TWO
(1) Phonology, Phonetics, Prosody, and Orthography of Chinese

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1 CHINESE LANGUAGE VS. DIALECTS

The aim of this section is to provide a brief background of Chinese phonology, phonetics, prosody, and orthography[1].

Of the 56 nationalities in China, the Han Chinese are the largest group, with a population of over one billion (or one-fifth of the world's population). As the largest single ethnic group in the world, the Han Chinese speak a language referred to as Chinese. It is one of the two branches of the Sino-Tibetan langauge family with numerous mutually unintelligible regional variations. The 10 major Chinese regional language families are Guan, Jin, Wu, Hui, Xiang, Gan, Kejia (Hakka), Yue, Min, and Pinghua, all of which are referred to as Chinese dialects.

Historically, the dialect spoken in the Beijing area, known as Mandarin, has been the spoken norm in China. It later served as the base of Putonghua, China's contemporary common language. The terms Mandarin and Putonghua are often used interchangeably. The majority of the Chinese population is bilingual (i.e., exhibiting diglossia), speaking both Putonghua and another native dialect. Putonghua is now used in every sector of daily life throughout China, but the Putonghua spoken by the majority of Chinese exhibits a wide variety of accents and levels of proficiency.

2 CHINESE ORTHOGRAPHY AND ROMANIZATION

In contrast to the great extent of spoken dialect variations, there is only one unified Chinese writing system. The syllable-to-character orthography was unified during Qin Dynasty (221-207 A.D.) by the imperial court and has been independent of vernacular variations since. For example, the number "one" written as the character "一" is pronounced *yi* in Mandarin, while *yat* in Cantonese with different tones[2]. Contemporary written Chinese is Mandarin-based. As a result, many dialectal vernaculars do not have corresponding characters in the orthography.

This single orthography, however, involves two co-existing systems in contemporary practice. The first is the traditional Chinese system. It takes the form from standardized characters dating back to the late Han Dynasty (202 BC - 220 AD) and is used in Hong Kong, Taiwan, and Macau . The second is the Simplified Chinese character system. It was developed by the People's Republic of China (PRC) in 1954 to promote mass literacy and is used in China, Singapore and Malaysia. The simplification involved both reducing the number of strokes of complex traditional glyphs and adopting historically common shorthand variants known as *caoshu*[2].

There are also two widely used Romanization systems for contemporary Standard Chinese, the Hanyu Pinyin (or simply Pinyin) system and the Wade-Giles system. Introduced by the PRC in 1956 and adopted by the UN in the 1970s, Pinyin is now used in schools and universities throughout America, Australia, and Europe, especially for teaching Standard Chinese. The Wade-Giles system was constructed by Thomas Wade in 1859 and modified by Herbert Giles in 1892[2]. It was the most widely used system before Pinyin and still appears in many books.

The inventory of syllable-based Chinese characters numbers around 10,000, which corresponds to around 400 toneless syllables (1,200 tonal ones). The tone-syllable discrepancy implies that in speech many homophones are differentiated only by tones and context, but in writing the distinct forms become much more effective visual aids for disambiguation.

3 SYLLABLE STRUCTURE

There are 4 types of syllables in Chinese—V, VC, CV, and CVC—where V stands for a vowel and C for a consonant. A V syllable can be extended to VV for a diphthong or VVV for a triphthong[3]. Table 1 in Section 6.1.3 lists the IPA symbols of the consonants and vowels in Chinese languages. According to contemporary Mandarin phonology, San Duanmu defines the structure of a Chinese syllable as follows. The longest syllable in most Chinese dialects is CGVX, consisting of a consonantal onset, a prenuclear onglide, a nucleus, and a coda. The coda can be an offglide, a nasal, or a voiceless stop[4]. In traditional Chinese phonology, the first C of a syllable is referred to as an initial, and the rest as a final. The syllables in Chinese can be classified into two types: closed syllables with an occlusive stop coda of [p], [t], or [k]; and slack or smooth syllables. The second C in a closed syllable can only be a nasal (N) or a plosive (P)[3]. Finals are classified into four categories of "calls" according to different lip gestures, namely, *kai*, *qi*, *he*, and *cuo*, corresponding to "opening," "spreading," "rounding," and "protruding," respectively[5]. The combination of an initial and a final into a syllable follows strict rules, demonstrated in the various collocation relations between the place of articulation of a consonant and the call of a final[3]. In addition, Chinese is a syllable-timed language.

(C)	(V)	V	(V, N, P)
	Medial	Nucleus	Coda
Initial	Final		

The basic syllable structure is the same across Chinese dialects. The phonetic details in each dialect, however, differ considerably; the differences manifest mainly in the size and content of the inventory of initials, finals, and tones. For example, in Suzhou dialect, there are 26 initials, 45 finals, and 7 tones; in Cantonese, 20 initials, 53 finals, and 9 tones. In Putonghua or Mandarin, on the other hand, there are only 21 initials,

38 finals, and 4 tones.

4 TONES AND TONE SANDHI

Tones are pitch contrasts differentiating word meaning in a language or a dialect. In north China some dialects may have as few as three tones, while in south China some dialects have 6 to 10 tones.

Documented studies of tones date back to the Sui Dynasty (601 AD) in a rhyme book named *Qie-Yun*. The five-volume book classifies Chinese characters into some two hundred rhymes, each of which has four tones, without description of the tone values. The four tones are *ping* ("level"), *shang* ("elevating"), *qu* ("departing"), and *ru* ("entering"). Two volumes of the rhyme book are *ping*-tone characters while the other three volumes are *shang*-, *qu*-, and *ru*-tone characters.

Tonogenesis and sound change have long been studied in Chinese philology. The general consensus is that sound change occurred by the 14th century in some parts of North China to closed syllables known as checked syllables. The second consonant at checked syllable end was dropped and caused the tone to change. For example in Beijing dialect, checked syllables with fully voiced initials became slack syllables with a *yang-ping*, those with nasals and laterals became slack syllables with a *qu* tone, and those with a voiceless initial may become slack syllables with any tone randomly. This sound change caused most newly derived syllables to become slack syllables with yang-ping or qu; Chinese became a fully fledged tone language since then.

The representation of tone value can be a physical *F0* contour or a phonological abstraction. The most widely used system to date is Chao's 4-increment 5-letter tone system with a set of corresponding IPA tonal letters[6] whereby the four Putonghua tones *yin*, *yang*, *shang*, and *qu* are represented as 55, 35, 214, and 51. The same scaling system has also been widely used in Chinese dialect investigations. In modern phonological theories, the tonal features "high" (H) and "low" (L) are used to describe pitch changes. The same four Putonghua tones are thus represented as HH, LH, LL(H), and HL, respectively.

The term sandhi comes from Sanskrit. When tones are produced in sequence, some of them may go through a change of tone shape, known as a tone sandhi. Put it simply, the tone sandhi in disyllabic sequences fall into three types[3]: (1) right-dominant, as in Putonghua whereby a *shang* tone [214] changes to a *yang-ping* [35] tone when followed by another *shang* tone; (2) left-dominant; and (3) bi-directional. Some tone sandhi are morpho-syntactically sensitive, while others are not. Further information on tone sandhi is available for the major Chinese dialects[7]. In short, the tone sandhi in Chinese dialects are very complicated, and much literature is available on sandhi research.

5 INTONATION

In the early 1900s, two giant figures of Chinese linguistics, Liu Fu and Chao Yuen-Ren, launched the first instrumental investigations of Chinese tones by using a kymograph. Soon it became evident that the interaction between tones and intonations merited clarification. Chao's internationally acknowledged theory explains how the sentence intonation and syllabic tones co-exist in Chinese at the same time. He compared the nature of tone-intonation interaction as small ripples riding on large waves while trade-off between the two can be accounted for by algebraically adding up high-high or high-low values. The theory is thus known as the ripple-wave theory.

The ripple-wave theory was later elaborated by two sets of rules postulated by Wu Zongji; the core concept is contextual intonation vs. obligatory tone sandhi whereby the Rules of Hierarchical Domino-Tone and Intonation account for successive tone sandhi; the Rules of Intonational Transposition explain the tonal variations of phrases[4].

Many different intonation models have been proposed in more recent intonation research, such as Xu Yi's PENTA model, Shen Jiong's Top-Bottom Line model, and Shih Chilin's Stem-ML model. In addition, Tseng Chiu-yu explained and modeled successive intonation variations from the perspective of hierarchical psycholinguistic discourse organization[8].

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