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## Wordhood in Chinese\*

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### 1. Introduction

While *zi* 'character' has figured prominently throughout the long history of Chinese linguistics, *ci* 'word' was hardly a topic prior to the twentieth century. According to Lü (1990: 367, note 3), the first Chinese scholar to talk about *ci* 'word', as in contrast to *zi* 'character', was Shizhao Zhang (1907). Real discussion did not occur until the 1950s, when, prompted by the desire to introduce an alphabetic writing system, wordhood became an issue of urgency and many studies ensued. It was soon realized, however, that the task at hand was harder than one had thought, since testing criteria often conflicted with each other (see, for example, Lu [1964], Ling 1956, Fan 1958, Chao 1968, Lü 1979, Huang 1984, H. Zhang 1992, Dai 1992). This has made some leading scholars doubt whether defining "word" in Chinese is a meaningful thing to do. For example, in his classic work on Chinese grammar, Y. R. Chao (1968: 136) states that "Not every language has a kind of unit which behaves in most (not to speak all) respects as does the unit called 'word' ... It is therefore a matter of fiat and not a question of fact whether to apply the word 'word' to a type of subunit in the Chinese sentence". Similarly, Shuxiang Lü (1981: 45) says, "the reason why one cannot find a satisfactory definition for the Chinese 'word' is that there is nothing as such in the first place. As a matter of fact, one does not need the notion 'word' in order to discuss Chinese grammar."

The distinction between words and phrases, however, is of vital importance to both morphology and phonology. Without knowing what a word is, one cannot meaningfully talk about morphology. Similarly, some phonological rules, such as stress assignment and the determination of tonal domains, apply differently at the word level from the phrase level (cf. for example, Selkirk and Shen 1990; Duanmu 1992, 1993; H. Zhang 1992; and section 5 below). Without a distinction between words and phrases, such rules would appear *ad hoc*.

In this paper I discuss the distinctions between word and phrase in Chinese with regard to their morpho-syntactic, semantic, and phonological properties. The term "word" as used here refers to an  $X^0$  in the X-bar theory,

and the term “phrase” refers to an XP in the X-bar theory. A “phrase” therefore can be either a phrase or a clause in the ordinary sense, which I will not distinguish. For example, *da de shu*<sup>1</sup> ‘big DE tree’ will simply be called a phrase, whether one analyzes it as ‘a big tree’ or ‘a tree that is big’ (cf. Sproat–Shih 1991 for the latter position). Note also that for a word that contains two or more morphemes, such as *gao-xing* ‘glad’ (literally ‘high-mood’), I will not be concerned with whether it should better be called a compound or something else, although I will use the term “compound” when there is no possibility of confusion.<sup>2</sup> I will also assume that a word can be made of words, departing from Lu’s [1964] position that a word can only be made of morphemes. Finally, for reasons of space, I will not discuss all forms of word structures. Instead, I will focus on nominal structures, and even here the discussion will not be exhaustive.

In section 2 I review previous morpho-syntactic and semantic criteria for testing wordhood and show the conflicts among them. In section 3 I suggest which criteria should be abandoned, which modified, and which adopted. Unlike the popular view, represented by Chao (1968) and Lü (1981), I conclude that wordhood in Chinese is clearly definable. In particular, a modifier-noun [M N] nominal without the particle *de* is a compound; so are its derivatives, such as [M [M N]], [[M N] N], [[M N] [M N]], etc., as proposed by Fan (1958) and Dai (1992). In section 4 I discuss some background in metrical and tonal phonology, as a preamble to section 5, where I give phonological evidence for wordhood in Chinese, which has been discussed very little previously. I show that phonological evidence and morpho-syntactic and semantic evidence support each other, and when one is missing the other can often fill the gap. In section 6, I discuss some remaining problems.

## 2. Previous criteria

In this section I review morpho-syntactic and semantic criteria that have previously been proposed for testing wordhood in Chinese. The list is probably not exhaustive but contains the important criteria.

### 2.1. The Lexical Integrity Hypothesis (LIH)

Huang (1984) suggests that most differences between a word and a phrase in Chinese can be attributed to the Lexical Integrity Hypothesis, which “is the single most important hypothesis underlying much work on Chi-

nese compounds” (1984: 64). Similarly, in a comprehensive study on Chinese morphology, Dai (1992: 80) suggests that “the LIH is a theoretical universal, slight variants of which underlie most current linguistic theories.” Following Jackendoff (1972) and Selkirk (1984), Huang (1984: 60) states the Lexical Integrity Hypothesis as follows:

- (1) The Lexical Integrity Hypothesis  
No phrase-level rule may affect a proper subpart of a word.

Intuitively, the Lexical Integrity Hypothesis makes good sense. For phrasal rules, words are usually the minimal units whose internal structures are no longer accessible. In practice, however, it is not always easy to decide which operation is a phrasal rule, and different test criteria often give conflicting results. In the following, therefore, I will review various test criteria separately.

### 2.2. Conjunction Reduction

Huang (1984) suggests that in both Chinese and English Conjunction Reduction can be applied to coordinated phrases but not to coordinated words. For example, consider the following (the latter two are taken from Huang 1984: 61):

- (2) a. [*jiu de shu*] *gen* [*xin de shu*]  
old DE book and new DE book  
‘old books and new books’  
b. [*jiu de gen xin de*] *shu*  
old DE and new DE book  
‘old and new books’
- (3) a. [*huo-che*] *gen* [*qi-che*]  
fire-car and gas-car  
‘train and automobile’  
b. \*[*huo gen qi*] *che*  
fire and gas car
- (4) a. [*New York*] *and* [*New Orleans*]  
b. \*New [York and Orleans]

(2a) is a conjunction of two phrases, so Conjunction Reduction can apply to delete the first *shu* 'book', giving (2b). In contrast, (3a) is a conjunction of two compounds, so Conjunction Reduction cannot apply, as shown by the ill-formed (3b). The same is true in English. In (4a) there is a conjunction of two proper names, which behave like compounds rather than phrases, therefore Conjunction Reduction cannot apply, as shown by the badness of (4b).

As Huang suggests, Conjunction Reduction is a phrase-level rule. By the Lexical Integrity Hypothesis, Conjunction Reduction cannot be applied to coordinated words. In other words, the Conjunction Reduction effect is a reflex of the Lexical Integrity Hypothesis.

The Conjunction Reduction effect has been observed before. For example, Fan (1958) suggests that there are two kinds of nominals in Chinese, as shown below (M = modifier, N = noun, *de* = a particle):

- (5) a. [M *de* N]  
b. [M N]

As Fan shows, these nominals behave quite differently in a number of ways. Among the differences, Fan notes (1958: 215) that Conjunction Reduction may apply to (5a) but not to (5b) as we saw in (1)–(3). Further examples are shown below:

- (6) a. [*xin de yi-fu*] *he* [*xin de xie*]  
new DE clothes and new DE shoe  
'new clothes and new shoes'  
b. *xin de* [*yi-fu he xie*]  
new DE clothes and shoe  
'new [clothes and shoes]'
- (7) a. [*yang mao*] *he* [*yang rou*]  
sheep wool and sheep meat  
'sheep wool and sheep meat'  
b. \**yang* [*mao he rou*]  
sheep wool and meat  
'sheep [wool and meat]'

(6a) is a conjunction of two [M *de* N] structures, so Conjunction Reduction may apply to give (6b). In contrast, (7a) is a conjunction of two [M N] structures, so Conjunction Reduction cannot apply to give the intended (7b).

By the Conjunction Reduction criterion, all [M *de* N] nominals are phrases, and all *de*-less [M N] nominals are words. This is what Fan (1958: 216) suggests. In addition, the Conjunction Reduction criterion can be applied iteratively, so that [M [M N]], [[M N] N], [[M N] [M N]], etc., are also words. For example, not only is *xin shu* 'new book' a compound, but [*xiao* [*xin shu*]] 'small new book', [[*da yan-jing*] *gu-niang*] 'big-eyed girl', [[*chang mao*] [*xiao gou*]] 'long-haired small dog' are also compounds, and so on.

The Conjunction Reduction test is challenged by Dai (1992, Chapter 3), who argues that coordination may appear inside a compound, therefore Conjunction Reduction is not a phrase-level rule. For evidence, Dai cites compounds like *television and VCR table* (1992: 65) and *anti-and pro-democracy* (1992: 123), which contain compound-internal coordination. We will return to Dai's criticism in section 3. We will also see below that the Conjunction Reduction test is in conflict with several other tests.

### 2.3. Freedom of Parts

The Freedom of Parts criterion, termed after Chao (1968: 361), says that if an immediate component of an expression is a "bound" form, such as an affix, then this expression is a word. The Freedom of Parts criterion has been proposed by earlier researchers such as Lu [1964] and Ling (1956). By Freedom of Parts, *jin-zi* 'gold' and *gao-xing* 'glad' (literally 'high-mood') are both words, since in the former both parts are bound forms, and in the latter the second part is a bound form. Huang (1984: 63) suggests that Freedom of Parts is derivable from the Lexical Integrity Hypothesis, presumably because a phrase consists of words, and all words are free; if an expression contains a bound form, then it cannot be a phrase.

Lü (1979: 21) points out that the Freedom of Parts test may lead to wrong results, a problem that was also noted by Lu [1964]. For example, the Chinese question marker *ma* is not a free form, but it does not make sense to consider a whole question sentence to which *ma* is attached a compound. In addition, it will be noted that the reverse of Freedom of Parts does not hold, that is, one cannot assume that if all parts of an expression are free forms, then the expression is a phrase. In English, for example, both *black* and *bird* are free forms, yet *blackbird* is a compound. Similarly, consider the Chinese examples below:

- (8) a. Free-Free      b. Bound-Free  
       *ji dan*            *ya dan*  
       'chicken egg'    'duck egg'

It happens that *ji* 'chicken' is a free form, but *ya* 'duck' usually has to be used with a meaningless suffix *zi*. As Lü points out, if the reverse of Freedom of Parts is true, one arrives at the rather absurd conclusion that *ji dan* 'chicken egg' is a phrase but *ya dan* 'duck egg' a word.

It is generally true, however, that if one part of an expression is bound, and if the other part is not a phrase, then the expression must be a word. If both parts are free, then one has to use additional criteria. This is the approach of Lü (1979) and Chao (1968), among others.

#### 2.4. Semantic Composition

Chao (1968: 363) proposes that for an expression whose parts are free, we can check whether the meaning of the expression is compositional from its parts. If the meaning is not compositional, then the expression is usually a word. If the meaning is compositional, then the expression is usually a phrase. Let us call this criterion Semantic Composition. For example, consider an example from Chao (1968: 363):

- (9) *da yi*  
       big garment  
       'overcoat' (\*'big garment')

Since the meaning of (9) is not a composition of its parts, (9) is a compound. Similarly, consider the following:

- (10) a. *da che*            b. *huang jiu*  
       big car                yellow wine  
       'cart'                 '(yellow) rice-wine'
- (11) a. *da shu*            b. *bai zhi*  
       big tree                white paper  
       'big tree'              'white paper'

The meanings of (10 a, b) are not compositional, so they are words. The meanings of (11 a, b) are compositional, so they are phrases.

Since the meaning of a compound need not be compositional, an [A N] (adjective–Noun) compound can take an additional A whose meaning may otherwise contradict that of the original A, as noted by Huang (1984: 61) and Dai (1992: 108), among others. This is shown below:

- (12) a. \**bai de hei de ban*  
           white DE black DE board  
           'white black board'
- b. *bai de hei-ban*  
           white DE black-board  
           'white blackboard'
- c. *bai hei-ban*  
           white black-board  
           'white blackboard'

In (12 a), *hei de ban* 'black board' is a phrase, so it cannot take the additional adjective *bai* 'white', whose meaning contradicts that of the original adjective *hei* 'black'. In contrast, in (12 b, c) *hei-ban* 'blackboard' is a compound, so adding the additional *bai* 'white' (with or without the particle *de*) is possible, even though *bai* 'white' contradicts *hei* 'black'.

Huang (1984: 61) suggests that semantic interpretation rules are phrasal rules, which cannot see the internal semantics of a word. Therefore Semantic Composition follows from the Lexical Integrity Hypothesis.

The Semantic Composition test has limitations, however. First, as noted by Chao (1968: 364) and Huang (1984: 63), the meaning of an idiomatic expression is not compositional, yet many idioms are not compounds. For example, neither *kick the bucket* nor *let the cat out of the bag* is a compound. Secondly, even when idioms are excluded, and when Semantic Composition is used together with the Freedom of Parts criterion, *ji dan* 'chicken egg' will still be seen as a phrase while *ya dan* 'duck egg' will be seen as a word, which is a rather strange conclusion. Finally, the results of Semantic Composition conflict with those of the Conjunction Reduction criterion; the latter considers both *ji dan* and *ya dan* as well as (10 a, b) and (11 a, b) to be compounds.

#### 2.5. Syllable Count

Lü (1979: 21–22) suggests that in deciding whether an expression is a word or a phrase, one should consider the length of the expression. As

Lü puts it (1979: 21), “The word in the mind of the average speaker is a sound-meaning unit that is not too long and not too complicated, about the size of a word in the dictionary entry.”

Specifically, Lü suggests that disyllabic [M N] nominals should be considered words, while quadri-syllabic or longer nominals should be considered phrases. In this analysis, both *ji dan* ‘chicken egg’, *ya dan* ‘duck egg’, (10 a, b) and (11 a, b) are compounds. On the other hand, all the following are phrases ((13 c) from Chao 1968: 481; (13 e) from Chao 1968: 365):

- (13) a. *ren-zao xian-wei*  
man-make fiber  
‘man-made fiber’
- b. *xiu-zhen ci-dian*  
pocket dictionary  
‘pocket dictionary’
- c. *luo-xuan tui-jin-qi*  
snail-turn push-advance-instrument  
‘screw propeller’
- d. *Beijing shi-fan da-xue*  
Peking Normal University  
‘Peking Normal University’
- e. *lian-he guo jiao-yu ke-xue wen-hua zu-zhi*  
united nation education science culture organization  
‘United Nations Education Science Culture Organization’

It will be noted that in each of (13 a–c), the first immediate component is not a free form. In (13 d, e), the expressions are proper names. According to Chao (1968), all these expressions are compounds. According to Lü, however, they are too long to be compounds.

It is not hard to see that the Syllable Count criterion is in conflict with most other criteria. We have already seen in (13) that it conflicts with Freedom of Parts, as well as with the general assumption that a proper name is not a phrase. On the other hand, for disyllabic [M N] nominals, the Syllable Count criterion gives the same results as the Conjunction Reduction criterion in that both consider *ji dan* ‘chicken egg’, *ya dan* ‘duck egg’, (10 a, b) and (11 a, b) as compounds. Yet for longer expressions, the Syllable Count criterion again gives different results from the

Conjunction Reduction criterion, as the following examples show (taken from Fan 1958: 215; judgments are Fan’s):

- (14) a. [*zheng-que yi-jian*] *he* [*zheng-que tai du*]  
correct opinion and correct attitude  
‘correct opinion and correct attitude’
- b. \**zheng-que [yi-jian he tai-du]*  
correct opinion and attitude  
‘correct opinion and attitude’]
- (15) a. [*zheng-que si-xiang*] *he* [*cuo-wu si-xiang*]  
correct thought and wrong thought  
‘correct thought and wrong thought’
- b. \**[zheng-que he cuo-wu] si-xiang*  
correct and wrong thought  
‘[correct and wrong] thoughts’

(14 a) is a conjunction of two [M N]s, therefore Conjunction Reduction cannot apply, as shown by the badness of (14 b). Similarly, (15 a) is a conjunction of two [M N]s and Conjunction Reduction again cannot apply. By the Conjunction Reduction criterion, therefore, a quadri-syllabic [M N] is a compound, but by the Syllable Count criterion, it is a phrase. If Syllable Count is accepted, a range of facts will remain unexplained.

A different version of Syllable Count is proposed earlier in Lu ([1964]: 22–27), who suggests that whether an [N N] nominal is a word or a phrase depends on the length of each N. In particular, [1 1], [1 2], [1 3], [2 1] and [3 1] (where the digits indicate the number of syllables in each N) are words regardless of other criteria (such as the Insertion test discussed immediately below), while [2 2] could be a word or a phrase depending on other criteria.

## 2.6. Insertion

The Insertion test was proposed as early as Wang (1944: 16). Lu [1964] considers Insertion (what he calls “expansion”) to be the most important test for wordhood. The Insertion test says that if an expression allows an item to be inserted between its parts, then it is a phrase; otherwise it is a

word. The Insertion test is adopted by many others. For nominals, the typical item to be inserted is the particle *de*, so that [M N] is converted to [M *de* N]; in fact, according to Lu ([1964]: 21), *de*-insertion is the only workable test for [M N] nominals. For illustration, let us consider two cases from H. Zhang (1992: 33).

- (16) a. *bai zhi*            b. *bai de zhi*  
       white paper        white DE paper  
       'white paper'     'white paper'

- (17) a. *xin zhi*            b. \**xin de zhi*  
       letter paper        letter DE paper  
       'letter paper'     'letter paper'

(16 a) allows *de*-insertion, but (17 a) does not (for the intended meaning). Therefore, following Lu, H. Zhang considers *bai zhi* 'white paper' a phrase and *xin zhi* 'letter paper' a compound.

Lu ([1964]: 8) points out that for the Insertion test to work, it is necessary that the inserted material should not change the structure of the original expression. To what extent two expressions have the same structure is not explained in detail, but a few illustrations are given. For example, Lu considers pairs like (16 a, b) to have the same structures, both being [modifier noun], and the particle *de* apparently having no significance. On the other hand, the expressions below, from Lu [1964]: 8), do not have the same structures:

- (18) a. *yang rou*  
       sheep meat  
       'mutton'
- b. *yang DE SHEN-SHANG YOU rou*  
       sheep DE body            have meat  
       'The sheep's body has meat.'

Although (18 a) can be converted into (18 b) by inserting the capitalized materials, the original structure has changed from a nominal in (18 a) to a sentence in (18 b). Therefore (18) should not be considered a genuine case of insertion.

A further restriction on the Insertion test is that the inserted material should not change the meaning of the original expression (cf. Lu [1964]: 32 and Chao 1968: 362). For example, consider the following:

- (19) a. *you zui*  
       oil mouth  
       'glib talker'
- b. *you de zui*  
       oil DE mouth  
       'greasy mouth' (\*'glib talker')

Although *de* can be inserted into (19 a) to give (19 b), the meaning has changed substantially. Therefore we should consider (19 a) to have failed the Insertion test.

Let us then state the two conditions on the Insertion test below:

(20) Conditions on the Insertion Test

- a. The resulting expression should have the same structure as the original.
- b. The resulting expression should have the same meaning as the original.

Proponents of *de*-insertion must have assumed that it is possible, at least in some cases, that *de*-insertion will not change either the meaning or the structure of the original expression. But this assumption is not shared by others, since significant semantic and structural differences between [M N] and [M *de* N] have been well documented (e. g., Zhu [1980], Fan 1958, Lü 1979, Sproat-Shih 1991, Dai 1992). We will return to this point.

Lu ([1964]: 8) notes a further problem with the Insertion test. Sometimes the results of *de*-insertion conflict with each other depending on whether the host expression occurs alone or in a larger structure. Consider the following examples (from Lu [1964]: 8):

- (21) a. *yang rou*  
       sheep meat  
       'mutton'
- b. *yang de rou*  
       sheep DE meat  
       'sheep's meat (mutton)'

- (22) a. *mai yi-jin yang rou*  
 buy one-jin sheep meat  
 'to buy a jin of mutton' (a *jin* is 500 grams)
- b. ?? *mai yi-jin yang de rou*  
 buy one-jin sheep DE meat  
 'to buy a jin of sheep's meat (mutton)'

In (21 a, b), both expressions are good (although one may argue whether the meanings are really the same). In (22), however, *de*-insertion makes (22 b) odd. (21)–(22) show that passing *de*-insertion in one environment does not guarantee passing it in another environment. To solve the problem, H. Zhang (1992: 52) suggests the following condition on where to apply *de*-insertion:

- (23) An [M N] nominal is a phrase if it can be changed into [M *de* N] in the accusative position.

In other words, the proper place to apply *de*-insertion is a situation like (22), but not a situation like (21). According to (23), therefore, *yang rou* 'mutton' fails the *de*-insertion test, so it is a compound. Similarly, both *ji dan* 'chicken egg' and *ya dan* 'duck egg' are compounds. On the other hand, *xin shu* 'new book' is a phrase, as the following sentences show (H. Zhang, 1992: 52):

- (24) a. *wo mai-le yi-ben xin shu*  
 I bought one-copy new book  
 'I bought a new book.'
- b. *wo mai-le yi-ben xin de shu*  
 I bought one-copy new DE book  
 'I bought a new book.'

For H. Zhang, the meanings of (24 a, b) are identical, therefore *xin shu* 'new book' passes the *de*-insertion test and is a phrase. Similarly, *da shu* 'big tree', *bai zhi* 'white paper', *hei mao* 'black cat', etc., are considered phrases.

But why is the accusative position, and the accusative position alone, selected for *de*-insertion? Although H. Zhang does not explain, it is probably because it is hardest to apply the *de*-insertion in that position. In any case, some problems remain. For example, whether the meanings of

(21 a, b) and (24 a, b), and pairs like them, are really identical is perhaps not so easy to tell. Zhu [1980], for example, argues that *xin shu* and *xin de shu* have different meanings, as do [M N] and [M *de* N] in general. Similarly, according to Sproat–Shih (1991), *xin shu* means 'new book' but *xin de shu* means '(a) book which is new'. Moreover, the Insertion test is in conflict with the Conjunction Reduction test, as the following example shows:

- (25) *xin shu he jiu shu*  
 new book and old book  
 'new book and old book'
- (26) \*[*xin he jiu*] *shu*  
 new and old book  
 'new and old books'

Since (25) cannot be reduced to (26), the Conjunction Reduction criterion regards both *xin shu* and *jiu shu* as compounds. Hence, the Conjunction Reduction criterion and the *de*-insertion criterion provide conflicting results.

There is another problem with the *de*-insertion test. Recall that for Lu and H. Zhang, both *da shu* 'big tree' and *da de shu* 'big tree' are phrases; presumably the presence or absence of *de* does not matter. Now consider the following examples:

- (27) \**da [tie de shi-zi]*  
 big iron DE lion  
 'big iron lion'
- (28) *da de [tie de shi-zi]*  
 big DE iron DE lion  
 'big iron lion'

Like *da shu* 'big tree', *da [tie de shi-zi]* 'big iron lion' must also be a phrase. Yet (27) is bad. For (27) to be good, there must be a *de* after *da*, as shown in (28). This effect has been noted by Fan (1958), Chao (1968: 288), Sproat–Shih (1992), and Dai (1992). For proponents of *de*-insertion there is no explanation for why (27) is bad. For others, however, the reason is simple. According to Zhu [1980], Fan (1958), Lü (1979), Sproat–Shih (1992), and Dai (1992), among others, [M *de* N] and [M N]

are very different structures; [M *de* N] is a phrase and [M N] a compound. Even if there is no apparent semantic difference, *de*-insertion will change the structure of an [M N] nominal. In particular, in (27), [*tie de shi-zi*] is a phrase but it occurs inside a compound structure [A N], making the expression ill-formed.<sup>3</sup>

A further problem with the Insertion test is that even if insertion applies, an inserted item does not necessarily change a compound into a phrase. For example, according to Chao (1968: 362), a compound verb may take *de* while still remaining a compound, as shown below:<sup>4</sup>

(29) *wo neng kan-jian ta.*  
I can look-see him  
'I can see him'

(30) *wo neng kan-de-jian ta.*  
I can look-DE-see him  
'I can see him'

In (29), *kan-jian* is a compound verb, which can take an object. In (30), *kan-de-jian* is also a compound verb, even though *de* is added. One can also cite apparent cases in English, for example *evening class* is a compound and *evening chemistry class* is also a compound (Halle-Vergnaud 1987).

In summary, the Insertion test can at most be used in a limited way. If the Insertion test cannot apply to an expression, then the expression is probably a word. If the test does apply, nothing can be inferred, and one has to turn to other evidence.

## 2.7. Exocentric Structure

Another test suggested by Chao (1968: 362) is whether the structure of an expression is exocentric. If it is, then the expression is a compound. Below are some examples:

(31) SV → N  
*huo shao*  
fire burn  
'baked wheaten cake'

(32) VO → N  
*tian fang*  
fill room  
'second wife (to a widower)'

(33) VV → N  
*kai guan*  
open close  
'switch'

Huang (1984: 63) attributes this criterion to the Lexical Integrity Hypothesis. This is because general principles require that all well-formed phrase structures be endocentric. In order for exocentric expressions to appear, they must be converted to compounds so that their internal structures are no longer visible to phrasal rules. Further examples of exocentric compounds include the following:

(34) a. SV → A  
*shou-ti shi*  
hand-carry style  
'portable style'  
b. VO → A  
*wa-tu ji*  
dig-soil machine  
'soil-digging machine (excavator)'

Note that VO and SV in (34) cannot be analyzed as relative clauses, since in Chinese, the particle *de* is required between a relative clause and the noun:

(35) a. [VO *de* N]  
*dai mao-zi de ren* (\**dai mao-zi ren*)  
wear hat DE person  
'the person who wears a hat'  
b. [SV *de* N]  
*wo mai de shu* (\**wo mai shu*)  
I buy DE book  
'the book I bought'

As far as I can see, the Exocentric Structure criterion works very well.



## 2.8. Adverbial Modification

Fan (1958: 214) notes that [A *de* N] may take an adverb (typically an adverb of degree) that modifies A, but [A N] cannot take such an adverb. Let us call this Adverbial Modification (although I leave it open whether all such modifiers are adverbials). The contrast between [A *de* N] and [A N] under Adverbial Modification is shown below:

- (36) a. *xin de shu*  
new DE book  
'a new book'
- b. *hen xin de shu*  
very new DE book  
'a very new book'
- c. *geng xin de shu*  
more new DE book  
'a newer book'
- d. *zui xin de shu*  
most new DE book  
'the newest book'
- e. *zheme xin de shu*  
so new DE book  
'such a new book'
- f. *bu xin de shu*  
not new DE book  
'a book that is not new'
- (37) a. *xin shu*  
new book  
'a new book'
- b. \**hen xin shu*  
very new book  
'a very new book'
- c. \**geng xin shu*  
more new book  
'a newer book'

- d. \**zui xin shu*  
most new book  
'the newest book'
- e. \**zheme xin shu*  
so new book  
'such a new book'
- f. \**bu xin shu*  
not new book  
'a book that is not new'

(36)–(37) show that [A *de* N] can take any adverbial that modifies A but [A N] cannot take such adverbials.

Dai (1992: 108) suggests that the badness of (37 b–f) is due to the Lexical Integrity Hypothesis, in that A in [A N] is protected by Lexical Integrity and is not accessible to an external modifier. In contrast, A in [A *de* N] is not protected by Lexical Integrity and is accessible to an external modifier. But why should the adverbial be considered external rather than internal? We know, for example, that (37 b) *hen xin shu* is not 'a [very [new book]]' but 'a [[very new] book]', that is, *hen* is an internal modifier. Perhaps M in [M N] cannot be expanded? But this is not true either. The examples below show that [M N] can expand into [[X M] N]:

- (38) [N N] → [[A N] N]  
*bu shou-tao* [lan bu] *shou-tao*  
cloth glove blue cloth glove  
'cloth glove' 'blue-cloth glove'
- (39) [A N] → [[N A] N]  
*hong shou-tao* [tao hong] *shou-tao*  
red glove peach red glove  
'red glove' 'peach-red glove'

(38)–(39) show that M in [M N] is expandable at least in some cases. What is the explanation then that M cannot be expanded in (37)? The reason, I suggest, is that the [adverb adjective] structure is always a phrase,<sup>5</sup> and because it is a phrase, it cannot occur inside a compound. In contrast, the [A N] in (38) and the [N A] in (39) are compounds, so they can occur inside a compound to give [[X M] N]. The same seems to be true in English, too. For example, *most A*, *more A*, *so A*, *best A*, *very*

*A*, etc., where *A* is an adjective, are always phrases. On the other hand, there are numerous [A N] compounds, such as *blackbird*, *redwood*, and *White House*, and numerous [N A] compounds, such as *peach-red*, *pitch-dark* and *snow-white*.

## 2.9. XP Substitution

Fan (1958: 214) notes that N in [M *de* N] can be substituted for by [X N], where X is a numeral-classifier unit or a demonstrative unit, but N in [M N] cannot be substituted this way. Since there is in my view little question that both [Numeral-Classifier N] and [Demonstrative N] are phrases (or XPs), I will call this process XP Substitution. (40) gives the schematic forms of XP Substitution and (41)–(42) show some examples:

(40) a. [M *de* N] → [M *de* XP]

b. [M N] ↛ \*[M XP]

(41) [M *de* XP]

a. *xin de [san ben shu]*  
new DE three copy book  
'three books that are new'

b. *xin de [nei ben shu]*  
new DE that copy book  
'that book which is new'

(42) \*[M XP]

a. \**xin [san ben shu]*  
new three copy book

b. \**xin [nei ben shu]*  
new that copy book

(41) shows that N in [M *de* N] can be substituted by an XP. (42) shows that N in [M N] cannot be replaced by an XP. Recall that in section 2.8 we have seen that M in [M *de* N] can be substituted by a phrase but M in [M N] cannot. In other words, both M and N in [M *de* N] can be replaced by a phrase, while neither M or N in [M N] can. Similar effects

are observed by Sproat–Shih (1991, 1992) and Dai (1992), who note that a *de*-phrase cannot occur inside a compound. For example, consider the following:<sup>6</sup>

(43) a. [[M *de* N] *de* N]  
*xin-xian de dou-sha de yue-bing*  
fresh DE bean-paste DE moon-cake  
'mooncake with fresh bean-paste filling'

b. [M *de* [M *de* N]]  
*xiao de [xin de shu]*  
small DE new DE book  
'small new book'

(44) a. \*[[M *de* N] N]  
\**xin-xian de dou-sha yue-bing*  
fresh DE bean-paste moon-cake  
'mooncake with fresh bean-paste filling'

b. \*[M [M *de* N]]  
*xiao [xin de shu]*  
small new DE book  
'small new book'

(43) shows that both M and N in [M *de* N] can be substituted by a *de*-phrase. (44) shows that neither M nor N in [M N] can be replaced by a *de*-phrase.

The contrast between [M *de* N] and [M N] under XP Substitution is compatible with the assumption that [M N] is a compound and [M *de* N] is a phrase. Since a phrase cannot occur inside a compound, the badness of (42 a, b) and (44 a, b) are expected. If [M *de* N] and [M N] had the same structures, as proponents of *de*-insertion assume, then the contrast between (41) and (42) would need an explanation.

## 2.10. Productivity

It is reasonable to assume that phrasal rules are productive. For example, if a language has the rule NP → [A N], by which a noun phrase can be made of an adjective plus a noun,<sup>7</sup> one expects most [A N] combinations to be possible. On the other hand, if most [A N] combinations are not possible, one would conclude that [A N] is not a phrase.

In English, [A N] is productive. In Chinese, many adjectives, such as *da* 'big', *xiao* 'small', *xin* 'new', *jiu* 'old', *bai* 'white', *hong* 'red', *chang* 'long', *duan* 'short', etc., are quite productive in that they can form [A N] with many nouns. If all [A N] structures are compounds in Chinese, as proposed by Fan (1958) and Dai (1992), one would wonder whether the criteria have been too loose. Why, for example, are all the expressions below (mostly from Zhu [1980]: 9–10) compounds in Chinese, while their structures, their meanings, and their English translations seem patently phrasal?

- (45) a. *gui dong-xi*  
expensive article  
'expensive article'
- b. *bao zhi*  
thin paper  
'thin paper'
- c. *cong-ming hai-zi*  
clever child  
'clever child'
- d. *hua-ji dian-ying*  
funny movie  
'funny movie'
- e. *huang zhi-fu*  
yellow uniform  
'yellow uniform'
- f. *shen shui*  
deep water  
'deep water'
- g. *duan xiu-zi*  
short sleeve  
'short sleeve'
- h. *bai zhi*  
white paper  
'white paper'

The picture in (45) is deceptive, however. In his insightful study on Chinese adjectives, Zhu [1980] points out that Chinese [A N] is not fully productive and many gaps remain. For example, all the expressions in

(46) are unnatural, even though they are exactly parallel in structure to those in (45) and their English translations are perfectly well-formed (from Zhu [1980]: 9–10; judgments are Zhu's):

- (46) a. *\*gui shou-juar*  
expensive handkerchief  
'expensive handkerchief'
- b. *\*bao hui-chen*  
thin dust  
'thin dust'
- c. *\*cong-ming dong-wu*  
clever animal  
'clever animal'
- d. *\*hua-ji ren*  
funny person  
'funny person'
- e. *\*huang qi-chuan*  
yellow steam-boat  
'yellow steam-boat'
- f. *\*shen shu*  
deep book  
'difficult book'
- g. *\*duan cheng-mo*  
short silence  
'short silence'
- h. *\*bai shou*  
white hand  
'white hand'

One may wonder if Chinese has language-particular constraints on the collocation between certain adjectives and nouns, such as those in (46). But this is not the case. All of (46 a–h) will become good if *de* is added between the adjective and the noun, as shown below.<sup>8</sup>

- (47) a. *gui de shou-juar*  
expensive DE handkerchief  
'expensive handkerchief'

- b. *bao de hui-chen*  
thin DE dust  
'thin dust'
- c. *cong-ming de dong-wu*  
clever DE animal  
'clever animal'
- d. *hua-ji de ren*  
funny DE person  
'funny person'
- e. *huang de qi-chuan*  
yellow DE steam-boat  
'yellow steam-boat'
- f. *shen de shu*  
deep DE book  
'difficult book'
- g. *duan de cheng-mo*  
short DE silence  
'short silence'
- h. *bai de shou*  
white DE hand  
'white hand'

Examples like the above strongly indicate that while [A *de* N] is fully productive in Chinese, [A N] is not. It should be pointed out that the distributional gaps in (46) are not exceptions but the norm. To appreciate how defective the [A N] distribution is, consider the following:

- (48) a. *gao shan*  
tall mountain  
'tall mountain'
- b. *gao lou*  
tall building  
'tall building'
- (49) a. \**gao shu*  
tall tree  
'tall tree'

- b. \**gao ren*  
tall person  
'tall person'

In (48), *gao* 'tall' appears productive. But (49 a, b), perfectly normal [A N] structures from an English point of view, are simply bad. One may suspect that, in parallel to English, which has two words for 'highness', *high* (which goes with *standard*, *speed*, and *mountain*) and *tall* (which goes with *building*, *tree*, and *person*), perhaps there is another Chinese word for 'highness' which can go with *shu* 'tree' and *ren* 'person'? Unfortunately, this is not the case; *gao* is the only word in Chinese for 'highness' and covers the meanings of both *high* and *tall* in English. To express 'tall tree' and 'tall person' in Chinese, *gao* must be followed by *de*.

- (50) a. *gao de shu*  
tall DE tree  
'tall tree'
- b. *gao de ren*  
tall DE person  
'tall person'

In other words, there is simply no way of forming plain daily expressions like 'tall tree' and 'tall person' in Chinese with an [A N] structure. If [A N] is a productive Chinese construction, such gaps are very striking indeed.

The following words from Zhu ([1980]: 11) nicely summarize the facts we examined in this section: "Evidence shows that ([A N]) is a structure that tends to be tightly frozen. Its structure is not determined by productive phrasal rules. When compared with other languages, this property is especially striking. When foreigners learn Chinese, they often cannot understand why expressions like *bai shou* 'white hand' and *gui shou-juar* 'expensive handkerchief' are not natural."

Since [N N] is less productive than [A N] (cf. Lu [1964]), by similar arguments [N N] cannot be a phrase either. In short, productivity evidence supports the view that [M *de* N] is a phrase but [M N] a word.

## 2.11. Intuition

A number of researchers have assumed that Chinese speakers, or educated linguists at least, have an intuition of what a word is and that the

predictions of one's theory should agree with it. For example, Lü (1979: 21–22) suggests that in the mind of the average speaker a “word” is something that is “not too long”, and Lü proposes an upper limit of four syllables, beyond which an expression should be considered a phrase regardless of other criteria. Similarly, intuition is often appealed to when one is faced with conflicting criteria. For example, H. Zhang (1992: 39) notes that by the *de*-insertion test *da shu* ‘big tree’ and *xiao shu* ‘small tree’ are phrases, but by the Conjunction Reduction test (cf. section 2.2 above) they are compounds; since “(a)lmost all Chinese linguists are of the same view” that *da shu* ‘big tree’ and *xiao shu* ‘small tree’ are phrases, H. Zhang rejects the Conjunction Reduction test in favor of the *de*-insertion test.

Intuition is certainly an important factor to consider, and in many cases people's intuitions do agree. On the other hand, the fact that there is still no consensus on where to draw the line between word and phrase in Chinese, even though the discussions started at least as early as the 1950s, indicates that there are areas where people's intuitions either are not clear or do not agree. Specifically, while it is relatively easy to determine the wordhood of an expression that contains an affix, it is harder to analyze [M N] nominals that do not contain an affix. As Lu ([1964]: 5) puts it,

When popular grammar books discuss (Chinese) word structures, they rarely focus on simple expressions like *tie lu* ‘iron road (railroad)’ and *cai chuang* ‘vegetable beds’ that are made of content forms only, apparently in order to avoid the greatest difficulty in Chinese morphology. In Chinese, expressions without functional forms are the hardest to analyze, because here one cannot rely on inflection to recognize wordhood, as one can in Indo-European languages.

Intuition, therefore, should be used with caution, especially with [M N] nominals. As far as possible, intuition should not be used alone to argue for one or another among conflicting criteria.

## 2.12. Summary

In this section I have reviewed a number of tests for wordhood in Chinese. I have focused on tests for nominals only, in particular [M N] nominals. The results are summarized below:

(51) <u>Test</u>	<u>word or phrase</u>
Conjunction Reduction	both
Freedom of Parts	both
Semantic Composition	both
Syllable Count	both
Insertion	both
Exocentric Structure	??
Adverbial Modification	word
XP Substitution	word
Productivity	word
Intuition	??

There is no question that [M *de* N] is always a phrase. For [M N], results differ. Three tests (Adverbial Modification, XP Substitution, and Productivity) consider all [M N]s as words. The Intuition test has no fixed answer, since people's intuitions do not always agree. The Exocentric Structure test considers exocentric [M N]s as words but says nothing about other [M N]s. The remaining five tests (Conjunction Reduction, Freedom of Parts, Semantic Composition, Syllable Count, and Insertion) consider some [M N]s as words and some as phrases; however, they differ on which [M N]s are words and which phrases. I will now offer my view on which tests should be adopted and which abandoned.

## 3. The present analysis

In this section I offer my view of which criteria should be rejected and which adopted.

### 3.1. Rejecting Syllable Count, Insertion, and Intuition

Consider Intuition first. There are two reasons for rejecting it. First, as noted by Lu [1964], people's intuitions do not always agree, especially with [M N] nominals, therefore it is hard to decide whose intuition to follow. Second, when intuitions do agree in certain cases, one can usually interpret these intuitions in concrete terms. For example, all people agree that *you zui* ‘oil mouth → glib talker’ and *tian fang* ‘fill room → second wife (to a widower)’ are compounds; the former can be explained by

Semantic Composition and the latter by Exocentric Structure. Therefore, it is better to rely on concrete evidence than intuition.

Next, consider Syllable Count. The shortcoming with this criterion is its arbitrary nature and lack of motivation. Why, for example, should the threshold for phrasehood be set at four syllables, instead of three or five? And why is there no such condition in other languages?

Finally, consider Insertion. As discussed in section 2.6, the Insertion criterion crucially requires that the following conditions be both met

- (52) Conditions on the Insertion Test
- a. The resulting expression should have the same structure as the original.
  - b. The resulting expression should have the same meaning as the original.

But the first condition is unlikely to be satisfiable in *de*-insertion. This is because inserting *de* definitely makes a nominal into a phrase, whereas without *de* a nominal could be a word. Besides, as Fan (1958) has extensively shown, [M N] and [M *de* N] have very different syntactic behaviors, therefore they cannot be of the same structure. As for the second condition, it is often hard to tell when two expressions have the same meaning. For example, does 'a big tree' have the same meaning as 'a tree that is big'? The semantic judgment required here must be very refined. The same is true in Chinese. For some, such as Zhu [1980], [M N] and [M *de* N] never have exactly the same meanings; for others, [M N] and [M *de* N] can have the same meanings. But even if 'a big tree' and 'a tree that is big' have the same meaning, it does not follow that they have the same structure. Why then should one assume that *da shu* 'big tree' and *da de shu* 'big DE tree' have the same structure just because they have similar meanings?<sup>9</sup>

A further reason to reject the above three criteria (Intuition, Syllable Count, and Insertion) is that not only do they conflict with each other, but they conflict with other criteria as well (cf. section 2). As we will see below, once these three criteria are rejected, all the remaining criteria give converging results.

### 3.2. Adopting Conjunction Reduction, Freedom of Parts, Semantic Composition, and Exocentric Structure with limitations

Let us now consider Conjunction Reduction, Freedom of Parts, Semantic Composition, and Exocentric Structure. The assumption here is that

phrases should have regular syntactic and semantic behavior; they should allow conjunction reduction, be made of free parts, be semantically compositional, and be structurally endocentric. If an expression fails any of these tests, it is not a phrase. This assumption is held by all analysts and will not be disputed here.

But what if an expression passes all these tests? Apparently one cannot conclude that the expression must be a phrase. If one does, one is assuming that no compound can allow conjunction reduction, be made of free parts, be semantically compositional, and be structurally endocentric. But this assumption is incorrect. As Dai (1992) points out, while some compounds may have peculiar syntactic and semantic behaviors, others have regular syntactic and semantic behaviors. Therefore, if an expression has peculiar behavior, it is likely a word, but if an expression does not have peculiar behavior, it may still be a word. Consider the following:

- (53) a. *meat-and-potato eater*  
 b. *apple pie*  
 c. *blackboard*

(53 a) is a compound which contains an internal conjunction (from Dai 1992: 112, citing Bates 1988: 228).<sup>10</sup> (53 b) is a compound that is made of two free parts. (53 c) is a compound whose structure is endocentric. Finally, the semantics of (53 a, b) are quite compositional. (53) shows that the syntactic and semantic structures of a compound can be regular. Thus, even if an expression passes all of Conjunction Reduction, Freedom of Parts, Semantic Composition, and Exocentric Structure, it still could be a compound. In other words, Conjunction Reduction, Freedom of Parts, Semantic Composition, and Exocentric Structure can only be used to spot expressions that have peculiar syntactic and semantic behavior, hence marking them as compounds, but they cannot be used for expressions with regular syntactic and semantic behavior, which may or may not be compounds.

### 3.3. Adopting Adverbial Modification, XP Substitution, and Productivity

Let us now consider the remaining three criteria, Adverbial Modification, XP Substitution, and Productivity. Adverbial Modification can probably be subsumed under XP Substitution, but it will not be our concern. These three criteria are based on reasonable assumptions, namely, that the A in

an [A N] phrase (but not the A in an [A N] compound) should be modifiable by an adverb, that in a phrase made of two parts at least one should be an XP and so substitutable by an XP, and that all phrasal constructions should be productive. As we have seen in section 2, by these three criteria one arrives at the same conclusion that in Chinese, all [M *de* N]s are phrases and all [M N]s are words.

It will be noted that in this respect Chinese differs from English in an important way. In English, an [A N] nominal can be either a compound (e. g., *black market*) or a phrase (e. g., *black dogs*). This has led many people to assume that the same is true for Chinese [A N] structures. But in English, [A N] is a fully productive construction, where the A readily accepts adverbial modifications (e. g., *difficult discussions*, *more difficult discussions*, *most difficult discussions*, *very difficult discussions*). In Chinese, however, [A N] is unproductive for most adjectives (e. g., \**jian-ku tao-lun* 'difficult discussions'), and the small number of adjectives, such as *da* 'big' and *xiao* 'small', which seem to be quite productive in [A N] structures, cannot take an adverbial modifier (e. g., \**geng da gou* 'more big dog → a bigger dog', \**zui da gou* 'most big dog → the biggest dog', \**hen da gou* 'very big dog → a very big dog'; cf. *geng da de gou* 'more big DE dog → a bigger dog', *zui da de gou* 'most big DE dog → the biggest dog', *hen da de gou* 'very big DE dog → a very big dog'). If the Chinese [A N] is equated with the English [A N], such facts will be very hard to explain. The same applies to longer *de*-less nominals, such as *da-xing min-yong pen-qi-shi fei-ji* 'large civilian jet liner'. For many people, such nominals are too long to be a compound. But then in \**xiang-dang da-xing min-yong pen-qi-shi fei-ji* 'fairly large civilian jet liner', \**bi-jiao da-xing min-yong pen-qi-shi fei-ji* 'relatively large civilian jet liner', and \**geng da-xing min-yong pen-qi-shi fei-ji* '(more large) larger civilian jet liner', why are the Chinese expressions bad yet the English ones good? In the present analysis, this contrast is just what one expects.

### 3.4. Summary

I have shown that there are good reasons for rejecting Syllable Count, Insertion, and Intuition as tests for wordhood in Chinese. Once this is done, all the remaining criteria provide converging results. In particular, all [M N] nominals, as well as their iterative derivatives (e. g., [M [M N]], [[M N] N], etc.) are words. This conclusion differs from most previous analyses of Chinese wordhood, but is similar to the one proposed by Dai (1992) and in part to the one proposed by Fan (1958). I will now present independent phonological evidence that supports the present analysis.

## 4. Background in metrical phonology and tonal phonology

To facilitate our discussion of phonological evidence for wordhood in Chinese, let me first review relevant findings in metrical and tonal phonology.

### 4.1. Metrical phonology

Metrical phonology determines which speech elements are more prominent than others. Metrical rules are often called stress rules for the reason that in many languages metrically prominent elements surface as stressed elements. It is important to remember, however, that phonetic stress (greater duration and/or intensity) is not the only possible manifestation of metrical prominence. In Japanese, for example, a metrically prominent syllable is assigned an H tone (which may spread to preceding syllables), without being necessarily longer or louder than other syllables. A metrically prominent element need not always bear a high pitch, either. For example, while a stressed syllable in English usually bears a high pitch, in certain speech styles it may bear a low pitch, while unstressed syllables bear high pitches.

Having mentioned the above precaution, I will continue to refer to metrical prominence as stress, with the understanding that stress may be realized in different ways. The manifestations of stress in Chinese will be discussed below. For more discussion on metrical phonology, see Halle–Vergnaud (1987) and Hayes (1995), among many others.

#### 4.1.1. Foot, head, and degenerate foot

Metrical elements (moras, syllables, etc.) are grouped into constituents, or "feet". In each foot one member is more prominent than others, and this member is called the head. The head element is also called the stressed element. The process of constructing feet and determining heads is therefore the process of stress assignment. As an example, consider the stress pattern in a language with syllabic trochee (\$ = syllable, ( ) = foot):

$$(54) \quad \begin{array}{ccc} x & x & x \\ (\$ \$) & (\$ \$) & (\$ \$) \end{array}$$

A trochaic foot is one that has two elements, with the first being the head. (54) shows a word with six syllables, which form three feet. In each foot, the head is marked by the symbol "x" on top of it.