour are taken directly from Annen, who characterized tone I and II as "*zhi di*" (straight and low) and "*zhi ang*" (straight and high).[4] The hypothetical durational distinction is based primarily on the ancient buddhist practice of using tone II and III syllables to transcribe Sanskrit short and long vowels, respectively. As noted above, entering tone syllables end in an oral stop -p,t,k. Not surprisingly, Annen describes the entering tone as "*jing zhi*" (abruptly stop), a "checked" quality that is still readily observable in those modern dialects that have preserved the old p,t,k codas (often reduced to a glottal stop, hereafter symbolized as -q). The reconstruction of tone III is somewhat more speculative: it is inferred from the fact that tone II syllables with a voiced obstruent onset had merged with tone III.[5] Since merger presupposes a certain phonetic affinity, and since tone II is

[4] Pulleyblank (1978:178) interprets *zhi ang* as "straight rising" instead, citing as evidence another contemporaneous document *Yuanhe Yunpu* (806–827), in which tone II is described as "*li er ju*" (stern and rising), where *ju* (lit. to lift up) clearly denotes a rising pitch movement.

[5] This is clearly indicated in Annen's statement that tone II only occurs with *qing* "light" syllables, i.e. syllables with voiceless (and sonorant) initials.

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known to be high, it stands to reason to assume that tone III also had a high pitch at the time the merger took place.[6]

Hirayama (1974, 1975) and Ting (1984) have made attempts at reconstructing the tonal values of Proto-Min and Proto-Wu, respectively.

Our thumbnail sketch of ancient Chinese tonology would not be complete without an aside on the hypothesis first put forward by Haudricourt (1954a, b, 1961), now generally referred to by the broader term "tonogenesis."[7] Haudricourt advanced the theory that the archaic Chinese tonal system arose through the loss of certain final consonants, in an evolution that parallels Vietnamese. Specifically, Haudricourt maintains that Archaic Chinese tone II, III and IV originated from CVq, CVs and CVk, respectively (-q represents a glottal stop, -s is a sibilant, and -k stands for any of the full oral stops -p,t,k). Crucially, Pulleyblank (1978) extends this hypothesis down to the more recent historical period of Middle Chinese. Specifically, he claims that the so-called "tones" actually corresponded to different syllable types prevailing in Late Middle Chinese (8th century), which still retained the old consonantal desinences. The Haudricourt–Pulleyblank hypothesis has found both supporters (Mei 1970, Sagart 1986) and skeptics (Ting 1981, 1996, Ballard 1985, 1988).

2.2 *Tone split*

The four Middle Chinese tones have undergone various splits and mergers. Tone split is sensitive to various phonological conditions, most notably the voicing contrast in the syllable onset,[8] as illustrated by the northern Wu dialect of **Songjiang** which, like all other Wu dialects, still maintains the voiced/voiceless contrast in the onset. Each of the MC tonal categories is split neatly into a high and a low register – known in traditional terminology as *yin* and *yang* – yielding a perfectly symmetrical eight-tone system (data from *Jiangsusheng he Shanghaishi Fangyan Gaikuang* 1960). In each

[6] For comparison, here is Ting's (1996:152) reconstruction of the MC tonal values, based on *Xi-tan zang* and other evidence (including comparative):

I	Level (ping):	level, probably low
II	Rising (shang):	high-rising
III	Departing (qu):	falling, probably mid-falling
IV	Entering (ru):	abrupt and short

Ting rejects any length contrast among tones I, II, and III.

[7] Coined by Matisoff (1970, 1973); see Hombert (1975, 1978), Hombert, Ewan, and Ohala (1979), Mazaudon (1977), and references cited therein. Utsat, a Chamic Austronesian language spoken on the Hainan island, instantiates a particularly transparent case of transition from an atonal to a fullblown tonal system. See Thurgood (1992) for details.

[8] Yip argues at length that what is crucial in conditioning tone split is not [voicing] but [murmur]. For details, I refer the reader to Yip (1980:211–242, and 1993b:249–254).

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case, the **yang** register with a voiced onset has a lower pitch value than the corresponding **yin** register. Songjiang is fairly typical of Wu dialects.

(4) Songjiang register split

register	tone			
	I	II	III	IV
a. high (*yin*)	53	44	35	5q
b. low (*yang*)	31	22	13	3q

5q, 3q indicate checked tones

The pitch values are indicated by the familiar tone digits first introduced by Y-R. Chao (1930). The tonal space is idealized as a five-point vertical scale, where 5 and 1 represent the highest and the lowest pitch respectively.[9] Thus 53 and 13 stand for a high-falling and a low-rising tone respectively. Examples are given below:

(5)

I	a.	*ti*	53	"low"
	b.	*di*	31	"lift'
II	a.	*ti*	44	"bottom"
	b.	*di*	22	"younger brother"
III	a.	*ti*	35	"emperor"
	b.	*di*	13	"field"
IV	a.	*paq*	5q	"hundred"
	b.	*baq*	3q	"white"

Needless to say, the voice-sensitive split into two registers is not always as neat or symmetrical. Take **Beijing Mandarin**. The correspondence between the MC tonal categories and their modern phonetic values is summarized in the following table (based on Chen 1976:152).

(6) Beijing Mandarin

MC onset	MC tones			
	I	II	III	IV
voiceless	55	213	51	55, 35, 213, 51
sonorant	35			51
voiced obstruent		51		35

The leftmost column indicates the three types of Middle Chinese onsets: voiced and voiceless obstruents, and sonorants (including liquids, nasals,

[9] Exactly the opposite of the convention that prevails in African and Amerindian tonological literature.

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and ∅-initials). Notice that tone I splits along the familiar [±voiced] division. Tone III remains a single cohesive category. Tone II also bifurcates along the voicing line, but in this case sonorants side with the voiceless rather than the voiced obstruents. Furthermore, the voiced obstruent onset syllables that split off from tone II have merged with tone III syllables. Finally, tone IV words (originally associated with checked syllables) are redistributed among the other tonal categories, conditioned by the three-way contrast between voiceless, sonorant, and voiced obstruent initials.[10] Note that two sweeping historical changes have occurred in Beijing Mandarin: all voiced obstruents have become voiceless, and all checked syllables (CVq) have lost their stop endings entirely. This means that both voicing and smooth vs. checked syllable contrasts are now recoded in purely tonal terms. In short, the evolution from MC to the tonal system of Beijing as we know it today entails the following historical processes:

(7) a. Register split of tone I
b. Tone IIb merges with tone III
c. Redistribution of tone IV among other tonal categories
d. Devoicing and, in some cases, aspiration of voiced obstruents
e. Loss of obstruent codas

Needless to say, (a, b, c) must precede (d) since the former are voice-sensitive, a distinction that is neutralized by the latter. Furthermore, (c) must pre-date (e) since the defining characteristic of tone IV is CVq, with an oral stop coda (symbolized by -q), which has dropped out via (e). Some examples follow:

(8)

	MC	Standard Mandarin		
I	*tang*	*tang*	55	"ought to"
	lang	*lang*	35	"wolf"
	dang	*t'ang*	35	"sugar"
II	*tang*	*tang*	214	"party"
	lang	*lang*	214	"bright"
	dang	*tang*	51	"to swing, sway"
III	*tang*	*tang*	51	"to pawn"
	lang	*lang*	51	"wave"
	dang	*tang*	51	"to procrastinate"
IV	*t'ak*	*t'uo*	55	"to entrust"
	lak	*luo*	51	"to fall"
	dak	*tuo*	35	"to stroll, pace"

[10] Tone IV words with a voiceless initial are scattered unpredictably among all four tonal categories in modern Beijing.

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Linguists have long noted the pitch-depressing effect of voiced obstruents, and sought to explain the cross-linguistic patterns in physiological terms.[11] For a general discussion and critical review see Hombert (1978), Hombert, Ohala, and Ewan (1979), and references cited there. For our purposes, it should be noted that subsequent historical changes – in particular, devoicing – may intersect and obscure the phonetically motivated partition of tonal categories into a high and a low register. It is not uncommon for the *yang* or b-register to show a high tone in a modern dialect instead of the expected low register, in a process sometimes referred to as "register flip-flop." A. Hashimoto (1986) sampled 997 dialects, and found 340 cases of register reversal. For this reason, we will often simply refer to register a (*yin*) and b (*yang*), to dissociate the relatively constant tonal categories from their often unpredictable phonetic values.

Somewhat less well known, but nonetheless quite common among Sino-Tibetan languages, is tone split along the dividing line between plain and aspirated onsets. Ye (1983) reports a three-way split of MC tones resulting in a perfectly symmetrical twelve-tone pattern in the Songling variety of **Wujiang**, also a northern Wu dialect.

(9) Wujiang three-way tone split

		I	II	III	IV
voiceless	plain	55	51	412	5q
	aspirated	33	42	312	3q
voiced[12]		13	31	212	2q

Since Wujiang has retained voicing and aspiration, the multiple splits merely produce allotonic variations rather than giving rise to new tonal categories. Examples illustrating the allotonic distribution within the four MC tonal categories follow:

(10) I 55 *tiɪ* "fall, topple"
33 *tʻiɪ* "day, sky"
13 *diəu* "head"

II 51 *tø* "short"
42 *tʻi* "body"
31 *dɛ* "light, insipid"

[11] Related is the blocking effect of voiced consonants on H-spread. Conversely, voiceless consonants tend to block L-spread (see Hyman and Schuh 1974).
[12] Including sonorants and ∅ or vocalic onset.

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