

Encyclopedia of Chinese Language and Linguistics

Volume 3

Men–Ser

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2017

Typeface for the Latin, Greek, and Cyrillic scripts: "Brill". See and download: brill.com/brill-typeface.

ISBN 978-90-04-18643-9 (hardback, set)
ISBN 978-90-04-26227-0 (hardback, vol. 1)
ISBN 978-90-04-26223-2 (hardback, vol. 2)
ISBN 978-90-04-26224-9 (hardback, vol. 3)
ISBN 978-90-04-26225-6 (hardback, vol. 4)
ISBN 978-90-04-26226-3 (hardback, vol. 5)

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This book is printed on acid-free paper and produced in a sustainable manner.

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Peggy Li

Prosodic Morphology

Prosodic morphology studies the shapes and sizes of canonical words and affixation in a language. Although it is a new area in Chinese linguistics as well as in general linguistics, many prosodic morphological phenomena have been recognized starting a half century ago. Guō first pointed out the syllabic flexibility of Chinese vocabulary items in 1938, while Lǚ first recognized the morphosyntactic preferences between 2+1 and 1+2 syllabic patterns in 1963. For example see (1).

1. a.	鞋廠	皮鞋廠	*鞋工廠	皮鞋工廠
	xiéchǎng	píxié chǎng	*xié gōngchǎng	píxié gōngchǎng
	'shoe factory'	'leather shoe factory'	'shoe factory'	'leather shoe factory'
b.	讀報	*閱讀報	讀報紙	閱讀報紙
	dú bào	*yuèdú bào	dú bàozhǐ	yuèdú bàozhǐ
	'read newspaper'	'read newspaper'	'read newspaper'	'read newspaper'

The most recent and important works on prosodic morphology were initiated by Lu and Duanmu in 2002 [1991] and Feng in 1995; the former employed a stress theory which successfully captured the difference between the 2+1 (nominal) and 1+2 (verbal) behaviors in Chinese grammar, while the latter introduced Prosodic Morphology (McCarthy and Prince 1993) into Chinese linguistics and developed a subsystem in Chinese prosodic morphology.

The crucial point in prosodic morphology, as defined by McCarthy and Prince, is as follows: "The right/left edge of some grammatical constituent coincides with the corresponding edge of some phonological constituent" (McCarthy and Prince 1993:79–153). Applying the theory to Chinese, Feng (1995, 2009) proposed that the sizes of Chinese morphological categories of morpheme and word would coincide with the prosodic categories of mora and foot respectively in the language. According to the theory of Alignment: [M]=[σ] (morpheme coincides with syllable), the notion of Morphosyllabicity, created and defined by DeFrancis (1986), is formulated as a prosodic constraint given in (2).

2. **Morphosyllabic Constraint (MC)** ("M" stands for morpheme and "σ" for syllable):
[M] = [σ] ALIGN: M-Edge, σ-Edge =
Left, Right

The MC in (2) indicates that Chinese syllables constitute morphemes and demands that indigenous morphemes in Chinese are monosyllabic, which is basically true as the statistics show (Shen 2007). In the 5th Edition of *Xiàndài Hànyǔ Cídiǎn* 現代漢語詞典 Modern Chinese Dictionary (2005), there is a total of 41,915 words, of which only 849, or 3%, are polysyllabic morphemes, which are arguably all non-indigenous in nature in the sense that they are loan words

either borrowed from other languages or passed down from classical Chinese thousands of years ago (Shen 2007). Aside from the complexity of the origins of polysyllabic words, they are neither indigenous in character, nor root morphemic in morphology in Mandarin Chinese (see Sproat and Shih 1996, Feng 2011).

Empirically, the Morphosyllabic Constraint (2) can be tested by the fact that polysyllabic forms were/are often morphemized into, and thus indigenized as, a monosyllabic morpheme in today's morphological process (Spoart and Shih 1996). For example:

3.	fótuó	佛陀	< Buddha (borrowed into China around the first century)
	fó-jīng	佛經	'Buddhist sutra'
	fó-diǎn	佛典	'Buddhist Document, Sutra'
	fó-fǎ	佛法	'Buddhist doctrine/power'
	fó-jào	佛教	'Buddhist teaching, Buddhism'
	fó-xué	佛學	'Buddhist Study'
	chéng-fó	成佛	'become a Buddha'
	dà-fó	大佛	'great Buddha'
	huó-fó	活佛	'current Buddha'

Furthermore, a well-known phenomenon in Chinese phonology is this: There is no resyllabification process in the language, for example:

CVC|VC → *(CV (CVC) lin-an → *li-nan

The lack of a resyllabification process in Chinese phonology is arguably an effect of the Morphosyllabic Constraint, namely that the morpheme-final consonant or vowel must occupy the final position in the corresponding syllable, and the morpheme-initial C or V must occupy initial position in that syllable. Consequently, a "morpheme mid-syllable/consonant" will de-align a morpheme (see McCarthy and

Prince 1993:38). This may be why there is no such ‘de-alignment’ operation (re-syllabification) in Mandarin Chinese (Feng 1995).

Last but not least, the Morphosyllabic Constraint (2) also brought to life a phonological reduction when lexical morphemes become functional, as Kratochvil (1977) observed: “under some conditions it (i.e., ‘the leftward movement of stress’ in a disyllabic word; Feng 1995) causes atonicity, reduction in the segmental structure, and ultimately the loss of syllable status of B altogether, and its fusion with A (in an A+B construction)” and thus, “Modern Peking Dialect shows signs of a process involving syllable fusion as its ultimate result” (Kratochvil 1977:26–27). Note that this process exclusively happens to functional elements and no root morphemes are undergoing phonological reduction in the language. This provides a strong possibility that the phonological reduction of the second syllable in disyllabic words may be a result of the Morphosyllabic Constraint. That is, all root morphemes follow the MC in (2) and only functional elements (or roots lost their lexical meaning in a disyllabic form) are exceptional. For example:

4. Monosyllabic Word 600 CE	Disyllabic Word 11th Century	Monosyllabic Word Mandarin Chinese
孩 <i>hái</i>	孩-兒 <i>hái-ér</i>	孩兒 <i>hái</i>

hái-ér (child-son) is a disyllabic word formed by *hái* (child) plus a monomorphemic nominal suffix *-ér* which etymologically means ‘son’ or ‘child’ in classical Chinese and was weakened as a diminutive suffix around the Táng Dynasty (618–907 CE) (Norman 1988:114). However, the second syllable *er* in almost all nouns of Mandarin Chinese has been reduced to only a /r/ feature fused on the preceding syllable yielding what Kratochvil (1977) called a fusion syllable.

Are there disyllabic or polysyllabic words in Chinese? The answer is yes, but they are overwhelmingly made by compounding of monomorphemes in prosodic morphology. While the

morphemes in Chinese coincide with syllables, the combination of morphemes coincides with a bigger prosodic category than the syllable in the Prosodic Hierarchy given below. According to the Prosodic Hierarchy proposed in McCarthy and Prince (1993), the next hierarchical category above the syllable is the foot.

5. Prosodic Word	(PrWd = Compound)
Foot	
Syllable	
mora	

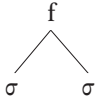
As seen in (5), the prosodic category above the foot is the Prosodic Word (PrWd) and in fact, a PrWd is realized by a foot. As a result, a foot is essential in determining (or imposing upon) the morphological category PrWd. What is a foot in Chinese?

The foot formation in Chinese can be successfully tested by using nonsense syllable strings (sound translation of foreign names) or syntactically non-structured words (a string of identical numbers), or syntactically equal-structured words (coordinating monosyllabic words) as follows (‘()’ represents rhythmic group):

6. a. (55) (55) ((55)5)
b. 柴 米 油 鹽 醬
(chái mǐ) (yóu yán) ((jiàng
firewood rice oil salt sauce
醋 茶
cù chá)
vinegar tea
c. 加利 弗尼亞
(jiā lì) ((fó ní) yà)
California

The rhythmic groups in (6) are rightwardedly organized into disyllabic units (feet) with the stray syllable attached to the last foot when the syllable string contains an odd number. This is called Natural Foot Formation, which is formulated as follows (Feng 1998):

7. Natural Foot Formation (NFF)



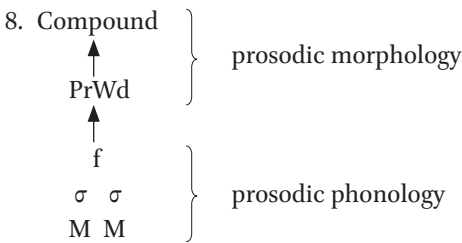
A natural footing in Mandarin Chinese is grouped by two syllables from left to right and attaches the stray syllable to the neighboring foot when the number of syllables is odd.

The generalization of NFF has a number of implications in Chinese prosodic morphology.

First, as seen in the Prosodic Hierarchy (5), the prosodic foot will realize a unit in morphology called the Prosodic Word in a language. If a standard foot in Chinese is disyllabic, the standard PrWd in Chinese will also be disyllabic, which directly controls the morphological processes of the language.

A remarkable effect of prosodic word (PrWd, for short) constraint in Chinese morphology is the → reduplication process in the language. For example, the outcome of noun reduplication (meaning ‘every noun’) in Chinese must be a PrWd, thus, *jiā-jia* 家家 ‘family-family, every family’, *nián-nián* 年年 ‘year-year, every year’ are acceptable but not **xīngqī-xīngqī* *星期-星期 ‘week-week, every week’, because the latter is formed bigger than the size of a PrWd.

The theory of prosodic word explains precisely what Chinese compounds come about as first proposed in Feng (1997) (where ‘M’ stands for morpheme, ‘σ’ for syllable):



According to (8), “a compound in Chinese must first be a prosodic word, though a prosodic word is not, by necessity, a compound.” This generalization captures the facts that (i) word formation in Chinese is overwhelmingly (if not exclusively) a compound formation, that is, a process of combining a monosyllabic morpheme/word with

monosyllabic morpheme/word, and thus, (ii) the majority of Chinese compounds are disyllabic. That is to say, new words, rather than the old and most commonly used ones like *shǒu* 手 ‘hand’, *tóu* 頭 ‘head’, *niú* 牛 ‘cow’, *yáng* 羊 ‘sheep’, etc., that were passed down from thousands of years ago and are thus exceptional to the modern prosodic constraint, are formed almost exclusively by no fewer than two syllables in Mandarin Chinese. Morphological/prosodic rules apply to different classes of morphological categories. Thus the standard size of all new (compound) words is overwhelmingly disyllabic, which is born out as predicted in the following statistic (Zhāng 1997): disyllabic words make up 49,641 (70.6%) of the total 70,343 words in Mandarin Chinese.

Second, the NFF also entails that monosyllabic forms cannot stand alone where an independent prosodic unit is required. This is evidenced by the following example.

9. A: 你去哪兒?
 Nǐ qù nǎr?
 2SG go where
 ‘Where do you go?’
- B: a. 我去大興 (縣)。
 Wǒ qù Dàxīng (xiàn).
 1SG go Dàxīng county
 ‘I am going to the county of Dàxīng.’
 b. *我去通 (縣)。
 *Wǒ qù Tōng (xiàn).
 1SG go Tōng county
 ‘I am going to the county of Tōng.’
- C: a. 我去日本 (國)。
 *Wǒ qù Riběn (guó).
 1SG go Japan country
 ‘I am going to Japan.’
 b. *我去美 (國)。
 *Wǒ qù Měi (guó).
 1SG go America country
 ‘I am going to America.’

In Chinese you may answer a question about the date by mentioning any polysyllabic number, but if one wants to specify a monosyllabic number, one has to add the syllable *hào* 號 ‘number’ otherwise the sentence is unacceptable. The same is true for monosyllabic place names as seen in (9c).

10. 2+2	1+2	2+1
複印文件	印文件	複印件
<i>fùyìn wénjiàn</i>	<i>yìn wénjiàn</i>	<i>fùyìn jiàn</i>
copy document	copy document	copy document
'a copied document'	*'a copied document'	'a copied document'
'to copy document'	'to copy document'	*'to copy document'

Given the unacceptable monosyllabic forms in prosodic parsing, it follows that trisyllabic units should be allowed by the grammar even if they are highly conditioned; in other words, when a monosyllabic morpheme or a word is used, it must attach to a neighboring foot in order to be not ruled out by the NFF. This has in fact resulted in what is called a Super Foot Formation giving rise to trisyllabic compounds in the language.

Given the NFF and the Super Foot Formation (SFF), the sizes of Chinese wordhood produced in morphology will be at minimum two and at maximum three syllables long under the prosodic morphological system outlined above. Aside from loan words and phrasalized expressions, the [2 > word > 3] generalization for word size is true for 82.4% of compound words produced by the prosodic word formation (Zhāng 1997, Zhōu 1998).

The third important implication of the NFF is its grammatical function of the directionality: Left-footing is preferred by word formation while right-footing is favored by phrasal prosody in Chinese prosodic morphology. Compare (10).

fùyìn wénjiàn 複印文件 'copy document' is a [2+2] syllable pattern hence the footing directions make no difference whether it is leftwarded (i.e., 2+2) or rightwarded (also 2+2) and as result, the outcome of the 2+2 word strings can be either a word or a phrase:

11. 兩份複印文件
liǎng fèn fùyìn-wénjiàn
two CLF copied-document
'two copied documents'
複印了兩份文件
fùyìn-le liǎng fèn wénjiàn
copy-ASP two CLF document
'copied two documents.'

However, the double-directional property of 2+2 will not be shared by the 1+2 and 2+1 rhythmic structures, because 1+2 is rightwarded and 2+1 is leftwarded and as a result, the dual properties that are obtained in the 2+2 rhythmic structure (i.e., being either a phrasal or a word category) cannot be shared by the 1+2 or 2+1 as shown in the following facts.

12. a. 皮鞋工廠 皮廠
píxié gōng-chǎng pí chǎng
leather-shoe worker-mill leather mill
'leather shoe factory' 'leather factory'
皮工 鞋工
pí gōng xié gōng
leather worker shoe worker
'leather worker' 'shoemaker'
鞋廠
xié chǎng
shoe mill
'shoe-factory'
- b. 皮鞋工 皮鞋廠
píxié gōng píxié chǎng
leather-shoe worker leather-shoe mill
'leather shoe factory' 'leather factory'
*鞋工廠 *皮工廠
*xié gōngchǎng *pí gōngchǎng
shoe worker-mill leather worker-mill
'shoe-factory' 'leather factory'
大皮鞋 小工廠
dà píxié xiǎo gōngchǎng
big leather-shoe small worker-mill
'a big leather shoe' 'a small factory'

The surprising footing-effect is this: noun compounds favor the rhythmic pattern of 2+1 while the adjective+noun phrases prefer 1+2. It has been commonly assumed that the combination of Noun+Noun (like 'leather factory') creates compound words, while that of Adjective+Noun (big factory) produces phrases in Chinese

(Duanmu 1990). Given this, it is expected that the 1+2 pattern is not acceptable for N+N but perfect for A+N because it is a phrasal prosody, as seen in (12). A corpus-analysis (Duanmu 2011) shows that only 1% of N+N compounds in Chinese are formed by the 1+2 syllable pattern such as *jīn xiàngliàn* 金項鏈 ‘gold necklace’, *zhǐ lǎohu* 紙老虎 ‘paper tiger’, etc. However, even if the *jīn- xiàngliàn* and *zhǐ- lǎohu* exist in Mandarin Chinese, it does not mean that *jīn* and *zhǐ* can be freely used to create 1+2 noun compound, as the following examples show:

13. a. *金工廠 b. *紙工廠
 *jīn gōngchǎng *zhǐ gōngchǎng
 gold factory paper factory
 ‘a gold factory’ ‘a paper factory’

Note that “gold necklace” and “gold factory” are different. ‘Gold necklace’ means that ‘the necklace is made of gold’, while ‘gold factory’ means ‘the factory that produces gold’. “Made of gold” and “producing gold” have two different internal-relationships between elements within the nouns (i.e., necklace and factory). When gold is used with a meaning of “made of” as in “gold necklace”, it functions as a property classifying the head “necklace,” which is why it uses the phrase prosody of 1+2 to describe the head, the result of which is acceptable. However, when ‘gold’ is used to mean a “product” as in “gold factory,” it occurs in a position generated by compound formation and hence it cannot use the 1+2 phrasal prosody, and thus the result is unacceptable (13). Interestingly, if *jīn-gōngchǎng* 金工廠 is understood, even if the semantics is unrealistic, as ‘a factory that is made of gold’, then the result is acceptable exactly like ‘gold necklace’ (the same is true with *zhǐ-gōngchǎng* 紙工廠 if it is understood as ‘a factory that is made of paper’). Apparently, the prosodic system recognizes the phrasal semantics and compound semantics by allowing the former with 1+2 and later with 2+1, which shows the grammatical function of foot directionality.

Finally the MC, NFF and SFF together derive a notion of the minimal word in Chinese. For example, only by conforming to the size of a minimal word, (i) can a VO be formed to take

an outer object as seen in (14a), (ii) can an [Auxiliary+V] become an adjective as in (14b), (iii) can a VO be used as an adverb as seen in (14c), and finally, (v) can a [size+N] be modified by color as seen in (14d).

14. a. *開玩笑他
 *kāi wánxiào tā
 make joke 3SG
 ‘make fun of him’
 a’ 取笑他
 qǔ xiào tā
 take joke 3SG
 ‘make fun of him.’
 b. *非常可懷疑
 *fēicháng kě huáiyí
 extremely can suspicious
 ‘extremely suspicious’
 b’ 非常可疑
 fēicháng kě yí
 extremely can suspicious
 ‘extremely suspicious’
 c. *並肩膀戰鬥
 *bìng jiānbǎng zhàndòu
 juxtapose shoulder fight
 ‘fight side-by-side’
 c’ 並肩戰鬥
 bìng jiān zhàndòu
 juxtapose shoulder fight
 ‘fight side-by-side’
 d. *黑大汽車
 *hēi dà qìchē
 black big vehicle
 ‘a big black vehicle’
 d’ 黑大雁
 hēi dà yàn
 black big gander
 ‘a black goose’

As seen above, the prosodic morphology in Chinese has its unique characteristics. First, instead of affixation controlled by prosody as in many other languages, prosody in Chinese morphology mainly affects compound word formation. Second, prosodic morphology in Chinese directly interacts with syntax. Finally, prosody may not only constrain morphology, it is part of morphology, which may better be considered as morphological prosody.

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Psycholinguistics, Overview

1. INTRODUCTION

In its primary sense, psycholinguistics is an interdisciplinary field in which linguists and psychologists use behavioral evidence to study how language is processed in the normal adult mind, though more broadly psycholinguistics also encompasses the learning of language by children and adults (language acquisition) and the implementation of language processing in the brain (neurolinguistics). This lemma gives an overview of psycholinguistics in its primary sense, reviewing its scope and history and describing some representative studies on Chinese. (For another general review of Chinese psycholinguistics, see Li *et al.* 2006; for a review of Chinese language acquisition, → Acquisition of L1, Overview; for a review of Chinese neurolinguistics, → Neurolinguistics, Overview.)

2. THE SCOPE OF PSYCHOLINGUISTICS

Psycholinguistics is notoriously difficult to define (Tanenhaus 1988). This is even reflected in the name: psycholinguistics (*xīnlǐ yǔyánxué* 心理語言學), a branch of linguistics, is also often called psychology of language (*yǔyán xīnlǐxué* 語言心理學), a branch of psychology. Crucial to understanding psycholinguistics is seeing how it relates to, yet differs from, both theoretical linguistics and neurolinguistics.

One tool for addressing this issue is the notion of levels of analysis proposed by the psychologist and neuroscientist David Marr (1982). He noted that any complex system can be described in terms of what it does (its function or abstract computation), how it does it (its representations and algorithms), and how it is realized (its physical implementation). In the case of language, the computational level describes the abstract