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4. The East Asian Tradition

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(Draft: Comments welcome!)

4.1 Introduction

This chapter gives a sketch of phonological studies in three East Asian languages—Chinese, Japanese, and Korean. Section 4.2 discusses phonological issues that have concerned Chinese linguists from ancient times to the present day, and how these issues relate to phonological theory in general. Section 4.3 focuses on Japanese and illustrates how phonological notions such as 'mora', 'pitch accent', and 'Lyman's Law' developed in the phonological studies of the language. Section 4.4 deals with Korean with primary focus on its writing system (*Hangul*), pitch accent, and the three-way contrast in consonants. A brief conclusion section closes the chapter.

4.2 Chinese

The Chinese orthography is perhaps the most opaque phonologically (see Sproat, Chapter 2, this volume), and one might expect it to have hindered phonological research. Paradoxically, the opposite is the case. Phonology in China originated quite early, precisely owing to the need to annotate pronunciation, however arduous the task is. This section covers four areas: traditional issues of interest, modern issues of interest, research on Chinese in generative phonology, and implications for phonological theory.

4.2.1 Traditional issues of interest

The first book of phonological interest is 詩經 *Shijing* 'The Book of Odes'. The surviving copy has 305 poems and songs from 1,100 BC to 600 BC (Chen 2014). There are over 7,000 lines, most of which have four syllables each. Owing to editing by Confucius, some poems were not completely original, but alliteration and rhyming were quite evident. Given such patterns, *Shijing* is the most important data source for the reconstruction of the phonology of Old Chinese (Baxter & Sagart 2014), despite its limited data size.

The next two books of interest are 爾雅 *Erya* and 方言 *Fangyan*. *Erya* appeared around 200 BC and likely had multiple contributors (Zhou 2004). It is essentially a dictionary, with some 2,000 entries, divided into 20 sections. Consider two entries in (1) and (2).

(1) From *Erya* section 1 (classic terms)

初, 哉, 首, 基, 肇, 祖, 元, 胎, 俶, 落, 權輿, 始 也.
W1, W2, W3, W4, W5, W6, W7, W8, W9, W10, W11, begin it-is
'W1, W2, W3, W4, W5, W6, W7, W8, W9, W10, W11, mean begin.'

(2) From *Erya* section 11 (mountains)

小 山, 岟; 大 山, 岯.
small mountain, hill; big mountain, big-mountain
'A small mountain is called 'hill' (岟); a big mountain is called 'big-mountain' (岯).'

In (1), the first 11 words, represented as W1 through W11 without gloss, all mean 始 'begin'. In (2), 岯 is glossed as 'big-mountain', for lack of a proper word in English. It can be seen that both 'hill' (岟) and 'big-mountain' (岯) contain the component 'mountain' (山), a point we shall return to.

While *Erya* is a book of synonyms, it offers clear evidence of a standard speech. In (1), the standard word 始 is used to define others. If a standard word is uncommon, such as 岟 and 岯 in (2), it is defined by simpler words. The title of *Erya*, which means 'using the original speech to define similar terms' (from *er* 'similar' and *ya*, an alternative pronunciation of 夏 *Xia*, the original region where Chinese people used to live), supports the view that there was a standard speech.

Fangyan was written by YANG Xiong (53 BC-18 AD). The title means 'regional speech' (from *fang* 'region' and *yan* 'speech'). The surviving copy, annotated by GUO Pu (276-324 AD), contains some 700 entries. Two are shown in (3) and (4). Names for locations are underlined but not glossed. W1, W2, etc., represent regional words, without gloss, because the characters often represent pronunciation differences of the same word, instead of words of different origins.

(3) From *Fangyan* part 1, entry 1

黨, 曉, 哲, 知 也. 楚 謂之 黨, 或 曰 曉,
W1, W2, W3, know it-is. 楚 call-it W1 or say W2;
齊 宋 之間 謂之 哲.
齊 宋 in-between call-it W3.
'W1, W2, and W3 mean 'know'. 楚 uses W1 or W2; between 齊 and 宋 W3 is used.'

(4) From *Fang Yan* part 1, entry 6

憮, 掩, 憐, 牟, 愛 也. 韓 鄭 曰 憮, 晉 衛 曰 掩,
W1, W2, W3, W4, love it-is. 韓 鄭 say W1, 晉 衛 say W2;
汝 潁 之間 曰 憐, 宋 魯 之間 曰 牟, 或 曰 憐.
汝 潁 in-between say W3, 宋 魯 in-between say W4 or say W3.

憐, 通語 也.
W3, everywhere-speech it-is.
'W1, W2, W3, and W4 mean 'love'. 韓 and 鄭 say W1; 晉 and 衛 say W2; between 汝 and 潁 W3 is used; between 宋 and 魯 W4 or W3 is used. W3 is the everywhere word.'

Unlike *Erya*, which focuses on classic terms, *Fangyan* focuses on regional speech. In addition, regional terms are defined by those used in the capital Chang'an, such as 知 'know' in (3) and 愛 'love' in (4). Moreover, there is a reference to 通語 'everywhere-speech' or 'common speech', which is not always the same as that of Chang'an. For example, in (4), 'love' is defined by 愛, a word used in Chang'an, but the word in common speech is 憐. Finally, *Fangyan* offers a record of dialectal pronunciations, which is recoverable once the phonology of the time is reconstructed. The full title of *Fangyan*, given in (5), is also of interest.

(5) 輶軒 使者 絕-代 語釋 別-國 方-言
cart official extinct-era lexicon other-state regional-speech
'An extinct-era lexicon of regional speech in other states by cart-officials'

'Cart-officials' were field linguists in the Zhou (1,046-256 BC) and Qin (221-206 BC) Dynasties. Each August, the court would send them out on light carts to every part of the land to collect regional speech and other data of interest, such as songs and poems (and this may have been a major source of the contents in *Shijing* 'The Book of Odes'). The term 'extinct-era' refers to the fact that in Yang's time there were no more cart-officials. The term 'other states' refers to the fact that many parts of the Zhou and Qin Dynasties used to be independent kingdoms. Thus, 'regional speech' covers not just Chinese dialects but ethnic languages, too.

After the Qin Dynasty fell apart, the court tradition stopped and the archived documents were mostly lost. Yang came across scattered pieces of them and admired the work (Zhou 1993). He decided to restore the effort through new documentation. Instead of traveling the country, he pioneered a new method of fieldwork by going to the capital Chang'an, at the age of about 40, and took advantage of the many native speakers there from all over the land. For the next 27 years, he documented regional speech single-handedly. While Yang collected or updated most of the entries in *Fangyan*, the book title pays tribute to the inspiration he got from cart-officials.

The next book of interest is 說文解字 *Shuo Wen Jie Zi* 'Discuss picture explain glyph (Explaining logograms)' by XU Shen, which was presented to the emperor in 121 AD (Wang & Li 2016). The book distinguishes two kinds of word forms, those made of a simple picture and those that are composite. The most common composite form is a 'meaning-sound' combination, which consists of a meaning component and a pronunciation component, exemplified in (6).

(6) From *Shuo Wen Jie Zi*, entry 3824

櫻, 果 也; 從 木; 嬰 聲.

cherry, fruit it-is; after tree; necklace sound.

'Cherry is a fruit (tree); after "tree" in meaning; after "necklace" in pronunciation.'

The left side of the word for 'cherry', originally the picture of a tree, indicates the meaning. The right side indicates the pronunciation (櫻 and 嬰 have the same pronunciation). Among the 9,353 entries in Xu's book, 85% have a sound component. This means that most Chinese logograms include some clue to their pronunciations, including 岌 'small mountain' and 峘 'big-mountain' that we saw earlier. In other words, if one has learned 2,000-3,000 words, one could figure out the pronunciation and the meaning of most others.

The next innovation came in the late Eastern Han Dynasty (22-220 AD), probably aided by Buddhist scholars of Sanskrit. It is known as 反切 *Fanqie*, by which the pronunciation of a syllable X is indicated by syllables A and B, where X has the onset of A and the rime of B. For example, we can use the onset of [ma] and the rime of [tai] to produce the target syllable [mai]. This method only requires the reader to know a small number of 'onset words' and 'rime words', which could be minimized to about three hundred.

At about the same time, 'rhyming books' started to appear, which grouped syllables into homophone sets. The best known is 切韻 *Qieyun* (LU Fayan 601). Then came the official versions, especially 廣韻 *Guangyun* (1008 by CHEN Pengnian & QIU Yong). Besides grouping words into homophone sets and annotating their pronunciations with *Fanqie*, *Guangyun* also offers word meanings. Therefore, it has the full function of a dictionary.

In summary, Chinese phonology originated early, mainly from the need to indicate the pronunciations of logograms. The analysis of composite 'meaning-sound' word forms, the invention of the *Fanqie* method, and the emergence of rhyming books enabled scholars to study syllable structure, reconstruct the phonology of Middle Chinese and of Old Chinese, and figure out patterns of sound change through time.

Rhyming books also created a tradition, still prevalent today, of starting a phonological description by listing the syllable inventory of the target language or dialect, and organizing them according to similarities in the onset, the medial glide, the rime, the coda, and the tone. Therefore, while there was a glaring absence of phonemic analysis in China, as there was an equally glaring absence of syllable analysis in the West (until fairly recent times), most Western terms for classifying sounds, such as place, manner, and voicing of consonants, have corresponding terms in Chinese.

4.2.2 Modern issues of interest

This section covers two issues: the effort to create an alphabetical writing system and the effort to promote a standard language.

The first person to create alphabetical writing for Chinese was the Italian missionary Matteo Ricci in 1605, but the record was lost (Ni 1948). Other missionaries made similar efforts, but none was widely used before the 20th century. The defeat of China in the Opium Wars, and a series of adverse subsequent events (such as the defeat of China in the First Sino-Japanese War in 1894 and the decline of the Qin Dynasty), made many intellectuals reflect on what made China, once a prosperous civilization, fall so far behind. Many scholars, including Western missionaries, believed that it was largely due to the writing system. With an alphabetical writing system, children can learn to read and write quickly, and it is easy to spread literacy. In contrast, with a phonologically opaque writing system, it takes a lot longer to become literate, and only a small portion of the population could make it. On this view, an urgent need would be for Chinese to switch to alphabetical writing, and this view soon made its way to the government.

In 1911, the last year of the Qing Dynasty, the government passed a plan to introduce an alphabetical writing system. A year later, the Republic of China passed a similar plan (Ni 1948). The task turned out to be harder than anticipated. For example, given many different pronunciations of contemporary dialects (so different that many consider them to be different languages), what should the standard pronunciation be? Should it be one that is closer to historical Chinese? Should it be one that is used in the capital city? Should it be an entirely new speech that incorporates features from both? With regard to orthographic symbols, there were also different views. Should the symbols be made of Chinese strokes? Should they be Roman letters? Should we use a single symbol to represent each rime or should we use separate symbols for the nucleus and the coda? In 1918, the first official system was introduced, called 注音字母 Zhuyin Zimu ‘Spelling symbols’, which were made of Chinese strokes. In 1928, 國語羅馬字 Guoyu Luomazi ‘National Language Romanization’ was introduced, which uses Roman letters. In 1958, the People’s Republic of China introduced yet another system, known as Pinyin, which also uses Roman letters. The Wade–Giles system, designed by Thomas Wade and Herbert A. Giles in the nineteenth century, continues to be used in the West.

Nowadays, Pinyin can be seen everywhere in China, such as store names, advertisements, traffic signs, and book titles, along with Chinese characters. In addition, Pinyin is taught in schools to annotate the pronunciation of Chinese characters. Moreover, Pinyin is used to input Chinese characters on a computer. However, Pinyin is not a stand-alone orthography, and no alphabetical system is likely to become one any time soon. There are several reasons. First, the 10,000 or so distinct Chinese characters are similar to 10,000 distinct words in English. If they are written in Pinyin, there are just 1,300 distinct word forms, because with characters most homophones still have distinct orthographic forms, but with Pinyin all homophones become

homographs as well. Therefore, Pinyin produces a prohibitively high degree of homographic ambiguity. Second, Chinese characters offer many hints to the meaning and the pronunciation of a word. For example, if one does not know 樱, one can still figure out that it is a tree (based on the left aide) and its pronunciation is similar to 'necklace' (based on the right side), and from this one may very well realize that it is 'cherry'. Third, most of the 10,000 or so Chinese characters are in the form of a meaning-sound composite, similar to 樱, and if one has learned a small portion of them, one could figure out most of the rest. Therefore, learning Chinese orthography may not be as daunting as it appears, the benefit in learning 1,000-2,000 characters may outweigh the effort, and the fact that China had fallen so far behind or the fact that its literacy level was low may have little to do with its orthography. Besides, while learning to write Chinese characters by hand is indeed time consuming, it has become less necessary once one learns to use the Pinyin input on a keyboard.

Next, we consider the promotion of a standard language. After its founding in 1949, the People's Republic of China took several initiatives on language. In 1956, the State Council issued a directive on promoting a standard speech called Putonghua 'Common Speech', starting in schools. The directive also called for a national survey of Chinese dialects, to be completed in 1957. The survey was supposed to cover at least one site of every county, and counties with complex linguistic geography would be surveyed at multiple sites. The People's Congress passed a directive to conduct a comprehensive national survey of minority languages as well (as part of a socioeconomic survey of ethnic minorities). Also in 1956, an expert body proposed a draft alphabetical writing system for Putonghua, known as Pinyin, which became official in 1958.

The national dialect survey was heavy on phonology and vocabulary. The survey sheet consisted of a word list of up to 3,000 items. The pronunciations of the items were transcribed, to be compared with those in Putonghua. Many books were then written with a similar title: 'How do X learn Putonghua?', where X refers to speakers of a given dialect. Each book would focus on phonological differences between a dialect and Putonghua. The national survey of minority languages involved 700 linguists. The two surveys, reminiscent of what 'cart-officials' used to do centuries before, brought up a core group of field linguists and generated a wealth of data for future research.

4.2.3 Research on Chinese in generative phonology

We have seen that phonology in China has mainly focused on Chinese, such as annotating word pronunciation, reconstructing Middle Chinese and Old Chinese, dialect surveys, promoting a standard variety, and creating an alphabetical writing system. Chen (2015: 1) observes that linguists in China tend to focus on the description and analysis of data, and rarely talk about

theories or methodologies. It is fair to say, too, that phonologists in China have not given much thought to properties that all languages share.

In contrast, generative phonology focuses on properties common to all languages. Therefore, research on Chinese has produced results that are of much theoretical interest, because some properties are easier to observe in Chinese than in other languages. Let us consider some examples.

4.2.3.1 Tone

In their pioneering work on generative phonology, Chomsky & Halle (1968) applied feature theory to the analysis of consonants and vowels, but they had little to say on tones. With advanced knowledge of their work, Wang (1967) proposed a feature system for tones, based on data from Chinese dialects. Shortly after, Woo (1969) proposed a different view on tonal representation. In Wang (1967), contour tones (rise or fall) are unitary elements: a rising tone has the feature [+rising] and a falling tone has the feature [+falling]. In Woo (1969), however, contour tones are composed of level tones, L (low) and H (high). Thus, a rising tone is LH and a falling tone is HL. The two views assume different answers to a theoretical question: Are all features 'stationary', representing a fixed target, or can some features be 'dynamic', moving from one target to another? In Wang's view, dynamic features are possible, such as [rising], which is a movement from a low pitch to a high pitch. In Woo's view, dynamic features are not possible, and a rising tone involves two stationary features, L and H. Woo's analysis yields a simpler feature theory, but the challenge is to show that contour tones are indeed made of two (and sometimes three) level tones each. Woo's analysis was soon adopted in the analysis of African tone languages (e.g. Leben 1973; Goldsmith 1981; Williams 1976) and in the analysis of English tone and intonation (e.g. Liberman 1975; Pierrehumbert 1980). It has also contributed to the development of 'autosegmental phonology' (Goldsmith 1976). In Chinese, on the other hand, there seem to be some cases where a contour tone seems to be a unitary element (e.g. Yip 1980, 1989; Chan 1991). However, Duanmu (1990, 1994, 1999) has argued that none of these cases requires dynamic features and stationary features are sufficient.

4.2.3.2 Tone sandhi: Syntax-phonology interaction

The determination of domains of tone sandhi has also attracted much theoretical interest. In Chinese, such domains often extend beyond the word level and require reference to morpho-syntactic structure. Therefore, they raise the question of how syntax interacts with phonology. For example, studies on tonal domains in Xiamen (e.g. Chen 1987) require reference to syntactic categories, and Chen's analysis of Xiamen was an important contribution to the development' of the 'end-based theory' of syntax to phonology mapping (Selkirk 1986). Studies on tonal domains

in Putonghua (e.g. Shih 1986) and Shanghai (e.g. Duanmu 1999) suggest that feet and stress play an important role, where foot formation and stress assignment are again dependent on syntax.

Research on syntax-phonology interaction has also shed light on some properties that are rarely reported in other languages. We discuss three such properties here: words of elastic length; word length preferences; and apparent violations of grammar by prosodic words.

4.2.3.3 Words of elastic length

Karlgren (1918) observed that many monosyllabic words in Chinese also have a disyllabic form, made by adding another monosyllabic word whose meaning is redundant. Such words are said to have elastic length (Guo 1938) and we shall call them elastic words. Some examples are shown in (7), where Chinese is in simplified characters and Pinyin is added.

(7) Words of elastic length (optional part in parentheses)

(看)-见	(kàn)-jiàn	'(look)-see'
(老)-虎	(lǎo)-hǔ	'(old)-tiger'
走-(路)	zǒu-(lù)	'walk-(road)'
煤-(炭)	méi-(tàn)	'coal-(charcoal)'
(商)-店	(shāng)-diàn	'(business)-store'

To Western observers, this property is rather odd, although it hardly caught the attention of Chinese scholars. Karlgren explained the puzzle as follows. Because most Chinese words are monosyllabic, in spoken Chinese, many homophones occur and disyllabic forms were created to avoid ambiguity. However, in written Chinese, the logograms offer enough distinctions and there is little need for disyllabic forms. Indeed, Chinese underwent a dramatic loss of syllable contrasts: Middle Chinese (500 AD) had some 3,000 distinct syllables, but modern Beijing Mandarin has only half as many. Nevertheless, Karlgren offered no evidence that the creation of disyllabic words is a recent phenomenon.

Dong (2015) found that, in modern Chinese (Putonghua), 49% of non-compound words have elastic length. In addition, a comparable percentage existed in Middle Chinese. Moreover, disyllabic forms are not used to avoid homophones, but serve a phonological purpose, in that a disyllabic form is needed in stressed positions, in order to satisfy 'foot binarity', and monosyllabic forms are used elsewhere (Duanmu & Dong 2016).

4.2.3.4 Word length preferences

Word length preferences refer to the fact that certain length combinations can affect the acceptability of an expression. For example, both 'coal' and 'store' have elastic length in Chinese and the compound 'coal-store' has four length combinations: 2+2, 2+1, 1+2, and 1+1,

where 1 is a monosyllabic form and 2 a disyllabic one. Among the four, 1+2 is disfavored, while the other three are good. Consider the example in (8).

(8) Word length preferences in Chinese NN compounds

Length	Example	Pinyin	Gloss
2+2	煤炭-商店	méitàn-shāngdiàn	'coal-store'
2+1	煤炭-店	méitàn-diàn	'coal-store'
*1+2	煤-商店	méi-shāngdiàn	'coal-store'
1+1	煤-店	méi-diàn	'coal-store'

In general, 1+2 is bad for NN (noun-noun) compounds and 2+1 is bad for VO (verb-object) phrases (Lu & Duanmu 2002). A corpus study confirms the generalization: in NN compounds, less than 2% are 1+2, and in VO phrases, less than 1% are 2+1 (Duanmu 2012). Three rules seem to be at play: (i) any 1+1 can form a foot in Chinese and be treated as a word, sometimes called a 'prosodic word'; (ii) a foot is a binary trochee (SW); and (iii) phrasal stress falls on the first N in NN and O in VO. In NN, 2+2 forms (SW)(SW); 2+1 forms (SW)W; 1+1 forms (SW); and 1+2 forms (S)(SW), where the first foot is the result of phrasal stress. All the feet are good in 2+2 (SW(SW), 2+1 (SW)W, and 1+1 (SW) are good, but the first foot in 1+2 (S)(SW) violates (ii). In VO, 2+2 forms (SW)(SW); 2+1 forms (SW)(S), where the second foot is again the result of phrasal stress; 1+1 forms (SW); and 1+2 forms W(SW). Thus, all the feet are good in 2+2 (SW(SW), 1+2 W(SW), and 1+1 (SW), but the second foot in 2+1 (SW(S) violates (ii). In this analysis, phrasal stress assignment in Chinese is the same as in English (Chomsky & Halle 1968), which Gussenhoven (1983) and Truckenbrodt (1995) call 'Stress-XP', assuming that the XP in NN is the first N, and the XP in VO is O.

4.2.3.5 Apparent violations of grammar by prosodic words

Apparent violations of grammar by prosodic words occur frequently (see Feng 2013 for a summary). One example is the 'word order problem', such as the alternation between VON and OVN, conditioned by the length of V and O. Specifically, VON is used when V and O are both monosyllabic, and OVN is used when V and O are both disyllabic. Consider the data in (9).

(9) The word order problem in Chinese

VON: V=1, O=1	OVN: V=2, O=2
洗 衣 机 xǐ yī jī *衣 洗 机 yī xǐ jī	水果 加工 厂 shuǐguǒ jiāgōng chǎng *加工 水果 厂 *jiāgōng shuǐguǒ chǎng
wash clothes machine *clothes wash machine 'washing machine'	fruit process factory *process fruit factory 'fruit processing factory'

The simplest explanation is that VO is a phrase, which should not occur in a compound. In contrast, OV is not a phrase, and so OVN is a good compound. However, when VO is 1+1, it can function as a prosodic word in Chinese, producing what seems to be VON, in apparent violation of a grammatical constraint.

Chinese grammar also prohibits VO from taking another object, as does English grammar, as in *'[take charge] this job'. However, if VO is 1+1, it forms a prosodic word, which can violate this constraint. Consider the example in (10).

(10) The exceptional status of a prosodic word (a foot)

[[V O] O]: VO = 1+1	[[V O] O]: VO is not 1+1
[负 责] 这 事 [fù zé] zhè shì	*[负 责任] 这 事 *[fù zérèn] zhè shì *[担负 责] 这 事 *[dānfù zé] zhè shì *[担负 责任] 这 事 *[dānfù zérèn] zhè shì
[take charge] this matter 'take charge of this matter'	[take charge] this matter

(担)负 'take' has elastic length, as does 责(任) 'charge'. However, of the four length combinations of VO, only 1+1 can take another object, because it can form a foot and be used as a word. Similar cases abound in Chinese (Feng 2013).

4.2.3.6 Syllable structure

Syllable structure is another area where Chinese has contributed to phonological theory. Chinese phonologists have examined syllable inventories in various ways and gained much understanding of the components and structure of a syllable. In contrast, Western scholars often focus on how to locate syllable boundaries (e.g. Sievers 1881; Jespersen 1904; Kahn 1976). Much disagreement persists on syllable structure, too. Some believe that some languages have syllables and some do not. Kohler (1966) proposes that no language has syllables: what people thought to be syllable structure in Chinese is word structure instead, because most Chinese syllables are words. Fudge (1969) proposes that all languages have syllables, although they may differ in size

and in structure. Duanmu (2008) argues that all languages have syllable structure, and all have the same maximal syllable size, which is CVX, where VX can be a long vowel, a diphthong, or a short vowel plus a consonant (see Ritter, this volume, for theories of the syllable in Government Phonology).

4.2.3.7 Properties not easily observed in Chinese

While some properties are easier to observe in Chinese than in other languages, there are properties that are harder to observe in Chinese than in English, such as morphophonemic alternations and the role of the foot and stress in poetic meter. Morphophonemic alternations do not occur often in Chinese, owing to a lack of affixes. However, Lin (1989) has shown that such alternations do occur in some Chinese dialects when a 'diminutive' suffix is used. In addition, she has shown that many intricate patterns are accountable in terms of feature spreading and syllable structure. In the analysis of poetic meter in English, stress and the foot play a central role (Halle & Keyser 1971). However, traditional studies on Chinese meter rarely mention stress or the foot, because judgments for stress in Chinese are hard to obtain. Nevertheless, Chen (1979) and Duanmu (2007) have argued that the foot and stress are central concepts in the analysis of Chinese meter, as they are in English.

4.2.4 Implications for phonological theory

Research on Chinese has contributed to phonological theory in two ways. First, some properties are easier to see in Chinese than in other languages, and they have helped expand phonological theory in several areas, such as syllable structure, the representation of tones, the special status of the prosodic word, and the interaction between syntax and phonology. Second, we have learned that Chinese and English share a number of similarities that are far from obvious at first sight. For example, despite the fact that stress judgments are hard to obtain in Chinese, and the fact that the foot is rarely mentioned in traditional studies on Chinese meter (e.g. Wang 1958), there is evidence that both stress and feet play an important role in Chinese. Similarly, although English uses a lot of consonant clusters and the maximal syllable size appears to be either CCCVVCCC (e.g. the second syllable in *constraints* [kən][streɪnts]) or CCCVCCCC (e.g. the nonce word *strexts* [strɛksts], which native speakers readily accept as a potential word), there is evidence that non-edge syllables rarely exceed CVX (Borowsky 1989; Duanmu 2008), similar to the case in Chinese. In addition, extra consonants at word edges can be accounted for by morphology (Duanmu 2008). Such similarities support the view that languages share far more in common than what appears at first sight.

4.3 Japanese

As compared with Chinese, the history of linguistic research on Japanese is not long, just as the history of written records in the language is not very old. In fact, the first written document is 古事記 *Kojiki*, a history book that dates back only to the early 7th century AD. Yet, Japanese is nevertheless one of the languages most extensively studied in linguistics today and is one of the most well-studied non-Indo-European languages. With this background, this section consists of two parts covering traditional and modern issues of interest, respectively. The part on modern issues discusses how Japanese phonology has been influenced by modern linguistics and vice versa.

4.3.1 Traditional issues of interest

4.3.1.1 Overview

Buddhism played an important role in the history of Japanese. One finds, for example, a considerable amount of Buddhist documents and dictionaries that have provided essential data for diachronic analyses in the 20th century (see Okumura 1961/1980 and Kindaichi 2005 for a list of historical documents for phonological analysis). The tonal descriptions in these dictionaries have served as valuable sources of data for the reconstruction of pitch accent systems in modern linguistics. For example, 類聚名義抄 *Ruijumyōgishō*, a dictionary complied by Buddhist scholars around 1,100 AD, has diacritic marks for tone and has served as a data source for the reconstruction of the accent system in medieval Kyoto Japanese (Kindaichi 1944). 補忘記 *Bumōki*, another Buddhist dictionary published in 1687, also shows diacritics for tones and led to the reconstruction of the accent system of Kyoto Japanese at the end of the Muromachi period (1333–1573) (Hattori 1942, Kindaichi 1942). Similarly, a careful analysis of 四座講式 *Shiza Kōshiki*, old Buddhist music in medieval Japan, led to the reconstruction of the accent system of Japanese in the Kamakura period (1185–1333) (Kindaichi 1964).[1]

The dictionaries compiled by Portuguese Christian missionaries have also been valuable sources of data about various aspects of the language in the 16th and 17th centuries. Notably, 日葡辞書 *Nippo Jisho* (*Vocabvlario da Lingoa de Iapam*), a dictionary complied by Jesuits and published in 1603, lists over 30,000 Japanese words in a Romanized orthography. The work by João Rodrigues (1561-1634) is also worth mentioning. He published a comprehensive grammar book, 日本大文典 *Nihon Daibunten*, in Nagasaki in 1604, originally under the title of *Arte da Lingoa de Iapam*. Written in the framework of Latin grammar and composed of three parts, this grammar book gives a detailed description of the morphology, parts of speech, and literary style of the language.

[1] See Ramsey (1979) and De Boer (2010) for a critique of Kindaichi's (1964) reconstruction.

4.3.1.2 The mora

As is well known, the notion of the mora plays many pivotal roles in Japanese phonology (see Kubozono 1999 and the references cited therein). Historically, this notion is closely related to the *kana* syllabaries of the language, 片仮名 *katakana* and 平仮名 *hiragana*, both of which were developed based on Chinese characters in the 9th-10th centuries (Kindaichi et al. 1988). Both are simplified forms of Chinese characters; specifically, *katakana* are formed by taking one part of a Chinese character and simplifying it while *hiragana* are highly simplified cursive forms of whole characters. For example, the *katakana* letter ア denoting the sound of /a/ is based on the left side of the Chinese character 阿. The corresponding *hiragana* letter is あ, which was derived from the Chinese character 安. Table 4.1 illustrates more examples showing the origin of the two types of *kana* letters.

Table 4.1 Correspondences between Chinese characters and *kana* syllabary

sound	Chinese character	*hiragana*	Chinese character	*katakana*
i	以	い	伊	イ
ke	計	け	介	ケ
ta	太	た	多	タ
ha	波	は	八	ハ
ro	呂	ろ	呂	ロ

As the examples in Table 4.1 show, *kana* letters correspond to a CV-sized phonological unit in which the onset consonant is optional. This unit was ambiguous between the syllable and the mora in ancient Japanese, which made no distinction—or had no need to distinguish—between the two phonological units. In other words, ancient Japanese is believed to have had only one syllable structure, (C)V, permitting neither coda consonants nor long vowels/diphthongs. This means that the mora and the syllable were in a one-to-one correspondence, with all syllables being monomoraic.

In the course of time, long vowels and diphthongs as well as coda consonants emerged in the language from two major sources: borrowings from Chinese and the native phonological processes generically called *onbin* (Frellesvig 1995). These phenomena introduced (C)VV and (C)VC in addition to the traditional (C)V syllables. These new syllable types potentially show a discrepancy between the mora and the syllable, since (C)VV and (C)VC both form one syllable but two moras. In other words, the second half of long vowels and diphthongs as well as the coda consonants can constitute one full mora although they cannot generally form an independent syllable. Japanese uses independent *kana* letters for these 'dependent' moras, thus representing both (C)VV and (C)VC with two *kana* letters. For example, /taː/ is represented as たあ in

hiragana and ター in *katakana*. Similarly, the four-mora word *nippon* 'Japan' is written with four *kana* letters corresponding to each of the four moras, with the first half of geminate consonants, or 促音 *sokuon*, denoted by a small letter corresponding to /tu/: にっぽん (*hiragana*) and ニッポン (*katakana*). In this new system of *kana* syllabaries, each *kana* letter corresponds to a mora, but not to a syllable. It is in this sense that modern *kana* syllabaries of Japanese are mora-based rather than syllable-based.

The *hirakana* syllabary is familiar to native speakers of Japanese in the form of 五十音図 *gojūon-zu*, literally meaning a table of fifty sounds, which is still widely used for the teaching of the *kana* syllabary in elementary schools. As shown in Table 4.2, this is a table consisting of (C)V syllables and the moraic nasal /N/: It usually begins with the letter あ (/a/) at the top right corner and ends in ん (/N/) at the top left corner.[2] The five vowels are arranged on the vertical axis and the consonants on the horizontal axis. Phonemic representations are added in parentheses to show what each letter signifies. Moreover, '--' means that relevant letters are no longer used due to phonotactic restrictions in modern Japanese.[3]

Table 4.2 Modern *gojūon-zu* (table of sounds)

ん(N)	わ(wa)	ら(ra)	や(ya)	ま(ma)	は(ha)	な(na)	た(ta)	さ(sa)	か(ka)	あ(a)
--	り(ri)	--	み(mi)	ひ(hi)	に(ni)	ち(ti)	し(si)	き(ki)	い(i)	
--	る(ru)	ゆ(yu)	む(mu)	ふ(hu)	ぬ(nu)	つ(tu)	す(su)	く(ku)	う(u)	
--	れ(re)	--	め(me)	へ(he)	ね(ne)	て(te)	せ(se)	け(ke)	え(e)	
を(wo)	ろ(ro)	よ(yo)	も(mo)	ほ(ho)	の(no)	と(to)	そ(so)	こ(ko)	お(o)	

This table is so familiar to native speakers of Japanese that it is often mistaken as a native table invented by their ancestors. However, its basic structure was originally established in Sanskrit phonology in ancient India and was introduced into Japan together with Buddhism (Uemura 1989). In this sense, Japanese nativized the Indian-born table by putting their native

[2] /y/ represents palatal glide [j].

[3] The letter を (wo) is still used although /wo/ has merged with /o/ in modern Tokyo Japanese.

kana letters into it. The earliest form of the table in Japan is found around 1100 AD (Mabuchi 1993).

What is more interesting about the *gojūon-zu* in Table 4.2 is that both vowels and consonants are arranged according to some phonetic and phonological principles. As for vowels, the vertical line begins with /a/, followed by /i, u, e, o/ in this order. The first three of these vowels—/a, i, u/—are located at the three corners of the vowel chart of an inverted triangular shape that is often posited in the phonetic literature and are, hence, the three vowels most distinct from each other. Not surprisingly, this represents the most common vowel inventory in world's languages with three short vowels, according to the UCLA Phonological Segment Inventory Database (UPSID). The same database also shows that four-vowel systems typically consist of /a, i, u, e/ and five-vowel systems /a, i, u, e, o/. Seen in this light, the five vowels in the *gojūon-zu* are arranged in order of markedness, from the least marked to the most marked. This arrangement of the five vowels is adopted in verbal conjugation in modern Japanese. Thus, the verb *iku* 'to go' conjugates in the following order: *ik-anai* (irrealis), *ik-imasu* (continuative), *ik-u* (predicative), *ik-utoki* (adnominal), *ik-eba* (conditional), *ik-e* (imperative), *ik-oo* (irrealis, invitation).

Consonants in the horizontal line of the same *gojūon-zu* table are also arranged in a phonetically reasonable manner. First, they fall into two natural groups: the first six consonants from the right edge—/k, s, t, n, h, m/—are obstruents and nasals (or nasal stops, to be exact), whereas the remaining three consonants—/y, r, w/—are 'semi-vowels' or approximants, which allow more free passage of air through the oral cavity.[4]

Secondly, both groups of consonants arrange their members according to their place of articulation, from the back of the oral cavity (velars) to the front (labials). Thus, obstruents and nasals are arranged from the velar consonant (/k/) to the labial consonant (/m/) via alveolars (/s, t, n/). One apparent exception to this is /h/, but it is not an exception since /h/ in modern Japanese was originally a bilabial obstruent (Vance 1987). The same principle is employed in the second group so that the palatal approximant (/y/) comes first and is followed by the alveolar (/r/) and labial (/w/) approximants in this order.

4.3.2 Modern issues of interest

Building on the linguistic traditions sketched above, serious linguistic research on Japanese started after the Meiji Restoration in 1868. Even before this, however, one can find examples of serious linguistic research such as the work by Norinaga Motoori (1730-1801) and his student, Tatsumaro Ishizuka (1764-1823). Their work marks the beginning of research on historical

[4] Voiced obstruents such as /b/ and /d/ are absent in the table because they were absent in Old Japanese and were derived from voiceless obstruents historically.

phonology, particularly regarding the number of vowel phonemes in Old Japanese, and had a profound impact on linguistic analyses in the 20th century (Hashimoto 1938/1950).

4.3.2.1 Pitch accent

As for lexical pitch accent, the first substantial work is that of Bimyō Yamada at the end of the 19th century (Yamada 1893): see Kubozono (2013) for a classified list of influential work in the past. In generative phonology, McCawley (1968) proposed a pitch accent analysis of Tokyo Japanese and defined the dialect as a 'mora-counting, syllable' language (McCawley 1978). His pitch accent analysis is obviously based on Hattori's (1954) pioneering work, which differs from his predecessors' in employing the notion of pitch accent—Hattori's *akusento kaku* 'accent kernel'—instead of the two distinctive tones, H(igh) and L(ow).

Before Hattori (1954), most phonologists, in a tradition continued in Kindaichi (1967), analyzed pitch accent patterns as a sequence of tones. Thus, the word *azarasi* 'seal, sea calf' was described as a string of LHLL. Similarly, so-called unaccented words such as *amerika* 'America' were analyzed as LHHH. Hattori (1954) argued against this tonal analysis for the reason of redundancy and proposed an accentual analysis whereby the two types of words can be distinguished by the presence or absence of a pitch fall: /aza'rasi/ vs. /amerika/.[5] In other words, Hattori claimed that it is the presence or absence of a pitch fall as well as its position that is phonologically distinctive in the Tokyo system. This analysis formed the basis of the phonological analyses of Japanese word accent that followed, which also incorporated notational variations of pitch accent. These include McCawley (1968), Poser (1984, 1990), Pierrehumbert and Beckman (1988), and Kubozono (1988), among others.

Another approach is seen in the emergence of Autosegmental Phonology in the 1970s (Goldsmith 1976). Originally a theory proposed for tone languages, it was shown by Haraguchi (1977) that it can be applied to the description of Japanese pitch accent systems. Haraguchi's analysis centered around the question of how surface pitch patterns such as LHLL can be derived from the underlying accentual representation, e.g. /aza'rasi/. Using universal conventions and language/dialect-specific underlying melodies, Haraguchi demonstrated that pitch accent languages can be analyzed in the same theoretical framework as tone languages.

Two other theoretical notions that have been introduced into the analysis of Japanese accent over the past thirty years are the 'bimoraic foot' (Poser 1990) and 'syllable weight' (Kubozono 1995, 1999). These notions have enabled us to make significant generalizations regarding the seemingly complex accent patterns in the language, including compound accent

[5] Apostrophes denote lexical pitch accent, or the location where pitch suddenly drops as its primary phonetic correlate in Tokyo Japanese. We will discuss so-called unaccented words shortly.

and verb/adjective accent. They have also helped to reveal striking similarities between the accentuation in Tokyo Japanese and that of other languages, particularly Latin and English (Kubozono 2008).

4.3.2.2 The mora as a linguistic unit

In the literature of modern linguistics, Japanese has often been cited as a typical 'mora' language. In phonetics, it is supposed to be a typical 'mora-timed language', where the mora rather than the syllable or stress foot recurs in a regular interval (Bloch 1950). A strong version of this analysis assumes that every mora has an equal phonetic duration: thus, the two moras comprising heavy, that is, bimoraic, syllables such as those in (11) are predicted to be phonetically as long as each other and, hence, twice as long as monomoraic words in (12). In the rest of this chapter, hyphens indicate syllable-internal mora boundaries, whereas dots denote syllable boundaries, which are always mora boundaries as well.

(11) te-n 'heaven, point', to-o 'ten, tower', ta-i 'Thailand, sea bream'

(12) te 'hand', to 'door', ta 'rice field'

This strong version of the mora hypothesis is compatible with native speakers' intuition of Japanese moras as well as the *kana* syllabaries of the language. Specifically, it agrees with the basic structure of traditional Japanese poems: *haiku*, which are composed of three phrases consisting of five, seven, and five moras, as illustrated in (13a), and *tanka*, a form that dates back at least to the 8th century, which has two additional phrases each made up of seven moras. Pauses are inserted after each phrase in these poems. These poem schema are still widely enjoyed by native speakers of Japanese, including small school children who follow the traditional meter to make slogans as in (13b).

(13) a. ya.se.ga.e.ru ma.ke.ru.na i-s.sa ko.re.ni.a.ri
skinny frog don't give up, Issa is here
'Don't give up, skinny frog. I (Issa) am here beside you'

b. to.bi.da.su.na ku.ru.ma.wa kyu-u.ni to.ma.re.na-i
Don't run out cars-TOPIC suddenly cannot stop
'Don't run out into the street; cars cannot stop at once'

On the other hand, a weaker version of the mora hypothesis does not claim that every mora has an equal duration; rather, it posits that the physical duration of words increases in proportion to the number of moras involved (Port et al. 1987): for example, four-mora words are expected to be about twice as long as bimoraic words like those in (11), which, in turn, are about twice as long as monomoraic words like those in (12). This is compatible with the phonetic evidence that vowels are longer in closed syllables, that is, before moraic nasals (撥音 *hatsuon*) and the first

half of geminate consonants (促音 *sokuon*), than in open syllables (Homma 1981, Kawahara 2015), a tendency quite opposite to the one observed in many other languages (Maddieson 1985).

Another major source of evidence for the mora in Japanese is phonological studies, particularly those on word accent, which claim that Tokyo Japanese is a typical 'mora-counting language': the mora is used as a counting unit in the assignment of lexical pitch accent (McCawley 1968). This does not hold in every dialect of the language, as we will see later, but it is true of standard Tokyo Japanese where nouns are typically accented (if accented at all) on the third mora from the end of the word as in (14a), and verbs/adjectives on the second mora from the end of the word as in (14b).

(14) a. a.za'.ra.si 'earless seal', ni.si.do'-i.tu 'West Germany', ro.sa-n.ze'.ru.su 'Los Angeles'
b. a.ru'.ku 'to walk', si.ra.be'.ru 'to examine', a.o'-i 'blue'

Accentuation in Tokyo Japanese is more complex than this and involves so-called accent shift when the target mora happens to be the non-initial mora of the syllable, as shown in (15). Since accent cannot be contrastive within heavy syllables, i.e. $(\mu'\mu)_\sigma$ vs. $*(\mu\mu')_\sigma$, Tokyo Japanese is classified as a 'mora-counting, syllable language' (McCawley 1978).

(15) a. o'-o.i.ta 'Oita (place name)', wa.si'-n.to-n 'Washington'
b. to'-o.ru 'to pass', to'-o.i 'far'

Having justified the mora as a basic unit in lexical accentuation in Tokyo Japanese, one must hasten to add that this is not true of all Japanese dialects. For example, Kagoshima Japanese spoken in Kagoshima Prefecture in the south of Japan is a typical 'syllable-counting, syllable language', or a system where the syllable functions both as a counting unit and a tone-bearing unit. Thus, the two distinctive tonal patterns—Type A and Type B—bear an H tone on the penultimate and final syllables, respectively (Hirayama 1951). In contrast, Kagoshima's sister dialect, Nagasaki Japanese, is a typical 'mora-counting, mora language', where an H tone is assigned on a certain *mora* by counting the number of *moras* (Matsuura 2014). The crucial difference between these two sister dialects suggests that the two types of prosodic systems—mora-based and syllable-based—can each change into the other type more easily than has been thought. This view can be supported by the observation that Koshikijima Japanese, which is another sister dialect of Nagasaki and Kagoshima and is basically a moraic dialect, has strengthened the role of the syllable over the past eighty years (Kubozono 2016).

4.3.2.3 Rendaku and Lyman's Law

A third major topic that has attracted serious attention in Japanese phonology is 連濁 rendaku: see Komatsu (1981) and Vance (2015) for an overview and Vance & Irwin (2016) for a comprehensive analysis. Analyses of this phenomenon hinge crucially on the development of modern phonology as it is closely related to the ideas of underspecification and markedness.

Rendaku is a phenomenon whereby the initial obstruents of non-initial members of compounds are voiced. This is exemplified in (16). The voiceless/voiced contrast in (16a) may look peculiar but this is due to the fact mentioned above, namely, that /h/ in modern Japanese was originally a bilabial voiceless stop, i.e. [p].

(16) a. h~b kutu + hako → kutu=bako (shoe=box) 'shoe box'
nabe + huta → nabe=buta (pan=lid) 'pan lid'
b. t~d hon + tana → hon=dana (book=shelf) 'bookshelf'
toki + toki → toki=doki (time=time) 'sometimes'
c. k~g yama + koya → yama=goya (mountain=hut) 'mountain hut'
sumida + kawa → sumida=gawa (Sumida=river) 'Sumida River'
wa + kasi → wa=gasi (Japan=sweets) 'Japanese sweets'
d. s~z oo + same → oo=zame (big=shark) 'big shark'
ko + sima → ko=zima (small=island) 'small island'

There is no doubt that rendaku has a long history in Japanese (Vance 2015). In Old Japanese, voiced obstruents did not appear in word-initial position. In such a system, rendaku had the effect of showing that elements beginning with a voiced obstruent are non-initial members of a larger word (Komatsu 1981).

In modern Japanese, rendaku voicing is subject to various linguistic constraints by which its application is blocked (Vance 1987, Ito & Mester 2003). The most well-studied constraint is an OCP (dissimilatory) constraint known as Lyman's Law,[6] which was named after Benjamin S. Lyman, an American mining engineer who lived in Japan in the late 19th century. He observed that rendaku is blocked if the second member already has a voiced obstruent, as illustrated in (17). This OCP effect itself can be found in the data of Old Japanese, according to Kindaichi et al. (1988: 264).

(17) a. h~b aka + huda → aka=huda, *aka=buda (red=tag) 'red tag'
b. t~d tabi + tabi → tabi=tabi, *tabi=dabi (times=times) 'often'
c. k~g yama + kazi → yama=kazi, *yama=gazi (mountain=fire) 'forest fire'
d. s~z sime + saba → sime=saba, *sime=zaba (pickled=mackerel) 'pickled mackerel'

It should be noted that it is voiced obstruents, not voiced consonants in general, that block the voicing process. In other words, the process is not blocked by the phonetic feature [+voice] per se in a consonant of the second member. It occurs quite readily if the second member contains sonorant consonants such as /m/, /n/, /w/, and /y/ as shown in (16). This raises the

[6] Norinaga Motoori (1730-1801) is believed to have originally discovered this constraint.

question of why rendaku is blocked by [+voice] in obstruents, but not by the same feature in sonorants.

This can be answered by examining the nature of [+voice] in the two types of consonants: [+voice] in obstruents functions contrastively in Japanese phonology, while [+voice] in sonorants is a redundant feature that can be predicted by their [+sonorant] feature. This is closely related with the notion of underspecification (Archangeli 1984, 2011), or the idea that redundant features are not specified in the lexicon. According to this notion, voiced consonants fall into two groups, /n, m, y, r, w/ and /b, d, g, z/, which have different feature specifications with respect to voice: the former group is not specified for this feature, while the latter is specified as [+voice]. As a process sensitive to this difference and blocked only by /b, d, g, z/, rendaku voicing thus contributed to the arguments for underspecification in theoretical phonology (Ito & Mester 1986).

Lyman's Law hinges crucially on the notion of markedness, too. In Japanese phonology, CV syllables are traditionally classified into two groups, 清音 *seion* 'pure sounds' and 濁音 *dakuon* 'dull sounds'. Initial consonants of *seion* syllables include /k, s, t, n, h, m, y, r, w/, while those comprising *dakuon* syllables are /g, z, d, b/. Rendaku voicing is sensitive to this distinction and is blocked only by the latter.

In terms of markedness, *seion* contains unmarked consonants, while *dakuon* contains marked ones. The former consists of two groups: /k, s, t, h/ are voiceless obstruents that are universally unmarked as opposed to their voiced counterparts, /g, z, d, b/, while /n, m, y, r, w/ are sonorants that are inherently voiced and are universally unmarked as against their voiceless counterparts, which do not occur in Japanese phonology. In more general terms, sonorants are voiced by default, while obstruents are voiceless by default. The distinction between *seion* and *dakuon* captures this universal distinction in markedness.

This distinction between marked and unmarked consonants has long been known in Japanese. The best illustration of this is the *gojūon-zu*, a table of *kana* syllabary where only *seion* are included (Table 4.2).

4.4 Korean

Finally, we will give an overview of Korean, which will of necessity be brief (see also Sproat, this volume, for some discussion of Korean orthography). Korean is often said to be historically related to Japanese as an Altaic language (Lee & Ramsey 2000; see Campbell & Poser 2008: 410 for a different view). In fact, it shares many linguistic attributes with this neighbor, including word order, morphology, and phonological/prosodic structures. Here we will briefly look at the native writing system called *Hangul*, pitch accent systems, and the three-way contrast in consonants for which the language is well-known in the phonological literature.

Like Japanese, Korean does not have a very long history of linguistic inquiry. In its relatively short history, the invention of the native writing system, *Hangul*, was probably an epoch-making innovation. Like Japanese, Korean had borrowed Chinese characters from Chinese and used them for many centuries until *Hangul* was invented in 1446 under the reign of King Sejong. Unlike the *kana* syllabaries of Japanese, *Hangul* was not based on Chinese characters but was invented independently, under the influence of Sanskrit Devanāgarī script (Chung 2013). It symbolizes the articulation of sounds in a systematic manner: for example, ㄱ shows the velar [k], or the back of the tongue being raised towards the palate, while ㄴ represents the tongue tip touching the alveolar ridge, hence [n]. Each *Hangul* letter combines these elements to represent syllable-sized units including CV and CVC. In this respect, it is crucially different from the *kana* syllabaries of Japanese, which represent mora-sized units and divide CVV and CVC syllables into two letters, i.e. CV-V and CV-C, respectively.

Korean is similar to Japanese in prosodic organization (Jun & Kubozono, forthcoming). Standard modern Korean, which is the variety spoken in Seoul, does not use pitch contrastively at the lexical level. This system corresponds to the accentless or one-pattern accent systems found in some peripheral areas in Japan (Uwano 1999). Other dialects of Korean use pitch contrastively like many Japanese dialects. They include 'multiple-pattern systems' found quite widely in Gyeongsang (Kyungsang), Hamgyeong, and some Korean dialects spoken in China (Fukui 2000, 2013). In these systems, the number of distinctive patterns increases as the word becomes phonologically longer, just as in Tokyo Japanese. One also finds 'N-pattern systems' in Korean, typically in Jeolla and some western parts of Gyeongsang. These systems are similar to Kagoshima and its sister Japanese dialects in that the number of patterns is fixed to a certain integer irrespective of the length of the word. According to Fukui (2000), N-pattern systems in Gyeongsang vary from one-pattern to five-pattern systems. It is not clear how these different types of pitch accent systems developed, but the similarities with Japanese pitch accent systems are noteworthy.

Finally, modern Korean has three types of voiceless obstruents: lax (or lenis or plain) /p, t, c, k/, tense or fortis /p', t', c', k'/, and aspirated /p^h, t^h, c^h, k^h/. This is a unique feature of the language that does not exist in Japanese, which has only voiceless/voiced pairs. It is not clear how this three-way voiceless contrast emerged in the history of Korean (see Sohn 1999 and Lee & Ramsey 2000 for some accounts), but it has attracted serious attention in general phonetics and phonology. Particularly interesting is the question of how the three types of voiceless obstruents are distinguished in speech, which remains a highly interesting question for phoneticians and phonologists working on speech production and perception (Kang & Han 2013).

4.5 Conclusion

Many factors can influence the phonological history of a language, including its orthography. For example, the phonological opaqueness of the Chinese orthography has given rise to a need to annotate pronunciation and an early start in the analysis of the Chinese syllable. In addition, the shared orthography by dialectal speakers has given rise to a general interest in language surveys. The lack of accent representation in the Japanese orthography has given rise to much interest in the analysis of pitch accents. The mora-based Japanese orthography (one ‘letter’ per mora) has drawn attention to the role that the mora plays. In modern times, however, generative phonology compels us all to consider broader questions, such as whether properties that are easy to observe in one language are also present in others as well, and much progress has been made in this regard.

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