Foot-shift and disyllabification in the history of Chinese

With a revisit of syllabic structures of Old Chinese

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This paper argues that the Chinese language has undergone a foot-shift from the Old Chinese monosyllabic foot to a Modern Chinese disyllabic foot. It will be shown that the natural simplification of Old Chinese syllables has caused the foot-shift, resulting in disyllabification. The disappearance of bimoraic feet in Old Chinese has resulted from the loss of consonantal codas, including codas of consonant clusters, which has led to the disappearance of heavy syllables, as well as super-heavy syllables. In other words, this foot-shift can be explained as a compensatory transformation of a heavy Old Chinese dimoraic monosyllable to a pair of light monomoraic disyllables. One way of understanding this evolution is that disyllabification of feet in Modern Chinese is a compensatory mechanism to maintain foot complexity.

Keywords: foot-shift, disyllabification, syllabic structure of Old Chinese, prosody

1. Introduction

Disyllabification of Chinese has been a hot topic in the history of the Chinese language, and has been explained from various perspectives in previous studies. Here is a list of points of view on the phenomenon: (1) *Compensation* (Kuo 1938; Wang 1944, 1980, 1989; Karlgren 1949; Lü 1963; Li & Thompson 1981: 14, 44, 392; Tang 1988, among others); (2) *Functional contrast* (Hu 1923: 60–61; Li 1990); (3) *Rhetorical aesthetics* (Ma 1983[1898]: 38; Cheng 1992: 59–60); (4) *Social requirements* (Cheng 1992: 58; 2008: 36–39; Wang 1980: 342; Tang 1988: 555–556; Zhu 1992: 124–130; Duanmu 1999; Xu 2005); (5) *Rhythmic preference* (Liu 1939: 56;

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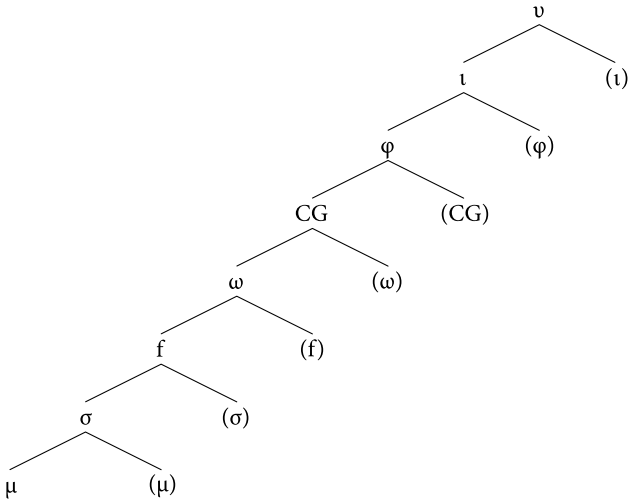
Jin 1922: 15; Lü Shuxiang 1963; Lü Yunsheng 1990: 11); (6) *Elastic words* (Kuo 1938: 4); and (7) *Foot-shift* (Feng 1997, 1998, 2000, 2009, 2017; Dong 2002, 2011; Zhuang & Zhao 2016); Zhuang & Zhao (2016), in a review of previous studies, argue that the foot-shift account can better explain the disyllabification of Chinese. This paper continues their study to discuss the prosodic foundation of the disyllabification of Chinese, aiming to identify the prosodic characteristics of Old Chinese,[1] the necessity of foot-shift, and the nature of disyllabification in the history of the Chinese language. Before the discussion, let us first have a brief introduction of some basic concepts of prosodic theory.

Previous prosodic studies (Liberman 1975; Liberman & Prince 1977; Selkirk 1980a, 1980b, 1981, 1981[1978], 1984; Napoli & Nespor 1979; Booij 1983, 1985a, 1985b, 1986; Neijt 1985; Nespor 1985, 1986; Vogel 1985, 1986; Nespor & Vogel 1986; 2007; Itô 1986; Hayes 1989; Zec 1989; McCarthy & Prince 1993; Chen 2000; Zhang 2017) have gradually developed the following full prosodic hierarchy, which consists of eight layers, as shown below (υ = Utterance; ι = Intonational Phrase; φ = Phonological Phrase; CG = Clitic Group; ω = Prosodic Word; f = Foot; σ = Syllable; μ = Mora):

(1)



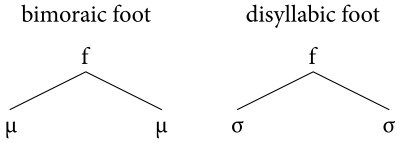
1. The term *Old Chinese* has been used in different ways. All forms of Chinese before the East Han Dynasty (25–220 AD) could be called *Old Chinese*. In this study, the term is used to refer to *Proto-Chinese* for the (reconstructed) prehistoric Chinese, and *Archaic Chinese* to that of the *Eastern Zhou Dynasty* (770–256 BC) for which reconstruction relies more on documentation than language comparison. Sometimes, *Proto-Chinese* is also applied to avoid confusion.

Four layers among them are the main concern of the current study, i.e., Mora, Syllable, Foot, and Prosodic Word. Thus, in accordance with McCarthy & Prince (1993: 45), we adopt the following Prosodic Hierarchy:

(2)

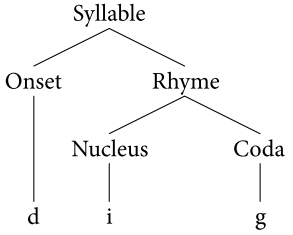
It is necessary to note that foot is essential in the four layers. As the minimal unit that can be used freely (Feng 1996), a foot, depending on different languages, can be composed of two moræ or syllables, to form bimoraic foot and disyllabic foot respectively.

(3)

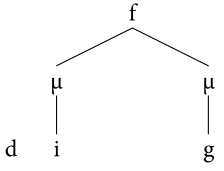


To make it simpler, if the canonical syllable consists of at least three parts in a language, that is, onset, nucleus and coda, this language can usually be regarded as a bimoraic language. Take English as an example. A canonical syllable in English like "dig" has the structure shown in (4), which means that it contains two moræ, forming a bimoraic foot, as shown in (5):

(4)

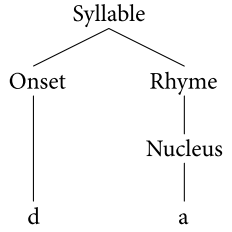


(5)

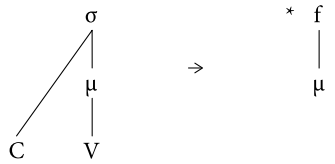


However, in a language like Modern Chinese, its canonical syllable is open, without a coda. For example, *da* 大, having only one mora, cannot form a bimoraic foot, as shown below:

(6)



(7)



As is well known, Old Chinese syllables had codas, but they (or most of them) have been dropped down through the ages. This has been found in many languages (Salmons & Zhuang 2018). The consequence of it is that a language may shift over time from a bimoraic to a disyllabic foot. The motivation behind this shift appears to be foot binarity (McCarthy & Prince 1993: 46):

(8) **Foot Binarity:**
Feet must be binary under syllabic or moraic analysis.

That is to say, in a language, as long as its words were typically bimoraic (as shown in (4), binarity was satisfied. However, the loss of codas leaves monomoraic words, such as in (8), the only mora left in the syllable, not being binary, cannot form a foot. To satisfy binarity, this mora has to combine with another one for a preferred foot. That supplementary mora is added by addition of another syllable, creating a disyllabic foot (Salmons & Zhuang 2018).[2]

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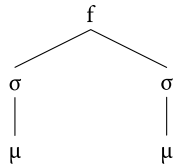
2. We appreciate one reviewers' pointing out a serious point: "Even if a language has many bisyllabic words, it does not mean that the minimum prosodic/phonological word is bisyllabic…" Yes. There exist many monosyllabic words in Modern Chinese (see Table 3); and that many Modern Chinese words are disyllabic does not mean that the minimum word in Chinese is disyllabic. The disyllabicity trend of the Modern Chinese foot is only a template (Salmons & Zhuang 2021). Here we want to quote Macken & Salmons' (1997: 37) definition that "a prosodic template is a conventionalized unit–a single unit–that imposes constraints on the surface form of words and, in so doing, encodes a particular relationship between words thus related. The template is prosodic in that its basic shape is a foot (or other prosodic constituent)." That is to say, foot, as a kind of prosodic template, imposes constraints, but does not determine the sur-

(9)



With this as our starting point, we shall demonstrate that the history of Chinese has undergone a foot-shift in the transition from Old Chinese to Middle Chinese. In the rest of this paper, we first figure out the prosodic properties of Old Chinese based on its previous reconstructions and nail down its monosyllabic foot nature (§2). In §3 we detail the process of simplification of consonant clusters and then elaborate the prosodic account of Feng's idea of 'foot-shift'. §4 goes on to show disyllabification caused by the foot-shift. §5 is the conclusion.

2. Prosodic properties of Old Chinese

This section consists of two parts: (1) the syllabic structure of Old Chinese, and (2) the nature and evidence of Old Chinese as a moraic foot language; thus proving that Old Chinese has a moraic foot structure and laying a foundation for further discussion of foot-shift.

2.1 Syllabic structure of Old Chinese

When studying disyllabification of Chinese, one should focus on *syllable*, because the disyllabification of Chinese is, after all, the shift of prosodic structure and the evolution from *monosyllabic prosodic unit* to *disyllabic prosodic unit* (Feng 2000). In terms of syllable, specific phonological values should not be involved in the disyllabification because, by and large, Chinese monosyllabic words are faced with the trend of disyllabification despite their phonological values (see Lü 1963). In Feng's (2000; 2009; 2017) view, the features of Chinese syllabic structures (including the role of tone) are important issues regarding the occurrence of Chinese disyllabification. Therefore, by investigating features of Old Chinese syllabic structures, we can better understand the evolution of Chinese phonological structures, and further understand the prosodic mechanism and nature of Chinese disyllabification.

face form of words. This also explains one reviewer's suggestion that "[t]here are more words in English that have more than two moræ, that does not make the minimum word in English bigger than bimoraic feet".

As for research on Old Chinese, many assumptions have been put forward in recent years on whether there existed consonant clusters or not (cf., Pulleyblank 1962a, 1962b; Wang 1980; Zhengzhang 1996, 2013; Pan 2000, among many others), whether Old Chinese was monosyllabic or disyllabic (c.f., Zhao 1984: 264; Huang 2001: 102; Jin 2002: 1–15; Jiang 2012, 2014; Sagart 1999: 17–18; Pan 1995: 129, 1999, 2000: 114–118; Li 2001: 211; Gao 2014; Baxter & Sagart 2014: 50–53, 318–319, among others), and the issue of tones (Haudricourt 1954; Wang 1980; Sagart 1986, 1990; Zhengzhang 1994; Pan 2000, among many others), etc. However, no matter which opinion scholars may hold, they do not deny that the syllabic structure of Old Chinese is much more complicated than that of Modern Chinese. In fact, despite the above-mentioned different opinions, a broad consensus on the rhyme groups of Old Chinese has been reached, i.e., the existence of (rather) complex consonantal codas in Old Chinese. The following part will review some representative opinions.

At present, the most widely-used Old Chinese phonological systems are Li's system, Wang's system, and the Zhengzhang-Pan system.[3]

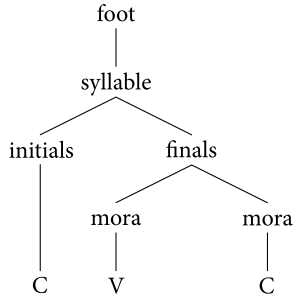
2.1.1 The Li Fang-kuei system

In Li's system, the syllabic structure of Old Chinese is (C)C(C)(S)VC(C), among which C stands for a consonant, V for a vowel, S for a semi-vowel, and the components in parentheses are optional (Li 1971, 1980: 35; Ting 1979). Li's basic CVC structure of Old Chinese is reconstructed on the basis of Middle Chinese syllabic structure, which is reconstructed on the basis of Middle Chinese rhyme books as well as the syllabic structure of Modern Chinese (mostly its dialects). In his system, the semi-vowel codas in Modern Chinese are assumed to be some traces of consonant codas in Middle Chinese, plus that in Old Chinese the *ru*-type rhymes (入聲韻) were closely related to the *yin*-type rhymes (陰聲韻), therefore, he believes that all the *yin*-type rhymes of Old Chinese should have a consonantal coda, and the canonical syllabic structure of Old Chinese should be CVC (Li 1971: 35; 1980: 33). He says:[4]

3. There are also other reconstruction systems of Old Chinese, such as Starostin's system and the Baxter-Sagart system, but obviously their constructions do not gainsay our discussion here. It is necessary to note that Baxter & Sagart (2014) assume Old Chinese to have been a disyllabic or sesquisyllabic language (c.f. Zhao 1984: 264; Huang 2001: 102; Jin 2002: 1–15; Jiang 2012, 2014; Sagart 1999: 17–18; Pan 1995: 129, 1999, 2000: 114–118; Li 2001: 211; Gao 2014; Baxter & Sagart 2014: 50–53, 318–319). If this system is adopted, the cyclicity (of East Asian Prosodic Templates) might be a good perspective to keep in mind, which is to say, the phonological structure of words in Chinese has undergone what can be described as a cycle, as noted in Salmons & Zhuang (2018).

Chinese phonologists have usually divided the rhyme groups into three types: *yin* 陰, *yang* 陽 and *ju* 入. In actuality, the *yin*-type rhymes correspond with the *ju*-type in that they comprise those syllables with even, rising and departing tones. We recognize the *yin*-type rhymes as also having had final consonants. This class of final consonants can be written as **-b*, **-d*, **-g*. Yet as to whether or not these finals were actually voiced, we simply have no good evidence on which we can base a decision.

(10)



2.1.2 Wang Li's system

Wang (1980) suggests that Old Chinese has two basic types of syllable structures, CVC and CV. Unlike Li (1980), Wang (1980) holds that Old Chinese has no consonant clusters and the syllable can be open or closed. Therefore, the syllabic structure in the Old Chinese phonological system reconstructed by Wang seems significantly simpler than that of Li's. It should be C(M)V(C).[5]

The majority of the reconstructed syllables in Wang's system have consonantal codas. They include those of *ru*-type rhymes and *yang*-type rhymes, approximately accounting for more than two-thirds. We shall discuss this in § 2.2.

2.1.3 The Zhengzhang-Pan system

In Zhengzhang-Pan system, Old Chinese can also be divided into two basic structures, CVC and CV. Among them, a CVC syllable is of oblique tone and level tone in *yang*-type rhymes, and a CV syllable is the level tone of *yin*-type rhymes (see Zhengzhang 1984: 40, 2013: 35–36 for a detailed discussion). Interestingly, the basic structure of Old Chinese reconstructed by this system is very similar to Wang's, but their complete syllable structures are quite different because Old Chinese phonology in the former system has an extremely complex

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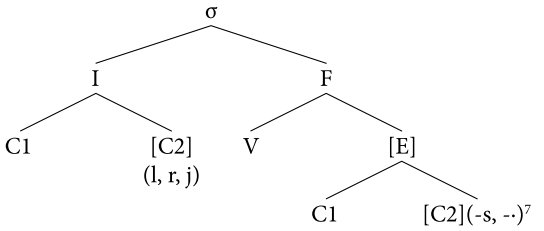
4. This citation is directly from Matto's translation (see Matto 1974–1975: 249). Note that the *ju* 入 here has a different spelling from ours.

5. Note that there are medials in Wang's (1980) reconstruction.

consonant cluster system. Pan (2000: 104), for example, proposes that the basic syllabic structure reconstructed can be represented in the following figure:[6]

(11)



(σ = syllable; I = initials; F = finals; C = consonant; V = central vowel; E = ending or coda)

The hierarchical structure inside the syllable can be clearly seen in this syllabic structure model. Syllables can be further divided into initials (I) whose internal structures include Consonant 1 (C1) and Consonant 2 (C2), and finals (F) whose internal structures include a central vowel (V) and an ending (E). And the internal structure of endings can be broken into two different consonants, C1 and C2. In the above-mentioned structures, C1 refers to basic consonants, and C2 refers to the consonants which later evolved into tones and medials, including l, r, j, s, etc.

2.2 A prosodic view of Old Chinese syllable

From the above three reconstructions by different scholars, it is not difficult to conclude that despite the presence or absence of consonant clusters, the rhyme groups in these reconstructions are relatively complex, and consonantal codas usually exist, which provides a basis for discussing the moraic foot in Old Chinese. What phonological effect will the complex syllables have? This can be analyzed in terms of contemporary metrical phonology. As the above discussion suggests, complex syllables may include two or more moræ and hence can become (moraic) feet. The syllables in Old Chinese have complex structures. Therefore, it

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6. It should be noted that, Pan advocated that the phonological unit of medial should be discarded when describing the syllabic structures of Old Chinese, for that medials of Middle and Old Chinese appear rather late (Pulleyblank 1962a, 1962b; Li Fang-kuei 1971; Yakhontov 1986; Zhengzhang 1987). Therefore, in the diagram of (11), the constituent between the first consonant and central vowel is marked as C2 rather than M (medial). Pan (2000) maintains that the medial in Middle Chinese is only part of the initials in Old Chinese and has not displayed features of medial.

The dot in the brackets ("·") is to indicate that there might be a tense glottal sound (but not a glottal stop as put forward by others), see more detailed discussion in Pan (2000: 162–163).

can be inferred that the syllabic structures of Old Chinese can meet the requirement of a binary-branched prosodic foot, making it have enough weight to independently constitute the smallest prosodic unit – foot.

Regardless of which of the above perspectives we hold, it is not difficult to reach the conclusion that the syllables of Old Chinese can satisfy the requirement of prosodic foot. However, this of course should be discussed from two aspects: One is to meet the condition of binary-branched mora inside the syllable, and the other to explain the comparison between heavy and light syllables in Old Chinese.

For the first aspect, although scholars are not in doubt about whether Li's system can meet the requirement of a binary-branched mora inside an Old Chinese syllable, they would wonder whether Wang's system and Zhengzhang-Pan system can satisfy the same requirement.

Li's system leaves no place for open syllables in Old Chinese. In accordance with this system, every syllable of Old Chinese can be a (bimoraic) foot with no doubt. In other words, the structure(s) of an Old Chinese syllable can meet the binary requirement.

Scholars on the side of Wang's or Zhengzhang-Pan systems would be confronted with the dilemma that the finals of *yin*-type rhymes may not branch. This involves a theoretical and practical question: Does the assumption that Old Chinese is a bimoraic foot language mean that the finals of *yin*-type rhymes in Old Chinese must branch?

First, the rhyme group of *yin*-type rhymes itself does not need to become a foot necessarily: the existence of phoneme is not based on foot. Of course, if monosyllables can carry stresses independently, then this means that monosyllables must have a bimoraic structure; otherwise, there would be no stresses. However, as a rhyme group (or the type of syllabic finals), there is nothing in prosodic theory that requires a syllable to be a foot.

Second, in fact, the difference between the *yin*-type rhymes and other rhymes is that a significant number of words with *yin*-type rhymes do not necessarily (or cannot) occupy the stressed position. Therefore, *yin*-type rhymes are not necessarily bimoraic; instead, they are mostly monomoraic syllables. It is well known that most function words in Old Chinese have *yin*-type rhymes, which either occupy the unstressed positions or are prosodically invisible constituents. They are usually monomoraic. Thus, *yin*-type rhymes can be monomoraic rhyme groups.

Third, according to prosodic phonology, if a monomoraic syllable is in the stressed position, the stress can be realized in a variety of ways, like lengthening and pausing. Accordingly, syllables or words (or Chinese characters colloquially) of *yin*-type rhymes can also be stressed (or prosodically branched) through phonological means.

Last but not least, it is noteworthy that the Old Chinese phonological system reconstructed by Wang (1980), as well as Zhengzhang-Pan system, does not contradict the opinion that Old Chinese is a bimoraic foot language. For example, Wang's system has a large number of reconstructed consonantal codas, with *ru*-type rhymes and *yang*-type rhymes accounting for two-thirds that can be regarded as bimoraic. Open syllables occupy only less than one-third (as noted above, two rhyme groups, i.e., *qin* (侵) and *tan* (談), do not have their corresponding *yin*-type rhymes). Among them "[ai] (歌)", "[ei] (脂)" and "[əi] (微)" may also be regarded as bimoraic. Thus, only "[ə] (之)", "[u] (幽)", "[o] (宵)", "[ɔ] (侯)", "[a] (魚)" and "[e] (支)" are certainly monomoraic, making up a very low percentage.

More interestingly, although some scholars propose to reconstruct *yin*-type rhymes (characters with a level tone) as having a -ɦ ending, such as Yu (1985) and Shi (2015), according to Zhengzhang (2013: 36), "-ɦ endings and vowel endings are actually the same". If this possibility is taken into consideration and/or regarded as an underlying form of *yin*-type rhymes in Old Chinese, the *yin*-type rhymes are not only a bimoraic rhyme group, but also a rhyme group (prosodic category) with prosodic variables, namely, the length of syllables can either be long or short. This is because the -ɦ ending of *yin*-type rhymes is unstable and tends to disappear in the historical phonological evolution (see Shi 2015), and due to their weak stress (and loss of ending mora), a large number of function words in Old Chinese are categorized into *yin*-type rhymes or even prosodically invisible constituents. If this is true, the contrast between light syllables and heavy syllables in Old Chinese and the fact that most unstressed (functional) words belong to *yin*-type rhymes (especially those *hai*-group 咍部) can be explained.

In fact, the proposal that the basic structures of Old Chinese syllables are CV or CVC (Wang's system and Zhengzhang-Pan system) can correctly show that there are differences between light syllables and heavy syllables in Old Chinese. This has been proven by previous studies. For instance, Takashima (1999) points out the strong and weak opposition between *yin*-type rhymes (CV) and *ru*-type rhymes (CVC) with examples and suggests that the *ru*-type rhymes have an extra plosive coda compared with their its corresponding *yin*-type rhymes and thus display a heavy form with respect to open syllables.

Another question thus arises naturally: Since there is no CV-CVC opposition in Li's system, if this system is adopted, how can the opposition between light syllables and heavy syllables in Old Chinese be explained? It must be emphasized that there exists a corresponding relation between the length and stress of syllables in a moraic language system. The prosodic weight of a syllable can be measured by its "length". According to metrical phonological studies, long syllables in quantity-sensitive languages are scanned as heavy (bimoraic or multimoraic

CVV, CVC or CVCC) while relatively short syllables as light (monomoraic CV). This indicates that whether syllables are heavy or light is based on whether they can form feet, and the underlying reason is whether the finals can become feet and meet the structural requirement of branching. How can Li's system reflect the opposition between light syllables and heavy ones? In metrical phonology, there exists an opposition not only between light syllables and heavy syllables, but also between heavy syllables and super-heavy syllables. This can be seen in various (although not all) constructed systems of Old Chinese. For example, in Zhengzhang-Pan system, a super-heavy syllable can be "final + consonant" (Feng 2000; Zhao 2014).

Takashima (1999: 417) has already pointed out that "syntax (and semantics as well) must also be taken into account in the assignment of the weak- or strong-syllable feature. Assigning the feature 'strong' to a CVC syllable structure, and 'weak' to one with a CV or V syllable-structure is not automatic." That is to say, strong syllables correspond with CVC structures, and weak syllables correspond with CV structures (see also Feng 2000, 2009, 2012, 2017; Zhao 2014). In other words, it means that different rhyme types of Old Chinese have different strengths between CV and CVC: not only displaying a difference in syllable strength, i.e., *ru*-type rhymes corresponding with *yin*-type rhymes have an extra consonant ending *-C), while these strong syllables usually express a semantic emphasis (Takashima 1999; Zhao 2014: 86):

(12)

Emphasizing form	Regular form	Gloss
*ŋajʔ (我)	*ŋa (吾)	'I'
*njaiʔ (汝)	*nja (爾)	'you'
*niak (若)	*nja (如)	'if'
*gʻat (曷)	*gʻa (何)	'what'
*ʔak (惡)	*gʻo (胡)	'why'
*wjək (或)	*wjə (有)	'there is'

More interestingly, if we turn to use other systems, this contrast can still be sensed. The following reconstructed pronunciations are from the Zhengzhang-Pan system:[8]

8. These reconstructed sounds of Old Chinese are mainly from Zhengzhang (2013) and Pan (2000). An online tool at http://www.eastling.org/sgycx.php (Accessed 2019-09-09.) was applied for a fast double checking.

(13)

Emphasizing form	Regular form	Gloss
*ŋaalʔ (我)	*ŋaa (吾)	'I'
*njaʔ (若)	*nja (如)	'if'
*gaad (曷)	*gaal (何)	'what'
*qaags (惡)	*gaa (胡)	'why'
*gʷɯɯg (或)	*ɢʷɯʔ (有)	'there is'

According to Zhao (2014), this kind of correspondence is not a coincidence: (1) *yin*-type rhymes correspond to *ru*-type rhymes; (2) *ru*-type rhymes correspond to the emphasizing form, and *yin*-type rhymes correspond to the regular form. In summary, those with more moræ are the emphasizing form, and those with fewer moræ are the regular form. For instance,

(14) 今者吾喪我。 (《莊子·齊物論》)
Jinzhe wu sang wo. (*Zhuangzi·Qiwu lun*)
Today I lose I
'Today I lost myself.'

In (14), *wu* 吾 'I' is prosodically light, whereas *wo* 我 'I' is prosodically heavy; and the two are not interchangeable. When a pronoun is placed in the stressed position, the first-person pronoun will use the prosodically heavy form *wo* 我rather than the relatively light *wu*. Yu (1999: 137) states, "the difference between *wu* 吾 and *wo* 我 is purely a pronunciation matter: When at the end of an utterance or to show contrast, it will be heavily pronounced, thus it has to be /ŋad/. Those that have some character following will be unstressed, thus the ending will usually be ignored and become /ŋa/."

Furthermore, according to the latest research by Pan (2014), the medials of Division III in Middle Chinese developed from normal vowels. Pan interprets the opposition between Division III and Non-Division III as the opposition between the normalcy and pharyngealization of the velar sound. "Length is an accompanying feature to distinguish Division III and Non-Division III, and Division III is short." he emphasizes. If this assumption is on the right track, it would indicate that the linguistic system must be sensitive to the length of vowels. According to previous studies, the majority of function words in Middle and Old Chinese belong to Division III rhyme (short vowels) (Norman 1994; Sun 2007). This phonological feature of function words, or extremely prosodically light constituents, does not contradict the monosyllabic foot analysis of Old Chinese.

The above set of evidence shows that Old Chinese is a moraic foot language, otherwise, there will be no oppositions like the ones between CVC and CV. As for the reason why disyllabic (and reduplicated) words appear later, such as *bi* 筆 (*bljət) 'brush' which can be said as *bulü* 不律 (*pjag ljuat) and *lü* 僂 (*klugx)

'hunchback' as *julü* 句(痀)僂 (Feng 1996; Takashima 1999), can be explained through foot-shift.

3. Simplification of syllabic structures in the transition from Old Chinese to Middle Chinese, with foot-shift thus triggered

This section aims to demonstrate that foot-shift in the history of Chinese was the result of the simplification of Old Chinese syllabic structures, a simplification that led directly to foot-shift in its transition from Old Chinese to Middle Chinese.

3.1 Simplification of syllabic structures

The phonological system of the Chinese language has changed a lot from the pre-Qin period (before 221 BC) to the Han Dynasty (202 BC–220 AD), and the canonical syllabic structure of Old Chinese is being gradually simplified from C(C)VC to CV(C). This tendency is consistent with the preference rule, a law of the Theory of Syllabic Phonology (Murray & Vennemann 1983; Vennemann 1988; Lowenstamm 1996; Levelt, et al. 2000; Berces 2006; Jiang 2014, among many others). This can be shown with the following schema:

(15) CCCMVCC ⟶ CV.

This process involves two aspects: (1) coda reduction and loss, and (2) simplification of consonant cluster. Data from Sino-Tibetan languages provide a reference.

3.1.1 Coda reduction and loss

Coda reduction and loss are well established in the literature (Murray & Vennemann 1983; Vennemann 1988; Mailhammer et al. 2015, among many others). For example, the process of coda reduction (and loss) has been discussed with regard to Sino-Tibetan languages *inter alia*, by Shi & Huang (1996; 1997) on Sino-Tibetan, Chen (1993) on Yi-Burmese, Zhengzhang (1990) and Zhang (2007) on Chinese, Liu (1984) on Qiang, Wang (1983) on Burmese, Zhang (1982), Gelek (1985) and Hua (1982) on Tibetan, Luo (1984) on Thai, and Long (2011) on Buyi. There are also studies dealing with specific issues, like Luo (1991) on *d* in consonant cluster codas in Old Tibetan and Tan (1985) on the change of fricative codas in Tibetan. Generally speaking, this process can be divided into three types (leaving aside issues with laterals, see Shi 2010).

Type I: Voiced stops become voiceless, then glottal stops occur before their eventual disappearance.

(16) -b, -d, -g > -p, -t, -k > -ʔ > Ø

Type II: Nasals merge, losing place distinctions and becoming nasalized vowels subsequently. Eventually, the nasal vowels disappear.

(17) -m, -n, -ŋ { -n, -ŋ ⟶ -n/-ŋ ; -m, -ŋ ⟶ -m/-ŋ } ⟶ Ṽ ⟶ Ø

Type III: The fricative -s either drops off after turning into a glottal stop or is lost directly.

(18) -s { -ʔ ⟶ Ø ; Ø }

3.1.2 Simplification of consonant clusters

Simplification of consonant clusters is also found in many languages, including Sino-Tibetan. In the literature, we have found discussion of Yi-Burmese by Xu Shixuan (1991), Kra-Dai (or Tai-Kadai) by Ni (1996), Miao by Cao (1991), Chinese by Mei (2008) and Zheng (2009), Qiang by Liu (1997), Yi by Zhu (1989), Burmese by Cai (1995) and Zhong (1996; 1999), and Amdo-Tibetan by Hua (1982). This process can be roughly divided into three types:

Type I: C_1C_2 ⟶ C_1, that is, the second consonant has been dropped. Sino-Tibetan languages have witnessed many such changes. For instance, previous reconstructions of Old Chinese provide many examples: *kloog > ku^{214} 'grain' (Zhengzhang 2013: 337), *klaag > *kɤ^{51} 'each' (Zhengzhang 2013: 331).

Type II: C1C2 ⟶ C2, that is to say, the first consonant has been dropped. For example, in OC the consonant cluster fil'- was reduced to l'- (Zhengzhang 2013: 71). Similar processes can also be found in Qiang today: *rbu > bo^{55} 'drum', *sqo > qo^{33} 'difficulty' (Liu 1997).

Type III: C1C2 ⟶ C3, that is, two (or more) sounds in a consonant cluster combine together to form a single distinct sound. Many such examples can be found in Sino-Tibetan. For example, in Chinese: *zluum > ts'an 'silkworm', *mhreeg > p'ai 'dispatch' (Zhengzhang 2013); and in Burmese: *kraj > tɕɛ 'star', *k'rang > tɕ'ĩ 'mosquito' (Zhong 1999).

3.1.3 Simplification of Old Chinese syllabic structures

Compared with the complex syllabic structure of Old Chinese, the syllabic structure of Middle Chinese is much simpler, and the most distinctive feature of which is the loss of consonantal endings (Feng 2009: 29), "the simplification of consonant cluster endings leads to the syllable being restricted in a sonorant ending or a plosive ending" (Sagart 1999: Chapter 2).

Based on previous studies (Ting 1979, 2002; Yu 1985; Wang 1993), Feng (2000; 2009) argued that the syllabic structure of Chinese has undergone the following simplifying processes from ancient times to modern times (C = initial consonant; M = medial; V = vowel):

(19)

(C)(C)C(M)(M)VC(C)	(Early Old Chinese, *Hsieh-sheng* period, 1384–771 BC)
C(C)(M)(M)(V)V(C)	(Middle Old, era of *Shijing*, 770–207 BC)
C(M)(M)V(p, t, k, ʔ/m, n, ŋ)	(Middle Chinese, 5th–12th century AD)
(C)(M)V(m, n, ŋ)	(Pre-Modern Chinese / era of *Zhongyuan Yinyun*, around 1324 AD)
(C)(M)V(n, ŋ)	(Modern Mandarin)
(C)(M)V[9]	(contemporary Beijing Mandarin)

3.2 Foot shift of Chinese

Specifically, in the times of Early Old times (Stage A), syllables had complex structures. Their codas are assumed to be consonant or even complex consonant clusters. This means that a syllable may consist of two or more moræ, satisfying the requirement of foot. However, as the syllable simplifies (Stage B), those coda consonants (or consonant clusters) in Stage A were gradually reduced and disappeared; the length of syllables was shortened. When the syllable was simplified to one vowel (Stage C), i.e., when it included only one mora, the binary-branched foot requirement could no longer be met. That is to say, if Old Chinese is a bimoraic foot language, then in Middle Chinese, due to the simplification of the syllabic structure, especially the loss of rhyme ending, most finals only have one mora left, which is shown as follows:

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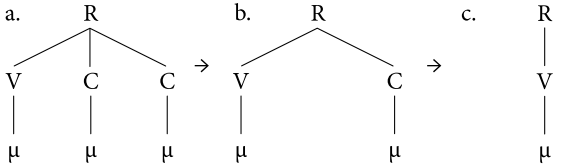
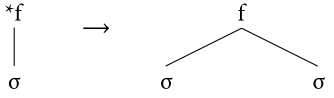
9. According to Wang (1993: xiii), "postnucleusnasals in Beijing Mandarin are nasal approximants instead of nasal stops. This leads to the claim that Beijing has only open syllables."

(20)



As a consequence, however, a monosyllable like (20c) cannot form an independent foot any more, because "a foot must be a branching structure" (Feng 2022: 554). That is to say, due to the fact that the syllabic length became shorter, as shown above, monomoraic syllables could not meet the requirement of a binary-branched foot, and disyllabic feet began to appear.

(21)



This evolution shows that the change in syllabic structure necessarily affects the prosodic structure. The above diagram clearly shows that the prosodic weight gradually decreases in the evolution from (20a) to (20c), the number of moræ drops significantly, and after syllables are simplified, with only one mora left, syllables cannot form feet. The change in syllabic structure will also lead to essential changes in prosodic structure. If syllables in Stage A and Stage B are still heavy syllables, then when arriving at Stage C, the prosodic weight is decreased and branches cannot be formed inside the syllables. Therefore, it can be seen that syllable simplification and foot-shift developed at the same pace in the history of Chinese.

It is worth noting that the establishment of tones plays a key role in the formation of the disyllabic foot. According to Feng (2005), the appearance of tones constrains the formation of feet by moræ inside syllables: "the newly appearing tones came into play, which necessarily led to the non-acceptance of monosyllables by the entire system and their replacement" (Feng 2005: 96). The synchronous development of the gradual establishment of tones and the gradual increase of disyllabic formations highlights that the tone system, to a certain degree, rejects monosyllabic feet; it also means that the existence of monosyllabic feet can be guaranteed in the Old Chinese where there was no tone.[10]

10. It is not clear whether there are tones or not in Old Chinese, however, among the various reconstructions, only Wang's system has tones. If this is true, the syllabic structure of Old Chinese should be linear. Whether the syllabic structure is linear or not is a key factor in discussing the law and mechanism of phonological evolution in Old Chinese. Because the transition from linear syllabic structure to non-linear syllabic structure (the change of syllable length) will

The history of Chinese shows that the establishment of tones and the disyllabification of Chinese develop in tandem. That is, the transformation of Old Chinese syllabic structures from segments to super-segments has a remarkable influence on its "disyllabification." The tone restricts and promotes the development of foot, which is not only responsible for foot changes, but also greatly impacts phonological change (Feng 2005).

It is known that the loss of consonantal endings brings the appearance of tones, and the duration of tones will offset the length of syllables. "If moræ cannot display the difference, the prosodic stress has to be realized through the number of syllables" (Feng 2000: 128, 130). For example, in Modern Chinese, we cannot determine which is more stressed, 八 [pa] or 掰 [pai]. Although their syllable lengths are different, they have the same duration under the same tone contour. Therefore, under tonal influence, the syllable length does not qualify to perform a prosodic function and cannot be used as a basis for forming a foot. It could be said that the tones prevent the inner components of syllables from forming feet inside syllables. This explains why after the Han Dynasty, as the syllabic structure simplifies and tone develops, disyllabic feet gradually displace moraic feet in tone languages.

Of course, it is important to mention here the particularity of the entering tone (入聲) in the entire prosodic shift (Feng 2000: 130). In the process of syllabic structure simplification, characters with an entering tone always keep a bimoraic structure [VC], which can meet the requirement of binary-branched feet and can form feet inside the monosyllables.[11] Therefore, why can monosyllables form feet on the one hand, and the Chinese language has to undergo the process of disyllabic feet on the other hand? This seems to pose some difficulties for the prosodic shift theory. But the fact is that this question can be answered from two angles: in syllables with tones, the syllabic structure of CVC is not longer than that of CV; meanwhile, thanks to the large number of monomoraic syllables [CV] produced by syllable simplification, the entire prosodic system begins to take the number of syllables rather than the number of moræ as the basis of foot realization.

To sum up, because of the two key factors of the simplification of syllables and the establishment of tones, the prosodic stress is necessarily realized through the

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greatly affect the prosodic structure of a language, and this involves the role of tones in the evolution of prosodic types.

11. In fact, *yang*-type rhymes have also kept a bimoraic structure. Moreover, after the Han Dynasty, the vowel ending became prominent (in Old Chinese reconstructions, most scholars reject the component of vowel endings), and this also makes some *yin*-type rhymes have a bimoraic structure. Rhymes which have only one mora are rare. We thank Professor Shi Xiangdong for his contribution to the above consideration.

number of syllables instead of the number of moræ, and thus the entire linguistic system begins to use the number of syllables as a mark of the prosodic stress. In terms of the prosodic structure, the simplification of syllables directly results in a reduction of the prosodic weight of syllables, and *simplification* is just the motivation of Chinese disyllabification. The simplification of syllables leads to the production of Chinese disyllabic feet, which directly results in the disyllabification of Chinese.[12]

4. Disyllabification: Consequence of foot-shift in the history of Chinese

Many pieces of evidence can be found to show that the foot-shift of Chinese has profound influence. This section will address the issue primarily through vocabulary and syntax.

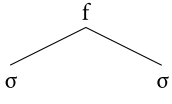
4.1 Vocabulary consequence of foot-shift

Feng (1994; 1998; 2017:111) argues that ever since the Warring States Period (475–221 BC), monosyllabic words gradually could no longer stand on their own, as they had in *Shangshu* (6th century BC), and wherever feet are needed, disyllables will be necessary. For instance:

(22) a. 予何言? (《尚書·益稷》, 6th century BC)
Yu he yan?
I what say
'What should I say?'

b. 是獨遵何哉? (《論衡·禍虛》, 100 AD)
Shi du zun he zai?
it only follow what PAR
'What does it expressly follow?'

Feng (1998) thus believes that the vocabulary constitution indicates that disyllabic foot could start in the Warring States Period, as shown below:

(23)


12. It is worthwhile noting that the shift from monosyllabic foot to disyllabic foot goes through a long process from a diachronic point of view. The disappearance of monosyllabic foot and its replacement by disyllabic foot occurs gradually over time. As for the time this shift takes, it lasts from the Spring and Autumn Period to the Han Dynasty (see Xu Tongqiang 1991:269; Feng 1998).

He considers the Eastern Han Dynasty (25–220 AD) to be the peak of disyllabic combinations in the history of Chinese. According to Zhou (2009: 16–17), in Old Chinese, words were predominantly monosyllabic. This is supported by the statistics shown in Table 1:

Table 1. Monosyllabic and polysyllabic words in pre-Qin documents

Pre-Qin documents	Total words	Monosyllabic words (%)	Polysyllabic words (%)
尚書 *Shàngshū*, 6th century BC	1,924	1,550 (80.6%)	374 (19.4%)
詩經 *Shījīng*, 6th century BC	3,450	2,476 (71.8%)	974 (28.2%)
論語 *Lúnyǔ*, 5th century BC	1,479	1,150 (77.8%)	329 (22.2%)
左傳 *Zuǒzhuàn*, end of 5th century BC	4,177	2,992 (71.7%)	1,185 (28.3%)
墨子 *Mòzǐ*, 4th century BC	3,977	2,641 (66.4%)	1,336 (33.6%)
孟子 *Mèngzǐ*, 3rd–4th century BC	2,240	1,589 (71%)	651 (29%)
莊子 *Zhuāngzǐ*, 3rd–4th century BC	5,170	3,205 (62%)	1,965 (38%)
商君書 *Shāngjun shū*, 4th century BC	1,353	906 (67%)	447 (33%)
荀子 *Xúnzǐ*, 3rd century BC	3,753	2,397 (64%)	1,356 (36%)
韓非子 *Hán Fēizǐ*, 3rd century BC	3,762	2,278 (60.3%)	1,484 (39.7%)
呂氏春秋 *Lǚshì chūnqīu*, 3rd century BC	3,992	2,844 (71.3%)	1,148 (28.7%)

Even in the Six Dynasties period (Middle Chinese), more than 50% of words were still monosyllabic, as shown in Table 2 (from Zhou 2009: 16).

Table 2. Monosyllabic and polysyllabic words in tales of marvel of the Six Dynasties

Documents of the Six Dynasties	Total words	Monosyllabic words (%)	Polysyllabic words (%)
博物志 *Bówù zhì*, 3rd century AD	2,165	1,428 (66%)	737 (34%)
搜神記 *Sōushén jì*, 3rd century AD	3,771	2,208 (59%)	1,563 (41%)
搜神後記 *Sōushén hòujì*, 3rd–4th century AD	2,407	1,396 (58%)	1,011 (42%)
拾遺記 *Shíyí jì*, 4th century AD	3,403	2,054 (60%)	1,349 (40%)
幽明錄 *Yōumíng lù*, 4th century AD	3,368	1,980 (59%)	1,388 (41%)
應驗記 *Yīngyàn jì*, 4th century AD	1,950	1,132 (58%)	818 (42%)
冥祥記 *Míngxiáng jì*, 4th century AD	4,763	2,569 (54%)	2,194 (46%)
異苑 *Yìyuàn*, 4th century AD	3,937	2,059 (51%)	1,879 (48%)

However, comparing the two tables above, we can see that the percentage of monosyllabic words decreases from over 80% to 51%. This tendency continues until Modern Chinese, when words again appear as predominantly disyllabic (about 70%) (Duanmu 1999: 5; Feng 2000: 135). Masini (1993: §2.1) reports his investigation of the post-1949 literary works and shows that 73.7% of the words are disyllabic.

Up to this day, statistics in the literature clearly show the typicality and productivity of disyllabic feet, such as Tang (1988):

> According to statistics in the *3000 Common Vocabulary of Mandarin Chinese*, in the total of 1,621 nouns, 1,379 of them are polysyllabic words, accounting for about 85%; in the 451 adjectives, 320 are polysyllabic words and take up a proportion of 69%; and in the 941 verbs, 575 are polysyllabic, taking up approximately 61%. Lu Zhiwei also collected 4,000 monosyllabic words in Beijing dialect, which only makes up 6% of the 70,000 common words in Beijing dialect.

Tang (1988) also provides another usually unnoticed fact as evidence of the unusually small number of monosyllabic words in Chinese, namely, that aside from personal pronouns of *ni* 你 'you', *wo* 我 'I' and *ta* 他 'he', kinship addressing terms *ba* 爸 'dad', *ma* 媽 'mum', *die* 爹 'dad', and *niang* 娘 'mum', and the noun *ren* 人 'person', there are few other monosyllabic nouns referring to human beings.

According to Lü (1963), a statistical analysis of the *List of 3000 Common Vocabulary of Mandarin Chinese* (initial draft) reveals that among its total of 3,817 words, 1,621 are nouns, 451 are adjectives, and 941 are verbs. In terms of nouns, the number of disyllabic or polysyllabic ones is 1,379, accounting for 85% (disyllabic forms accounting for 75% of all words). As for the adjectives, 311 are disyllabic or polysyllabic (most are disyllabic), accounting for 69%. With reference to verbs, 573 are disyllabic, with a proportion of 61%.

Zhou (1999) finds that, among the 58,481 items collected in the revised edition of the *Modern Chinese Dictionary* (Editorial office of Dictionary, Institute of Linguistics, Chinese Academy of Social Sciences 1996), "the number of disyllabic compounds is 39,548, accounting for about 67.625%."

Wu (2003: 14) conducts a statistical analysis on the *List of 3000 Common Vocabulary of Mandarin Chinese* (Zheng 1987), and it is worth noting that he considers the factor of frequency of use. The result is shown as follows:

In other words, the overall shapes of Chinese words have undergone disyllabification over the course of history.

Table 3. Statistical outcome of the *list of 3000 Common Vocabulary of Mandarin Chinese* (1987)

Frequency of use	Nouns		Verbs		Adjectives	
	Mono-syllabic	Di-syllabic	Mono-syllabic	Di-syllabic	Mono-syllabic	Di-syllabic
1–1000 words	136	170	172	60	57	24
	77%	23%	71%	29%	70%	30%
1–2000 words	254	438	343	184	96	86
	37%	63%	65%	35%	53%	47%
1–3817 words	242	1,379	368	573	140	311
	15%	85%	39%	61%	31%	69%

4.2 Syntactic consequence of foot-shift

Feng (2013) indicates that although Old Chinese in the Pre-Qin Period was an SVO language, SOV order could also be found. After the Han Dynasty, however, when the question + object is made up of two components, like *he zui* 何罪 'what crime.' It will not be placed before the verb, even before Chinese [wh-V] evolved into [V-wh]. For example, a sentence like the following cannot be found in Old Chinese:

(24) *宋何罪有?
**Song he zui you?*
Song what crime have

But, [what-N pro-V] and [V what-N] structures are quite common, such as:

(25) a. 宋何罪之有? (《墨子·公輸》, 4th century BC)
Song he zui zhi you?
Song what crime PAR have
'What crime(s) did Song commit?'

b. 前身有何罪? (王梵志詩, around the end of 6th century AD)
qianshen you he zui?
prelife have what crime
'What crime did the prelife commit?'

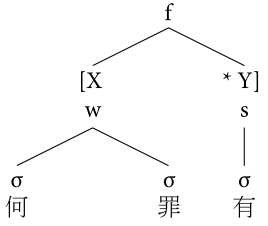
Why is **he zui you* 何罪有 in (24) illegitimate while *he zui zhi you* 何罪之有 in (25a) legal? According to Feng (1994), Chinese was originally an SOV language, and later evolved into a well-known SVO language (1000 BC). Therefore, OV word order such as [wh-V] should be the residual of SOV. Then, how do we explain the fact that SOV still exists? Feng further notes that Old Chinese is an

SVO language, which makes the primary sentential stress fall on the right side of the sentence,[13] so it follows the Nuclear Stress Rule (Feng 2013):

(26) **Nuclear Stress Rule**
For $[X\,Y]_P$, if X and Y are the constituents of phrase P and P is the last phrase in the sentence, then Y should be stressed.

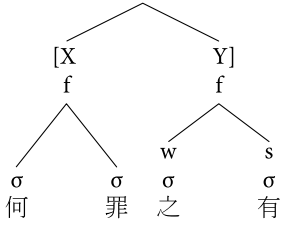
According to the Nuclear Stress Rule, if the ending phrase of a sentence is assigned a stress, the sentence is legal. The illegitimate sentence **he zui you* 何罪有 has the verb *you* 有at its end, therefore, *he zui* 何罪 can be regarded as the X in the Stress Rule and *you* 有 as Y. However, the monosyllabic word 有 cannot form an independent foot and thus cannot be assigned a nuclear stress, as shown in (26).

(27)



Assume that *zhi* 之 is attached to the verb *you* 有, forming a foot,[14] then the fact that *he zui zhi you* is acceptable can be accounted for. That is to say, in this structure, *he zui* is the X in the Stress Rule, and *zhi you* is the Y to realize the sentence stress.

(28)



Moreover, the prosodic effect of the redundant syllables provides better evidence, for example:

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13. See the Non-head Stress Rule of Duanmu (1990) or the Depth Stress Rule of Cinque (1993). These two hypotheses maintain that normally, the phrasal stress should be assigned in the following way: in [XP Y] structure or [Y XP] structure, the stress falls on XP or the syntactic complement.

14. Feng believes that in the remaining SOV structure (such as *he zui zhi you* 何罪之有), *zhi* 之 and *you* 有 cannot be separated. This means that *zhi* is a prosodic element attached to the verb *you* to satisfy the footing requirement.

(29) 夥頤，涉之爲王沈沈者！ (司馬遷《史記·陳涉世家》)
Huo yi, She zhi wei wang chen chen zhe
Many INTERJ Chen.She PAR as king deep deep PAR
'Wow! So deep is (the palace) of King Chen She!' (Sima 2014: 778)

This sentence is the closest to the spoken Chinese of Sima Qian's time (154 BC–?), and Fu Qian (184? AD–?) explained:

(30) 【索隱】服虔云：「楚人謂多爲夥。又言頤者，助聲之辭也。」
[Suoyin] Fu Qian yun: "Churen wei duo wei huo. You yan yi zhe,
[Annotation] Fu Qian say People of Chu call many as many and say
zhusheng zhi ci ye."
YI PAR interjection PAR
'Annotation: Fu Qian said that People of Chu pronounced *duo* as *huo*, and the *yi* following it is an interjection.' (Sima 2014: 778)

According to Fu Qian, the exclamation *huo yi* 夥頤 has the same meaning as that of monosyllable *huo* 夥; therefore, *yi* 頤 is a semantically redundant component. Its appearance here is to provide prosodic support to *huo*. The fact that monosyllabic components need extra *supplemental syllables* while disyllabic components do not indicates that monosyllables cannot form prosodically independent feet to realize exclamation stress and focus stress. Thus, the use of supplemental syllables offers further evidence for the above argument that disyllabic units constitute standard feet.

5. Conclusion

Starting from the syllabic structures, the current paper endeavors to explore the foot-shift in the history of Chinese from the perspective of prosodic grammar. It is argued that Old Chinese with monosyllabic feet evolved into disyllabic feet of Modern Chinese. The shift finds a common source: i.e., triggered by syllabic structural simplification. The disappearance of bimoraic feet in Old Chinese comes from the loss of consonantal coda and consonantal cluster coda, and this loss leads to the disappearance of heavy syllables and super-heavy syllables. This change results in the foot-shift in the history of Chinese: Disyllabic feet replacing bimoraic feet to make up for the loss. The foot determines its prosodic words, and thus the foot-shift in the history of Chinese exerts a direct influence on Chinese – the disyllabification of Chinese words.

The disyllabification of Chinese is an important event in the history of Chinese, which involves not only phonological issues, but also aspects of vocabulary, grammar, language use, styles, etc. It can be seen from the whole evolution

of Chinese disyllabification that the complex syllables of Old Chinese provide a guarantee for bimoraic feet, making its words display a monosyllabic form. However, as the Chinese syllabic structures are simplified to CV and the production of tones erases the difference between polymoraic syllables and monomoraic syllables, the moraic foot cannot be realized within one syllable and can only form a disyllabic foot together with another syllable. Thus, Chinese starts a process of disyllabicity. One way of understanding the evolution is that the disyllabification of feet in Modern Chinese is a compensatory mechanism to maintain foot complexity.

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List of abbreviations

ι	intonational phrase	f	foot
μ	mora	F	finals
σ	syllable	I	initial
υ	utterance	M	medial
φ	Phonological Phrase	O	object
ω	prosodic word	S	subject
C	consonant	V	vowel; verb
E	ending or coda	CG	Clitic Group

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