

Chapter 35

LFG and Sinitic languages

Olivia S.-C. Lam

University of Hong Kong

One-Soon Her

Tunghai University & National Chengchi University

Jing Chen

The Hong Kong Polytechnic University

Sophia Y.-M. Lee

The Hong Kong Polytechnic University

The assumptions of LFG have been applied to the research on a number of grammatical phenomena in Chinese languages. In this chapter, we present an overview of some of the studies devoted to investigating the syntactic patterns of two varieties of Chinese: Mandarin and Cantonese. This chapter includes a discussion on the expression and identification of grammatical functions, *ba*, *bei* and related constructions, the dative alternation, compounds (VO compounds and resultative compounds), the locative inversion, and classifiers and measure words. The chapter concludes with a brief overview of the applications of LFG in Chinese language processing.

1 Introduction: Chinese or Sinitic Languages

LFG is a lexicon-driven, unification-based linguistic theory aiming to account for both variations and universals found in human languages. The well-known parsimony of morpho-syntactic markings in Chinese poses an interesting challenge to the theory, but at the same time provides an opportunity to showcase



the explanatory adequacy of LFG. The term ‘Chinese’ is commonly replaced by ‘Sinitic languages’ or ‘Chinese languages’ in the linguistics literature. These two terms refer to a family of varieties which are genetically related but are, very often, not mutually intelligible (Handel 2015, Huang & Shi 2016). Wurm & Liu (1987) list 10 varieties under ‘Chinese’ in the *Language Atlas of China*, while the *Ethnologue* lists 16 (Eberhard et al. 2020). The more prominent varieties are traditionally known as *fangyan* 方言 (literally ‘regional speech’ or ‘dialect’), and are classified into 7 groups: Mandarin, Xiang, Gan, Wu, Yue, Hakka and Min. Drawing data from both Mandarin and Cantonese (a Yue dialect), we will be using the term ‘Chinese’ to loosely refer to the Sinitic family, and reserve the terms ‘Mandarin’ and ‘Cantonese’ for these two individual varieties.

LFG has been adopted to study Chinese since 1985. Earlier studies, such as Huang (1985, 1986, 1987, 1988, 1989b,a, 1990) and Huang & Mangione (1985), present LFG accounts of a wide range of grammatical structures in Mandarin Chinese, including the internal structure of NPs, the subcategorized topic, and lexical discontinuity. Her (1990) investigates the grammatical functions in Mandarin, while Tan (1991) focuses on the subject in Mandarin. Bodomo & Luke (2003), the monograph resulting from the first LFG Workshop dedicated to the analysis of Chinese languages in 2001, contains studies on Mandarin, Cantonese, and other Sinitic languages.

It is important to note that, although this chapter focuses on Cantonese and Mandarin, LFG has in fact been successfully applied to a wide range of varieties in China. For instance, Huang (1991) provides an account of adjectival reduplication in Taiwan Southern Min. Studies on Zhuang, a Tai-Kadai language spoken in southern China, include Pan (2010), Bodomo (2011), and Burusphat & Qin (2012).

There is also a well-established collection of LFG literature written in Chinese, with most of them providing an introduction to the framework. These include Huang (1988, 1989b), Fu (1990a,b), Fu (1993), Feng (2004), Gao & Li (2009) and Wei (2014).

In the following sections, we first outline the prominent grammatical properties of Chinese from an LFG perspective (Section 2). Section 3 discusses the encoding of grammatical functions in Chinese, while Sections 4–10 provide an overview of the major grammatical phenomena which have been analyzed in LFG. Section 11 concludes the chapter by highlighting LFG analyses which have contributed to the understanding of Sinitic languages, and how the studies on Sinitic languages have contributed to the development of LFG.

2 Grammatical properties: An LFG Perspective

This section introduces important grammatical features of Chinese from an LFG perspective, including the morpho-syntactic encoding of grammatical functions (Section 2.1); the classifier system (Section 2.2); and the canonical word order and the role of information structure (Section 2.3). For more in-depth and recent discussions on issues in Chinese linguistics, see Huang et al. (2009), Wang & Sun (2015), Huang & Shi (2016), and Huang et al. (2022), among others.

2.1 Morpho-syntactic encoding

Chinese has been described in the literature as being ‘morphologically impoverished’ (e.g. Packard 2000, Hsieh et al. 2022). This, however, does not mean that there is no morpho-syntactic encoding. In (1a), TENSE is not encoded on the verb, but in (2), aspect is.^{1,2}

- (1) a. Cantonese
 Zoengsaam kam jat/ gam jat/ ting jat faangung.
 Zoengsaam yesterday/ today/ tomorrow work
 ‘Zoengsaam went to work yesterday/ is going to work today/ will go to work tomorrow.’
- b. Mandarin
 Zhangsan zuotian/ jintian/ mingtian shangban.
 Zhangsan yesterday/ today/ tomorrow work.
 ‘Zhangsan went to work yesterday/ goes to work today/will go to work tomorrow.’
- (2) a. Cantonese
 Zoengsaam tai-zo/ -gan/ -gwo bun syu.
 Zoengsaam read-PFV/ -PROG/ -EXP CLF book
 ‘Zoengsaam has read/is reading/read the book.’
- b. Mandarin
 Zhangsan du-le/ zhengzai du/ du-guo (yi) ben shu.
 Zhangsan du-PRF/ ZAI read/ read-EXP (NUM) CLF book.
 ‘Zhangsan has read/is reading/read a book.’³

¹Tones are omitted unless they are relevant to the discussion.

²Examples in Cantonese are romanized using the scheme developed by LSHK (2002).

³The marker -gwo, and the Mandarin equivalent -guo, express the ‘experiential aspect’ in Chinese.

There is no person, number or gender agreement between a verb and its arguments.

(3) Cantonese

- a. Zoengsaam gin-dou keoidei.
Zoengsaam see-DOU 3PL
'Zoengsaam saw them.'
- b. ngo gin-dou Zoengsaam.
I see-DOU Zoengsaam
'I saw Zoengsaam.'

Note that the changes in person and number do not affect the verb forms in (3). Note also that *-dou* (到; *-dao* in Mandarin) is not a tense marker – it marks accomplishment and is part of a verb-result compound.

There is no case-marking in Chinese. Pronouns are not case-marked, either:

(4) Cantonese

- a. ngo gin-dou keoi.
1SG see-DOU 3SG
'I saw him/her.'
- b. keoi gin-dou ngo.
3SG see-DOU 1SG
'S/he saw me.'

2.2 Number-marking, classifiers and the expression of quantities

Most nouns are not number-marked. The only marker which codes number in Mandarin is the plural marker *-men* (Hsieh et al. 2022). Yet, even for human nouns, a bare noun is unspecified for number, allowing both a singular and a plural reading, as exemplified in (5).

(5) Mandarin

- Gebi de xuesheng hen chao.
next.door DE student very noisy
'The student(s) next door is/are very noisy.'

Classifiers are a significant feature of the Chinese languages. As number is not explicitly encoded in Chinese, nouns can only be enumerated when they are individuated by classifiers in the [NUM CLF N] structure. Some scholars believe that

classifiers ‘serve to profile an essential or inherent feature of the head noun...and contribute no additional meaning to the head noun’ (Her 2012a; see also Cheng & Sybesma 1999). Others (e.g. Huang & Ahrens 2003, Chen et al. 2022), however, argue that classifiers make a crucial contribution to the meaning through coercion.

(6) Mandarin

- a. san ben shu
 three CLF book
 ‘three (volumes/copies of) books’
- b. san xiang shu
 three CLF book
 ‘3 boxes of books’

Cantonese, among other varieties of Chinese and unlike Mandarin, allows the omission of the numeral one. Whether ‘one’ is expressed depends on the information structure and the grammatical function of the noun. The structure [CLF N] receives a definite, or contextually retrievable, interpretation when it serves as the SUBJ, but when it is an OBJ, either a definite or an indefinite reading is possible:

(7) Cantonese

- a. [CLF N] as SUBJ
 (Context: What happened to the book?)
 [bun syu] laan-zo.
 CLF book damage-PFV
 ‘The book is damaged.’
- b. [CLF N] as OBJ
 - i. With a definite reading
 (Context: Where is the book?)
 ngo m gin-zo [bun syu].
 1SG not see-PFV CLF book
 ‘I have lost the book.’
 - ii. With an indefinite reading
 ngo kam jat maai-zo [bun syu].
 1SG yesterday buy-PFV CLF book
 ‘I bought a book yesterday.’

2.3 Canonical word order

Different views can be found in the literature regarding the canonical word order in Chinese languages. While there is a long tradition of analyzing Chinese as having a canonical SVO word order (e.g. Light 1979, Mei 1980, Sun & Givón 1985, Dryer 2005), there are also arguments for treating the SOV order as the canonical word order (see, for instance, Tai 1973, Li & Thompson 1974). The empirical and theoretical arguments for both the SVO and SOV accounts can be found in Liu (2022) and Xu & Dong (2022) respectively. In some Wu varieties, it has also been observed that the SOV or OSV orders occur more frequently than the SVO order, especially in cases where OBJ expresses the patient role (Yue 2003).

Despite the ongoing debate on the canonical word order, it is generally accepted that word order variations in Chinese can be accounted for in terms of information structure (Shyu 2016). Chinese has been well-established as a topic-prominent language since Li & Thompson (1976). Constituents bearing almost any grammatical function can be easily placed in the sentence-initial position as long as they are topics. Kroeger (2004) provides a clear overview on the grammatical functions which can be topicalized in Chinese, including the possessor (Xu & Langendoen 1985). Identifying grammatical functions in Chinese is thus far from being straight-forward – grammatical functions may be expressed in various syntactic positions depending on the discourse context, and they are not morphologically encoded. The OBJ *pingguo* can appear in the canonical object position (8a), sentence-initially if it is topical (8b), and between the SUBJ and the V, where the marker *ba* is optional:⁴

(8) Mandarin

- a. ta chi le [pingguo].
 3SG eat PFV apple
 ‘S/he ate the apple/apples.’
- b. [pingguo] ta chi le.
 apple 3SG eat PFV
 ‘S/he ate the apple/apples.’

⁴Whether the marker *ba* is required depends on the semantic features of the displaced NP. A displaced human NP must be marked:

- (i) Ta *(ba) laoshi tuidao le.
 3SG.M BA teacher push.over PFV
 ‘He pushed over the teacher.’ (Yang & van Bergen 2007: 1622)

- c. ta (ba) [pingguo] chi le.
 3SG BA apple eat PFV

‘He ate the apple/apples.’ (Yang & van Bergen 2007: 1622)

Other word order variations are found in Chinese. These will be discussed in Section 4.

Chinese is also well-known for having ‘Chinese-style topics’ (Chafe 1976), or ‘dangling topics’. These topics are unique in that they are not subcategorized for by the predicate in the comment (Pan & Hu 2008). In (9), the predicate in the comment is *lai* ‘come’, which is intransitive and only subcategorizes for a subject, *xiaofangdui* ‘fire-brigade’. The topic [*nei chang huo*] ‘that fire’ is not related to the predicate-argument structure of *lai* ‘come’, and is thus considered a ‘dangling’ topic.

- (9) Mandarin

[*nei chang huo*], *xingkui* *xiaofangdui* *lai* *de* *kuai*.
 that CLF fire fortunately fire-brigade come DE quick

‘As for that fire, fortunately the fire-brigade came quickly.’

(Li & Thompson 1976)

It is also possible and entirely natural to have more than one topic at the beginning of a sentence in Chinese, i.e. ‘topic-chain constructions’:

- (10) Mandarin

[*zhei jian shi*], (*Zhangsan*), *ta* *mei* *you* *cuo*.
 this CLF matter Zhangsan 3SG not have fault

‘Regarding this matter, Zhangsan is not at fault.’

(Her 1990; glosses modified)

We provide a more detailed discussion on the TOPIC as a grammatical function in Section 3.

3 Grammatical functions and word order variations in Chinese

We provide a synopsis of the state-of-the-art LFG research on Chinese in this section and Sections 4–10. We begin with the fundamental issue of encoding grammatical functions in Chinese.

Identifying grammatical functions in Chinese can be challenging due to the lack of morphological encoding of grammatical functions, and to the fact that Chinese has relatively free word order. We offer an overview of the grammatical functions in Mandarin (Section 3.1), and in Cantonese (Section 3.2).

3.1 Mandarin

Almost all early LFG studies on Chinese have included a classification of grammatical functions. Interestingly, although there are no obligatory morphological encodings of GFS, there is general consensus as to the grammatical functions which can be identified for Chinese. Huang (1989b, 1993a), adopting the assumptions of classical LFG (Bresnan 1982b, Bresnan & Kanerva 1989), shows that GFS in Mandarin can be identified by their unambiguous syntactic positions at the surface level, and can be classified into four types based on two features: [\pm restricted] and [\pm objective]. Her (1990, 2008) presents an expanded set of GFS in Mandarin, and recognizes SUBJ, OBJ, OBJ₂, OBL _{θ} (oblique function which includes subtypes OBL_{THEME} (theme), OBL_{GOAL} (goal), OBL_{BEN} (beneficiary), OBL_{LOC} (location), and COMP (complement function that includes subtypes xCOMP, sCOMP, and nCOMP) as subcategorizable GFS, while TOPIC, ADJunct (adjunct function that has two subtypes ADJ and xADJ), and POSS are identified as non-subcategorizable, as shown in Figure 1. It should be noted that, in the current LFG literature, the restricted object function OBJ _{θ} has replaced OBJ₂, while grammatical function labels such as sCOMP and nCOMP, which make reference to c-structure categories, are no longer adopted.

The syntactic encoding of GFS is via both the c-structure and the predicate argument structure (AS). Take the lexical verb *da* ‘hit’, for example: it has a predicate argument structure of \langle AGENT, THEME \rangle , and subcategorizes for \langle SUBJ, OBJ \rangle , where the linking between the argument roles and the grammatical functions is constrained by the Lexical Mapping Theory (LMT; Bresnan & Kanerva 1989).

- (11) Mandarin
Lisi da Zhangsan.
Lisi hit Zhangsan
‘Lisi hit Zhangsan.’

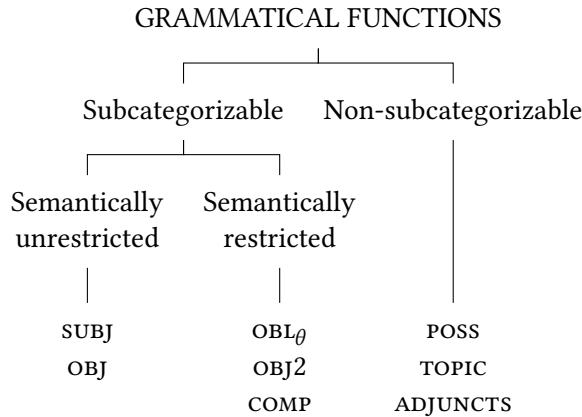
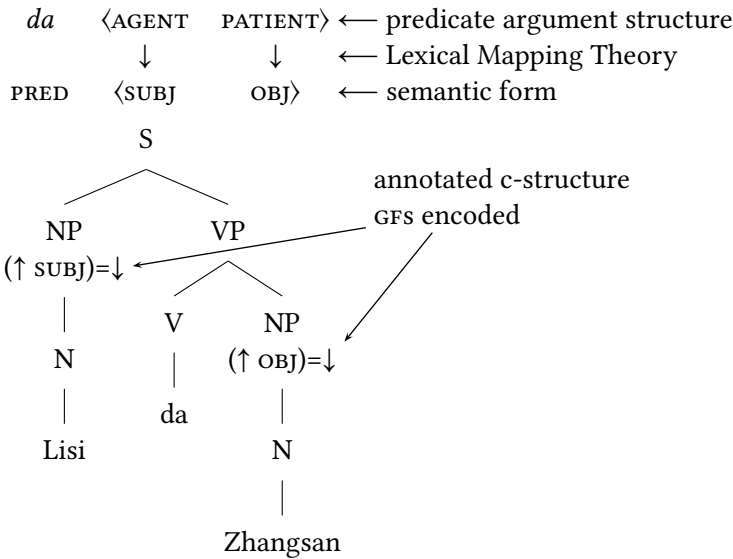


Figure 1: Classification of grammatical functions in Mandarin (Her 1990, 2008)



The treatment of TOPIC above touches on a fundamental issue related to the universal properties of GFS. Recall that Chinese is a topic-prominent language (see, for instance, Tsai (2022), for a discussion on the syntactic approaches to the phenomenon, and Tao (2022), among others, for a discussion on the functional approaches). Thematic TOPICS may be ‘preposed’, while non-thematic TOPICS may remain *in situ*. A set of frequently used constructions known as ‘Pseudo-transitive constructions’ (Chang et al. 1988) pose challenges to the grammatical

status of TOPIC, and this has been treated in detail in Huang (1989a). In these constructions, an NP which is clearly an argument of the verb may only occur in the pre-verbal TOPIC position or some OBL positions, but never in the postverbal OBJ position. The following two examples are from Huang (1989a).

(12) Mandarin

- a. zeijian shi, ni zuozhu.
 this matter 2SG make.master
 ‘You’ll take charge of this matter.’
- b. *2SG zuozhu zeijian shi.
 you make.master this matter

(13) Mandarin

- a. yuyanxue, ta nashou.
 linguistics 3SG take.hand
 ‘S/he is good at linguistics.’
- b. *ta nashou yuyanxue.
 3SG take.hand linguistics

Huang (1989a) has made the following observations: (i) the topical NPs have clearly subcategorizable semantic roles; (ii) these constructions involve a large set of compound verbs, including some V+N compounds which are practically all disyllabic in Chinese, and all of the quadrisyllabic compounds, and (iii) TOPICS can be regarded as being subcategorized (Bresnan 1982a). Based on these three observations, Huang shows that the most efficient account is to treat the topical NPs as subcategorized TOPICS. Mo (1990) has proposed a new grammatical function STOPIC (s for ‘subcategorized’) to differentiate them from the non-thematic TOPICS.

According to Huang (1989a), the subcategorizable TOPIC achieves parsimony in terms of lexical encoding and mapping to c-structure, but this would introduce complexities to the LMT. Her (1991, 2010), based on the same LMT considerations, argues that TOPICS should be regarded as strictly non-subcategorizable. To deal with the fact that pseudo-transitive verbs do not allow the stipulated OBJs to be realized in the canonical OBJ position, a feature-value pair [FRAME +] is assigned to those verbs. The [FRAME +] feature can only be obtained by way of unification with the TOPIC. The annotated PSR in (14b) specifies that TOPIC receives the feature [FRAME +] and it must be associated with some GF in the f-structure to fulfill the Extended Coherence Condition.

(14) Her (2010):

- a. *nashou* V (\uparrow PRED) = ‘BE-GOOD-AT<SUBJ OBJ>’
 (\uparrow OBJ FRAME) =_c +
- b. S' → NP S
 (\uparrow TOPIC)=↓ \uparrow =↓
 (\uparrow FRAME)=+ +

It is important to note that neither account explicates how it will account for the NPs occurring in other non-OBJ positions, such as in (15).

(15) Mandarin

[[Mali zui nashou] de kemu] shi shuxue.

Mary most take.hand DE subject be math

‘The subject that Mary is best at is math.’

In (15), a gap in the relative clause is linked to the head noun, and is then linked to the complement of the verb *shi* ‘be’. In Huang’s (1989a) account, the subcategorized SUBJ will have to be linked to other GFs following the same mechanisms for control and complementation (Bresnan 1982a). See Her (2010) for a different account. In both cases, however, there is neither a clear solution to the entailed complexities for LMT, nor an answer to the question of why such a high-level solution is needed for what seems to be a parochial fact limited to a set of predicates in a specific language.

In sum, the pseudo-transitive verbs in Mandarin, where the OBJ-like arguments can only occur in the TOPIC position, pose a great challenge to the theory of GF-encoding in LFG. The two existing proposals (Huang 1989a and Her 2010) both have their strengths and weaknesses. The fact that the set of verbs involved are some of the verbs currently undergoing changes in transitivity (Jiang & Huang 2018) suggests that the ultimate solution may involve a theory which takes historical changes involving GFs into consideration.

3.2 Cantonese

In contrast to the issue-driven discussion on GFs in Mandarin in the last section, this section will provide a survey on SUBJ (Lee 2003), OBJ (Lam 2008), and the complement (Bodomo & Lee 2003, Lee 2002) in Cantonese.

3.2.1 Subject in Cantonese

Lee (2003) shows that two syntactic properties are of particular relevance in the identification of the subject in Cantonese. The first is the binding of the reflexive

pronoun *zigei* ‘self’ to the subject *Mary* within the same clause, or to the subject *John* in the clause containing the local clause. This, following Tan (1991), clearly distinguishes the subject from the topic, both of which can be found preverbally.

(16) Cantonese

John_i zi1 Mary_j sik6-zo2 keoi5-zi6gei2_{i/j} haap6 faan6.
 John know Mary eat-PFV 3SG-self CLF rice
 ‘John knows that Mary ate his/her lunch box.’ (Lee 2003: 30)

The second distinctive property of the subject is that the possessor of the subject can be easily relativized with the gap strategy (17a), but the possessor of the object cannot be relativized in the same way (17b):

(17) Cantonese

- a. [_ sing4zik1] ji5ging1 gung1bou3-zo2 ge3 hok6saang1
 grades already announce-PFV REL students
 ‘the students whose grades have been announced.’ (Lee 2003: 37)
- b. *hok6haau6 ji5ging1 gung1bou3-zo2 [_ sing4zik1] ge3 hok6saang1
 school already announce-PFV grades REL students
 (Intended meaning: ‘the student whose grades have been announced
 by the school’) (Lee 2003: 38)

Luke et al. (2001) discuss the Subject Condition in Cantonese. As with Sinitic languages in general, Cantonese allows pro-drop even without agreement morphology or case-marking. This poses a challenge to the identification of grammatical functions at f-structure. Luke et al. (2001) show that apparently ‘subjectless’ sentences, in fact, do have a subject, but discourse-pragmatic criteria, such as the speech context, must be taken into consideration in order to retrieve the subject. See also Liao (2010) for a discussion on the pro-drop patterns in Mandarin Chinese, and for an analysis within LFG.

3.2.2 Object in Cantonese

Lam (2008) investigates the syntax of objects in Cantonese, in particular, their syntactic behaviours in double object constructions (DOCs). Without morphological marking, the structural position of each object becomes an important clue in the identification of the different object functions – in (18), the recipient-object is found immediately postverbally, with the theme-object following it:

(18) Cantonese

- a. Recipient-NP < Theme-NP
 ngo gaau siupangjau zungman.
 1SG teach children Chinese
 'I teach children Chinese.'
- b. *Theme-NP < Recipient-NP
 *ngo gaau zungman siupangjau.
 1SG teach Chinese children
 'I teach children Chinese.'

This, however, is not the canonical order of objects for the verb GIVE – it is the theme-object that must be immediately postverbal.

(19) Cantonese

- a. Theme-NP < Recipient-NP
 ngo bei-zo bun syu ngo gaaze.
 1SG give-PFV CLF book 1SG elder.sister
 'I gave the book to my elder sister.'
- b. *Recipient-NP < Theme-NP
 *ngo bei-zo ngo5 gaaze bun syu.
 1SG give-PFV 1SG elder.sister CLF book

A related question is – which one of these objects is the unrestricted object OBJ, and which is the restricted one OBJ_θ? In LFG, the object in a DOC which grammatically patterns with the monotransitive object is OBJ, while the one which does not is OBJ_θ. Passivization is often seen as *the* diagnostic for unrestricted objecthood, but in Cantonese, as in Mandarin Chinese, passivization is often constrained – the passive is associated with a meaning of adversity. As a result, not all verbs, even monotransitive ones, can be involved in passivization (20). It is therefore not a very helpful test for the unrestricted object. We shall return to a discussion of passivization in Section 4.

(20) Mandarin

- a. Zhangsan gei ren du-si le.
 Zhangsan give people poison-die PRT
 'Zhangsan was poisoned to death by people.'
- b. *Zhangsan gei ren yi-hao le.
 Zhangsan give people cure PRT
 'Zhangsan was cured by people.' (Lefebvre 2011: 257)

Patterns of relativization and pro-drop show that it is the theme-object which behaves like the monotransitive object. Lam (2008) thus concludes that the theme-object is the unrestricted object in Cantonese, while the recipient-object is the restricted object.

3.2.3 Complement in Cantonese

Lee (2002) and Bodomo & Lee (2003) show that Cantonese verbs such as *zidou* ‘think’ may take either a COMP (21a) or an OBJ (21b), while other verbs subcategorize for only a COMP (22a) but not an OBJ (22b):

(21) Cantonese

- a. ngo zi dou _S[keoi hai hou jan].
1SG know 3SG be good person
‘I know that s/he is a good person.’
- b. ngo zi dou _{DP}[li gin si].
1SG know this CLF matter
‘I know (about) this.’

(22) Cantonese

- a. ngo hei mong _S[keoi hai hou jan].
1SG hope 3SG be good person
‘I hope that s/he is a good person.’
- b. *ngo hei mong _{DP}[keoi].
1SG hope 3SG
[‘I hope him/her.’]

They therefore argue that Cantonese is a ‘mixed language’, along the lines of Dalrymple & Lødrup (2000).

4 *Ba*, *Bei*, and Related Constructions

4.1 Mandarin

The Mandarin *bei* construction is considered to be the equivalent of the English *by* passive in the literature. The discussion of the *bei* passive is frequently compared to the *ba* construction, as they share almost identical surface structures. Note that in (23), the agent *gemi* ‘fans’ is optional, much like the *by*-agent phrase in English. A *bei* construction with the agent phrase is known as the ‘long’

passive, while a *bei* construction with the agent phrase omitted is the ‘short’ passive (Huang et al. 2009, Huang & Shi 2016).

- (23) Mandarin
 Amei bei (gemi) weizhu.
 Amei BEI fans encircle
 ‘Amei was encircled (by the fans).’

- (24) Mandarin
 gemi ba *(Amei) weizhu.
 fans BA Amei encircle
 ‘The fans encircled Amei.’

Several important and controversial issues have been raised over the passive analysis of the *bei* construction. The first is whether *bei* is a preposition like the English *by* (Huang 1982, Li 1990, Li & Thompson 1981, Lü 1980, McCawley 1992, Tsao 1996) or a verb (Bender 2000, Feng 1995, Her 1989, 2009, Hsueh 1989, Huang 1999). The current dominant view of *bei* as higher verb is heralded by Huang & Mangione’s (1985) formal semantic account, and was first adopted in LFG syntactic studies (e.g. Huang & Mangione 1985, Bender 2000).

The second issue is whether there is one or two passive constructions. The dominant GB analysis treats the passive in Mandarin as having ‘split’ into two different constructions: the agentless short passive versus the long passive with an overt agent. This is motivated by the observation that the long passive allows a much wider range of syntactic behaviours than the short passive. Yet Her (2009) shows, with corpus data from Sinica Corpus (Chen et al. 1996), that the short passive in fact exhibits the same range of syntactic behaviours, and argues that the two should receive exactly the same analysis, with the only difference being whether the agent is overt or covert. The evidence is presented below. First, Her (2009) shows that short passives (26), just like long passives (25), allows long-distance gaps:

- (25) Mandarin
 bei ta qitu nuyi de ziyou renmin.
 BEI 3SG attempt enslave DE free people
 ‘the free people who were “attempted-to-enslave” by him’

(26) Mandarin

- a. gongsi-de wanglu bei qitu ruqin.
company-POSS network BEI attempt hack
'The company network has been "attempted-to-hack".'
- b. ziliao bei shefa kaobei le.
document BEI manage copy PRF
'The documents have been "managed-to-copy".'

Second, the claims in the literature that a long passive, but not a short passive, allows a resumptive pronoun to fill a gap are also incorrect, as in (27) and (28).

(27) Mandarin

- Zhangsan_i bei wo piping-le ta_i yidun.
John BEI 1SG criticize-PFV 3SG once
'John was criticized once by me.'

(28) Mandarin

- ta ba_i pa bei renwei ta_i wufa guanjiao haizi.
3SG father afraid BEI consider 3SG fail discipline children
'His father was afraid to be considered that he failed to discipline his children.'

Third, the split view claims that the pronominal particle *suo* is allowed in the long passive only, as in (29), and not the short passive. The corpus example in (30) shows that *suo* can be found in the short passive as well:

(29) Mandarin

- ni hui bei ren suo chixiao.
2SG will BEI person SUO sneer
'I'm afraid your recent behavior toward him will be sneered at.'

(30) Mandarin

- ni nanmian bu bei suo pian.
2SG unavoidably not BEI SUO trick
'Unavoidably you would be tricked.'

Finally, the split view claims that only the long passive allows an adverbial PP, as in (31), but not in the short passive. This is again shown to be wrong by the corpus example in (32).

(31) Mandarin

Zhangsan bei Lisi zai xuexiao pian-zou le.
 John BEI Lee at school abduct PFV
 'John was abducted at school by Lee.'

(32) Mandarin

yi zhi laoshu bei zai jiujiang zhong jinpao-le yi nian.
 one CLF mouse BEI at alcohol inside soak-PFV one year
 'A mouse has been soaked in alcohol for a year.'

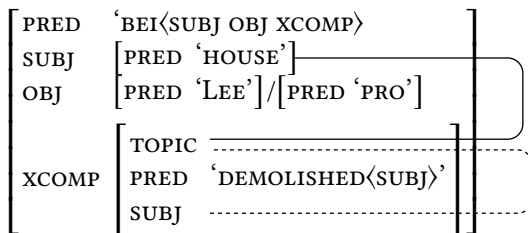
The analysis proposed by Her (2009) has *bei* as a three-place predicate requiring three theta roles, which are mapped to SUBJ, OBJ, and XCOMP, with a meaning that approximates (33). The lexical entry, including its lexical category, lexical form, and the control relations, is shown in (34). Note that the operation that links theta roles with GFS is γ ; thus $\gamma(\hat{\theta})$ in (34) refers to the GF linked to the logical subject. $(\uparrow \text{OBJ}) = (\uparrow \text{XCOMP } \gamma(\hat{\theta}))$ thus means that OBJ controls the GF in XCOMP that is linked to the $\hat{\theta}$. The f-structure of a typical *bei* sentence is illustrated in (35).

(33) *bei* $\langle x y z \rangle$: *x* is (adversely) affected by *y* in a way that *z* describes

(34) *bei* V $(\uparrow \text{PRED}) = \text{'BEI(SUBJ OBJ XCOMP)'}
 $(\uparrow \text{SUBJ}) = (\uparrow \text{XCOMP TOPIC})$
 $(\uparrow \text{OBJ}) = (\uparrow \text{XCOMP } \gamma(\hat{\theta}))$
 $\neg(\uparrow \text{OBJ}) \Rightarrow (\uparrow \text{OBJ PRED}) = \text{'PRO'}$$

(35) Mandarin

na jian fangzi bei (Lisi) chai-le.
 that CLF house BEI Lee demolish-PFV
 'That house got demolished (by Lee).'



In (35), $(\uparrow \text{OBJ})$, which is either an overt agent *Lee* or a covert pronoun, is responsible for adversely affecting $(\uparrow \text{SUBJ})$, the house, in a way described by

(↑ XCOMP), i.e., the house is demolished. Note that (↑ SUBJ) controls the TOPIC in XCOMP, which is anaphorically linked to SUBJ, indicated by the dotted line. The matrix SUBJ, the house, is also the SUBJ of the embedded clause, which is passive in nature. A non-canonical example is given in (36), with both c-structure and f-structure illustrated.

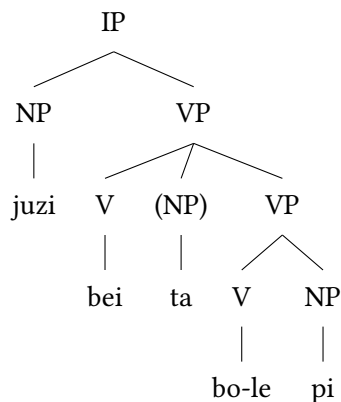
(36) Mandarin

juzi bei (ta) bo-le pi.

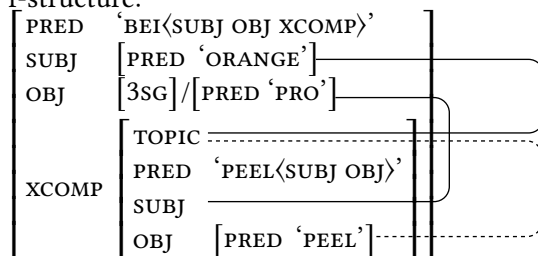
orange BEI 3SG peel-PFV peel

‘The orange has its peel peeled off (by him).’

a. c-structure:



b. f-structure:



In (36), (↑ OBJ), which is again either overt or covert, is responsible for adversely affecting (↑ SUBJ), the orange, in a way described by (↑ XCOMP), i.e., the orange has its peel peeled off. Note that (↑ SUBJ) controls the TOPIC in XCOMP, and (↑ OBJ) controls the SUBJ in XCOMP. Within the XCOMP, TOPIC is anaphorically linked to OBJ.

Based on this account, Her (2009) contends that the *bei* construction is the passive counterpart of the *ba* construction, not the canonical active sentence. Thus, *ba* is likewise a three-place predicate, as in (37), and its lexical entry is

In summary, *ba* and *bei* are both treated as three-place predicates. While the former involves a causer as SUBJ, an affectee as OBJ, and an active proposition describing the caused event as xCOMP, the latter involves an affectee as SUBJ, a causer as OBJ, and a passive proposition describing the caused event as xCOMP. Thus, in this sense the *bei* construction is the passive counterpart of the *ba* constructive.

See also Yang (2020) for a discussion of the impersonal BEI-passive in Mandarin.

4.2 Cantonese

A discussion on aspects of the passive structure in Cantonese is offered in Chow (2019). While Cantonese shares a phonologically similar passive morpheme *bei* with Mandarin, the two counterparts differing only in tones, one clear morphosyntactic difference is that the NP following *bei* in Mandarin is optional (40a), while that in Cantonese is obligatory (40b). In other words, the ‘short’ passive discussed in the previous section is not allowed in Cantonese. Even in agentless passives, the NP *jan* ‘person’ must follow *bei*.

- (40) a. Mandarin
 Zhangsan bei (Lisi) daa-le.
 Zhangsan BEI Lisi hit-PFV
 ‘Zhangsan has been hit (by Lisi).’
 b. Cantonese
 Siuming bei *(jan) daa.
 Siuming PASS people hit
 ‘Siu Ming was beaten up.’

Based on this, Chow (2019) argues that passivization in Cantonese involves the subject being linked to an oblique object, a non-core argument (Bresnan 1982c; Chow 2019: 232). It is also shown that, unlike Kit’s (1998) and Her’s (2009) analyses for the Mandarin *bei*, the Cantonese *bei* is a ‘non-argument taking and a non-predicative’ coverb (Chow 2019: 186), which contributes a (↑ VOICE)=PASS feature to f-structure.

Similar to Her (2009), Chow (2019) acknowledges that the matrix subject in a passive structure is linked to the topic role. Indeed, the same propositional content may be expressed by an active, a ‘direct’ or canonical passive (41a), or a ‘indirect’ passive (42b) structure, depending on the information structure to be expressed. In an canonical passive structure, the entire theme-NP is topical

– it is expressed as the subject. In an ‘indirect’ passive structure, however, it is the possessor of the theme-NP which is topical – the possessor is linked to the subject.

(41) Cantonese

a. The ‘direct’ or canonical passive

[Can saang gaa ce] bei tungsi zong-laan zo.

Mr. Chan CLF car PASS colleague crash-broken PFV

‘Mr. Chan’s car has been crashed by his colleague.’

b. The ‘indirect’ passive

[Can saang] bei tungsi zong-laan zo [gaa ce].

Mr. Chan PASS colleague crash-broken PFV CLF car

‘Mr. Chan had his car crashed by his colleague.’

Semantically, the subject must be adversely affected in order for an indirect passive to be acceptable. Chow (2018, 2019) proposes that, for the indirect passive structure [NP1 BEI2 NP2 V NP3] to be licensed, an additional malefactive role, which must be topical, is introduced into the structure. Due to the limits of space, we shall leave the discussion here and ask interested readers to refer to these studies.

5 Dative alternation

Dative alternations, as well as ditransitive constructions, have been extensively discussed in the Chinese linguistics literature. In addition to the word order variations and the introduction of an applied object common in other languages (e.g. Bresnan et al. 2007), the challenges in analyzing the Mandarin dative alternative involve the position and the grammatical status of the lexical form *gei* ‘give’ (e.g. Chao 1968, Zhu 1982). The discussion in this section focuses on Mandarin only, as the dative alternation is not attested in Cantonese (Lam 2008).

(42) Ditransitive constructions with *gei* in Mandarin (42a, 42c & 42d are from Huang & Ahrens 1999)

a. SUBJ *gei* IO V DO

b. SUBJ DO V (*gei*) IO

c. SUBJ V (*gei*) IO DO

d. SUBJ V DO *gei* IO

The pattern in (42d) will be treated as the semantically most transparent word order for *gei* ‘give.to’. It should, however, be noted that it is not clear whether a clearly favoured canonical word order is available (Yao & Liu 2010). In a ditransitive construction, *gei* introduces the IO as the goal towards which a theme DO moves. In the literature, there are several different views regarding the grammatical status of *gei*: *gei* is (i) a verb, producing a serial verb construction with the other verb in the construction; (ii) a co-verb/preposition, marking the IO in the construction. The verb/preposition debate is familiar in the Chinese linguistics literature, and has been applied to several other lexical items with similar distributions. Either account is generally adequate in describing the patterns in (42a) and (42d). The patterns in (42b) and (42c), where *gei* is optional and the optionality depends on the V, has generated interesting debates specific to the ditransitive construction (e.g. Chao 1968, Li & Thompson 1981, Cheng & Huang 1988). Huang & Ahrens (1999) observe that verbs without an inherent meaning of transfer (e.g. *ti* ‘to kick’, *bian* ‘to knit’), typically require the presence of *gei*, while *gei* in structures with verbs with an inherent meaning of transfer may be optional (e.g. *song* ‘to give as a gift, to send’, *zhu* ‘to lend’, *mai* ‘to sell,’ and *gei* ‘to give’). This suggests that the *gei* immediately after the verb is a stem that introduces an applicative goal role to the argument structure of the verb. This account has been incorporated into Huang’s (1993a) LMT of Mandarin. The compounding account has also been adopted by several Construction Grammar-based accounts (e.g. Ahrens 1995, Zhang 1999, Liu 2006). Huang (1993a) argues that the postverbal *gei* is a part of the complex predicate which involves a morpholexical rule introducing an additional goal role into the argument structure. The study also observes that there is a significant contrast between the English and Chinese dative constructions – the theme can become SUBJ in a passive construction in Mandarin, but not the goal.

- (43) a. Mary gave John a book.
 b. John was given a book by Mary.
 c. A book was given to Mary by John.
- (44) Mandarin (adapted from Huang (1993a: example 22))
 a. Zhangsan ti-*(gei) Lisi yi ge qiu.
 Zhangsan kick-GEI Lisi one CLF ball
 ‘Zhangsan kicked a ball to Lisi.’
 b. *Lisi (bei Zhangsan) ti-gei-le yi ge qiu.
 Lisi BEI Zhangsan kick-GEI-PFV one CLF ball

- c. *nei ge qiu (bei Zhangsan) ti-gei-le Lisi.*
 that CLF ball BEI Zhangsan kick-GEI-PFV Lisi
 ‘That ball was kicked to Lisi (by Zhangsan).’

In sum, this account of V-*gei* compounding, adding an applicative GOAL role, illustrates the lower accessibility of the goal role on the Thematic Hierarchy, and predicts that the goal role cannot be linked to SUBJ in a Mandarin passive structure.

See also Her (2006a) for an alternative analysis of the Mandarin dative alternation.

6 Compounds

Compounding is a productive morpholexical process in Chinese (Hsieh et al. 2022). Mandarin is known to have at least the following types of compounds that can introduce new predicate-argument structures: (i) subject-verb (SV) compounds; (ii) verb-object (VO) compounds; (iii) verb-resultative (VR) compounds; and, (iv) verb-verb (VV) compounds. In this section, the LFG treatments of resultative compounds and VO compounds are presented in Sections 6.1-6.2 and Section 6.3, respectively.

6.1 Early LFG studies on Mandarin compounds

Chao (1968) has observed that a number of distinctive grammatical features of Chinese are related to the prevalence of compounds: (i) V+N compounds tend not to take another object directly; (ii) the noun in the compound is often separable even though it is a sub-lexical unit (called ‘ionization’ in Chao 1968); (iii) separable compounds allow certain degrees of internal modification, and in some cases, an object may appear in non-canonical positions. The earliest published studies in the LFG literature on Mandarin, Huang (1985, 1986, 1988, 1990) for example, have aimed to account for these separable compounds and their non-canonical object positions.

Huang (1990) provides an account for VO compounds in Mandarin. One example that is of particular interest is the idiom chunk *chi cu* ‘be jealous of’, consisting of the lexical verb *chi* ‘eat’ and the noun *cu* ‘vinegar’. The chunk is a non-compositional compound, as the overall meaning is only available if both the V and the N are found in the sentence. What is interesting, and yet challenging, is the fact that the V and the N in the compound can be separated, by *de* in the following example:

Bodomo et al. (2017) treat *seoi* ‘water’ as a syntactic object, whose form is obligatorily required to give the target meaning (hence the FORM feature in OBJ below), but it is not subcategorized for by the PRED, as the VO compound *jau-seoi* ‘swim’ requires only an agent argument at a-structure and *seoi* ‘water’ is athematic in the compound (Bodomo et al. 2017: 389):

$$(48) \left[\begin{array}{l} \text{PRED} \text{ 'SWIM<SUBJ OBJ>} \\ \text{SUBJ} \left[\begin{array}{l} \text{PRED 'PRO'} \\ \text{NUM SG} \\ \text{PERS 1} \end{array} \right] \\ \text{ASP PFV} \\ \text{OBJ} \left[\text{FORM SEOI} \right] \\ \text{ADJ} \left\{ \left[\text{PRED 'ZAN'} \right] \right\} \end{array} \right]$$

Bodomo et al. (2017) apply this analysis to Mandarin VO compounds, too. Che & Bodomo (2018) discuss Mandarin VO compounds, as well as idioms, and adopt a complex predicate analysis for VO compounds.

A complex predicate approach has also been proposed to analyze serial verb constructions, which are common in Chinese. See Bodomo et al. (2003) for a syntactic and semantic account of Cantonese serial verb constructions involving the benefactive role.

6.3 Resultative compounds

Chinese resultative compounds involve the concatenation of two verbs, and the merge of their predicate argument structures. They are called resultative compounds (VR) because the first verb denotes an action, and the second verb typically refers to the result caused. Previous studies have found that both verbs contribute to the argument structure of the compound. Li (1990) proposes a structure-based account that allows most possible predicate-argument structures, but fails to select the correct reading among other possibilities. Huang & Lin (1992) assume that VV compounds in Mandarin represent composite event structures and the complex predicate formation can be resolved with morpholexical mapping based on prototypical argument templates. Li (1995) proposes another account based on the causative hierarchy. Her (2004, 2007) offers an LFG account by incorporating unified mapping principles of LMT.

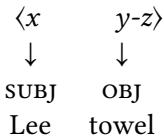
Her’s (2004, 2007) account focuses on cases where the first V has either one or two arguments, while the second V has only one argument. In addition, it is assumed that the VR compounds have two arguments. Hence, there are cases in

which each verb contributes an argument, or the more complicated cases where the argument from the second verb can be merged with either the first or the second argument of a transitive verb, such as *niu* ‘to wring’ in (50). The two argument merging scenarios are given in (49).

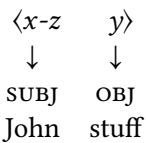
- (49) V-V Resultative Compounding
 $V_1\langle x\ y\rangle + V_2\langle z\rangle \rightarrow$ (i) $\langle x\ y-z\rangle$
 (ii) $\langle x-z\ y\rangle$

Given that the resultative compound is transitive, thus a two-place predicate, the single role of V_2 must join one of the two roles of V_1 and form a composite role. Logically, two possibilities are obtained as shown in (49), but three patterns of argument-function linking are observed, as in (50)-(52). Note also that a causative reading is also obtained, except in (51).

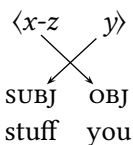
- (50) Mandarin; causative
 Lisi niu-gan-le maojin.
 Lee wring-dry-PFV towel
 ‘Lee wrung the towel dry.’



- (51) Mandarin; non-causative
 Zhangsan chi-yan-le zhe zhong dongxi.
 John eat-tired.of-PFV this kind stuff
 ‘John got tired of eating this kind of stuff.’



- (52) Mandarin; causative
 zhe zhong dongxi hui chi-si ni.
 this kind stuff will eat-dead 2sg
 Eating this kind of stuff will make you dead.’



Her's (2007) resultative compound rules are given below in (53).

(53) V-V Resultative Compounding

$V_{\text{caus}}\langle x \ y \rangle + V_{\text{res}}\langle z \rangle \rightarrow V_{\text{caus}}V_{\text{res}}\langle \alpha \ \beta \rangle$, where $\langle \alpha \ \beta \rangle^* =$

(i) $\langle x \ y-z \rangle$

(ii) $\langle x[\text{caus}] \ y-z[\text{af}] \rangle$

(iii) $\langle x-z \ y \rangle$

(iv) $\langle x-z[\text{af}] \ y[\text{caus}] \rangle$

*Unsuppressed z and the other unsuppressed role receive [af] and [caus], respectively

With these rules, and a modified version of LMT, all possible interpretations of resultative compounds with $V\langle x \ y \rangle$ and $V\langle x \rangle$ combinations can be accounted for. See Her (2007) for details.

7 Lexical Mapping Theory and locative inversion

LFG crucially observes radical lexicalism (Karttunen 1989), and views grammatical operations as the projection and unification of mentally represented lexical information (Bresnan 1982b). Word order variations and alternations are not accounted for by transformational rules, but by the projection and unification of the mental representation of information from conceptual structure to c-structure. See Belyaev 2023a [this volume] and Belyaev 2023b [this volume] for a discussion on the architecture of LFG.

The introduction of Lexical Mapping Theory (LMT) to LFG to derive lexicalized argument structures in terms of GFS is crucial in allowing the theory to account for concept-driven lexicalization. It also provides an elegant way to account for word order and other typological variations. LMT formulates rules to capture how conceptualized event structures are lexicalized as argument structures to mediate mapping to functional structures (Bresnan & Kanerva 1989, Alsina 1993). Huang (1993a) proposes an adapted LMT for Mandarin, adopting previous assumptions that the mapping is determined by the thematic hierarchy, and the theory of intrinsic and default classification of grammatical functions. The adaptations are proposed, taking into consideration both the theoretical concerns to incorporate Dowty's (1991) Proto-role properties, and the need to capture several atypical argument realization patterns in Mandarin. These patterns include the NP realization of extent/dimension (54a), and the use of time/location NPs instead of pleonastic pronouns in the subject position in presentative constructions (54b).

(54) Mandarin

- a. Ta ti-le wo yi jiao.
3SG kick-PFV 1SG one foot
'S/he kicked me once'
- b. Qiangshang gua-le ji fu hua.
wall.top hang-PFV several CLF painting
'There are several paintings on the wall.'

Huang also provides evidence to show that the GOAL role is below the THEME role on the thematic hierarchy in lexicalized compounds, idiom chunks and ditransitive verbs. The thematic hierarchy for Mandarin is thus revised, as shown in (55). The intrinsic and default classification of grammatical functions (57a) are slightly modified to simplify feature assignments, and to accommodate the locative inversion construction in Mandarin.

(55) Thematic hierarchy for Mandarin Chinese (Huang 1993a)

ag > ben/mal > instr > th/pat > exp/goal > loc/dom

Huang & Her (1998) and Her (2010) propose a simplified LMT. This proposal keeps the universal thematic hierarchy, with the assumption that morpholexical operations can replace the Subject Condition. Note that the two proposals take different approaches to accommodate the Mandarin Chinese data. Huang (1993a) has revised the thematic hierarchy, but has kept intrinsic and default classification of grammatical functions, while Her (2010) has kept the thematic hierarchy (56), but has adjusted the criteria for the $\pm r$ (estricted) and $\pm o$ (bjective) specifications. The different proposals aim to account for several important generalizations in Chinese, some of which will be discussed below.

(56) Thematic Hierarchy for Mandarin Chinese (Her 2010)

ag > ben > go/exp > inst > pt/th > loc

In terms of the classifications, the $[-]$ values, considered less marked than the $[+]$ values, are thus given a higher position on the hierarchy. Her (2010) also assumes that $[-r]$ (unrestricted) is less marked than $[-o]$ (non-object-like), given that $[-r]$ GFs are not restricted to specific argument roles, Huang (1993a) does not make the same assumption.

(57) Markedness Hierarchy of Grammatical Functions:

- a. SUBJ ($[-r, -o]$) > OBJ ($[-r, +o]$) / OBL _{θ} ($[+r, -o]$) > OBJ _{θ} ($[+r, +o]$)
(Huang 1993b)

- b. SUBJ $([-r, -o]) > \text{OBJ } ([-r, +o]) > \text{OBL}_\theta ([+r, -o]) > \text{OBJ}_\theta ([+r, +o])$
(Her 2010)

See also Fu (1993) and Pan (1997) for introductions to LMT published in Chinese journals.

Locative inversion is heavily influenced by considerations at information structure (Bresnan 1989; Dalrymple 2001: 209). It is also known as the presentative or existential construction. Gu (1992, 1997) assumes that most verbs which may participate in the locative inversion in Mandarin are derived from transitive verbs. Pan (1996, 1997) argues that it is necessary to distinguish two types of locative inversion, based on the presence of the aspectual markers *-le* PFV or *-zhe* DUR on the verb. Huang et al. (1999) shows that the range of different meanings associated with the locative inversion and the presentative sentences can be accounted for by considering the interaction of constructional and lexical meanings. Cui & Yuan (2020) suggest that existential sentences exhibit features of ergativity.

The challenge that the locative inversion presents to LFG, especially to LMT, is how it is possible to map the locative role, ranked low on the thematic hierarchy, to the most prominent grammatical function SUBJ. Bresnan & Kanerva (1989), based on data from Chicheŵa, propose a special default rule for the presentational focus construction. The rule assumes that the locative phrase bears the focus feature and ensures that a locative $[-r]$ argument appears. Bresnan (1994) extends the account to English. Huang & Her (1998), however, shows that the proposal cannot account for the locative inversion in Mandarin, especially in constructions involving three-place predicates, such as *fang* ‘put’:

(58) Mandarin

- a. Lisi fang-qian zai zhuo-shang.
Lisi place-money at table-top
‘Lisi placed some money on the table.’
- b. qian (Lisi) fang zai zhuo-shang.
money Lisi placed at table-top
‘Money was placed on the table by Lisi.’
- c. zhuo-shang (Lisi) fang-le qian.
table-top Lisi place-PFV money
‘On the table was placed some money.’

Crucially, both (58b) and (58c) are treated as locative inversion structures. There is, however, evidence suggesting that (58b), in fact, involves topicalization, but

not locative inversion. First, *qian* ‘money’ is not a locative phrase. Second, the verb in (58b) does not require the presence of the aspectual markers *-zhe* DUR or *-le* PRF, unlike the verb in well-accepted Mandarin locative inversion structures. The preposed NP in (58b) can therefore be treated as a regular topicalized phrase, without further stipulations. See also Lui (2020) for a discussion of the locative inversion in Cantonese.

8 Classifiers and measure words

Mandarin is a textbook example of a numeral classifier language. As a lexical category, numeral classifiers have two subcategories, namely sortal classifiers (C), *aka* classifiers; and mensural classifiers (M), *aka* measure words (Huang & Shi 2016). See (59) and (60) for examples of Cs and Ms, respectively (Her 2012b).

(59) Mandarin

- a. san gen xiangjiao
3 CLF banana
‘3 bananas’
- b. yibai ben shu
100 CLF book
‘100 books’
- c. shi pi ma
10 CLF horse
‘10 horses’

(60) Mandarin

- a. san da xiangjiao
3 M-dozen banana
‘3 dozens of bananas’
- b. yibai xiang shu
100 M-box book
‘100 boxes of books’
- c. shi qun ma
10 M-herd horse
‘ten herds of horses’

C and M consistently appear after a numeral (Num) and before a noun (N) and are mutually exclusive in this position, as only one C/M can be used. It is a near

consensus in the Chinese linguistics literature to assign the same phrasal structure to them. The syntactic position is typically called the classifier position. See Jiang et al. (2022) for a summary of syntactic approaches, and Chen et al. (2022) for a summary of semantic approaches to the Chinese classifier system.

Cs and Ms, however, do exhibit some differences (Chao 1968, Her 2017; see also Huang 2015 for an ontological account). In terms of modification, the adjective, whether it is found before or after a C, modifies the head N. (61a) and (61b) therefore have the same meaning. An adjective in a nominal structure with an M, however, modifies the immediately following element. Thus, in (62a), *da* ‘big’ modifies *xiang* ‘box’, yielding the meaning ‘one big box of apples’, while in (62b), *da* ‘big’ modifies *pingguo*, yielding the meaning ‘one box of big apples’ (Her 2012b):

(61) Mandarin sortal classifiers

- a. yi da ke pingguo
1 big CLF apple
- b. yi ke da pingguo
1 CLF big apple
‘one big apple’

(62) Mandarin mensural classifiers

- a. yi da xiang pingguo
1 big M-box apple
‘one big box of apples’
- b. yi xiang da pingguo
1 M-box big apple
‘one box of big apples’

Another difference between Cs and Ms is that the former has the fixed numeral value of precisely 1, while Ms can be of any value, numerical or non-numerical, except 1, as shown in (63). In (63), K is a C or M, and k is the mathematical value of K.

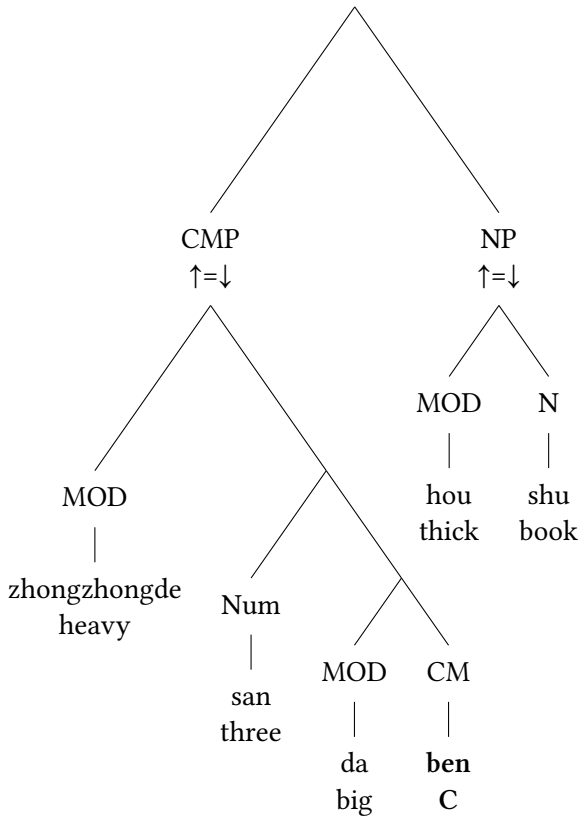
(63) C/M distinction in mathematical values

[Num K N] = [NUM×kN], where K=C *iff* k = 1, otherwise K=M.

The LFG account offered in Her (2012b) assigns a left-branching c-structure to C/M, as in (64), consistent with the traditional approach but contra the dominant right-branching structure preferred in recent derivational syntax. See Her

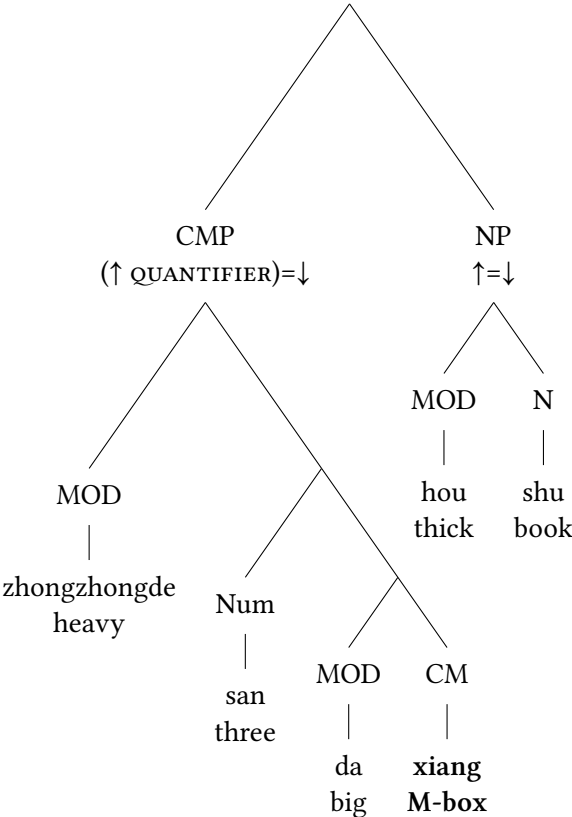
The notation ‘ $A \Rightarrow B$ ’ in (66) means ‘if A, then B’. Thus, in a C/MP, if it has **PRED**, indicating it is an M, then the information goes in a **QUANTIFIER** function; if it does not have **PRED**, indicating it is a C, then it serves as a co-head with N and its **PROFILED** value must be a member of N’s **PROFILABLE** set of values. The c-structure and f-structure of two nominal phrases with a CLF and an M are given in (67) and (68), respectively.

- (67) Mandarin
 zhongzhong-de san da ben hou shu
 heavy-DE 3 big CLF thick book
 ‘three heavy big thick books’



PRED	BOOK
PROFILED	BEN 本
PROFILABLE	{BEN 本, CE 冊}
CARD	3
ADJUNCTS	$\left\{ \begin{array}{l} \left[\begin{array}{l} \text{“HEAVY”} \end{array} \right] \\ \left[\begin{array}{l} \text{“BIG”} \end{array} \right] \\ \left[\begin{array}{l} \text{“THICK”} \end{array} \right] \end{array} \right\}$

- (68) Mandarin
zhongzhong-de san da xiang hou shu
heavy-DE 3 big M-box thick book
‘three heavy big boxes of thick books’



PRED	BOOK									
ADJUNCTS	{["THICK"]}									
PROFILABLE	{BEN 本, CE 冊}									
CARD	3									
QUANTIFIER	<table> <tr> <td>PRED</td> <td>'BOX'</td> </tr> <tr> <td>CARD</td> <td>3</td> </tr> <tr> <td>ADJUNCTS</td> <td>{ <table> <tr> <td>["HEAVY"]</td> </tr> <tr> <td>["BIG"]</td> </tr> </table> }</td> </tr> </table>		PRED	'BOX'	CARD	3	ADJUNCTS	{ <table> <tr> <td>["HEAVY"]</td> </tr> <tr> <td>["BIG"]</td> </tr> </table> }	["HEAVY"]	["BIG"]
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["HEAVY"]										
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The parallel architecture of c-structure and f-structure allows Cs and Ms to belong to one syntactic category and (67) and (68) thus share the same c-structure, while their differences are captured in the f-structure, where a CLF serves as a co-head of the nominal construction and an M serves as the head of a quantifier phrase.

See Börjars et al. (2018) for a different proposal for the c- and f-structures of Mandarin noun phrases containing classifiers and measure words, and Huang & Ahrens (2000) for a discussion on kind and event classifiers in Mandarin.

9 Other properties and phenomena

A number of other properties and phenomena are prominent in Chinese as well, and studies of these are available in the very large body of LFG literature on the analysis of Chinese. However, due to constraints of space and scope, we cannot discuss all of these in detail in this chapter. This section will hopefully serve as a pointer to some of these works. The syntax of Mandarin questions has been investigated in Shiu & Huang (1989) and Huang (1993b). Relativization and topicalization phenomena in Mandarin have been studied in Huang (1992), where the author proposes a functional uncertainty analysis (Kaplan & Zaenen 1989). Huang (1988) analyses 'possessive subjects' in Mandarin, while Huang (1990) offers an LFG account of possessive-object constructions in Mandarin, showing how these display lexical discontinuity. Chief (1996) explores an LFG account of Mandarin reflexive verbs. Dong (2016) provides an LFG analysis of pronominal binding in Mandarin. Lam (2020) investigates anaphoric and functional control in Mandarin. Che (2014) is a study of particles in Mandarin.

10 NLP applications of LFG in Chinese

LFG has played an important role in the development of Chinese NLP. Joan Bresnan, Ronald Kaplan, Lauri Karttunen and Annie Zaenen visited Taiwan at

the dawn of Chinese computational linguistics in 1989 and made lasting impact (Bresnan 1989). One of the immediate outcomes was the Information-based Case Grammar (ICG, Chen & Huang 1990), the first comprehensive grammar of Chinese that incorporated features of both LFG and HPSG. Her et al. (1991) and Her (1995) describe a rule-based commercial machine translation system for English-Chinese, where parsing, transfer and generation are all based on LFG. This system was later acquired by Apptek (<https://www.apptek.com/>) and expanded to include multiple language pairs and many other NLP applications. Kit (1992, 1993a,b) and Kit & Webster (1992) are also among the earliest studies applying LFG assumptions to parse Chinese. Webster & Kit (1995) describe the use of a 'Chinese-Lexical Functional Grammar (C-LFG)' parser to analyze simple sentences from texts. Sun (2001) outlines the computational implementation of LFG in Chinese. Fang & King (2007) provide an LFG grammar of Mandarin for machine use. Guo et al. (2008) describes LFG-based generation for Chinese, while Burke et al. (2004) and Guo (2009) describe LFG-based Chinese treebanks. Chief et al. (2000) present a corpus-based approach to the analysis of synonyms in Chinese. Jiang et al. (2018) annotate Chinese light verb constructions according to the paradigm of PARSEME, a platform built based on LFG and other theoretical frameworks.

11 Conclusion: LFG and Chinese Linguistics

The assumptions of LFG have been applied to the research on a number of grammatical phenomena in Chinese languages since Huang (1985). A number of LFG-based studies on Chinese have made a significant impact to Chinese linguistics. Huang & Mangione (1985), one of the earliest LFG papers on Chinese, has inspired Huang's (1988) treatment of, and a long debate on, the status of V1 and V2 in the Mandarin resultative verb construction. Interestingly, the V2-as-matrix-verb analysis, initially proposed by Huang & Mangione (1985), is gradually emerging as a possible consensus. Similarly, the functional uncertainty of LFG allows a transparent account of Mandarin long-distance dependencies without abstract levels and movements (Huang 1992). Huang (1993a) first introduced the concept of applicatives to Mandarin, and initiated many interesting discussions in Chinese linguistics in the past 20 years. LFG studies (Huang 1989a, Tan 1991, Her 1991) on the TOPIC and SUBJ functions in Chinese have contributed to the ongoing topic/subject debate in Chinese. LFG studies have also provided crucial insights to the understanding of the *ba* and *bei* constructions in Chinese (e.g. Her 1989, Bender 2000, Her 2009), especially in terms of treating *ba* and *bei* as the main

predicate. The seeming dilemma of Chinese compounds displaying lexical non-compositionality and phrasal compositionality (e.g. the separable compounds) can be straight-forwardly dealt with by adopting the assumptions of LFG. This is perhaps one of the topics receiving the most attention in the LFG literature on Chinese, including but not limited to Huang (1990), Huang & Lin (1992), Her (1996, 1997), and Bodomo et al. (2017).

Accounts of Chinese languages have contributed to the development of the LFG framework, too. Shiu & Huang (1989) was one of the first LFG accounts on sentential clitics (e.g. Mandarin question particles). Huang (1992, 1993b) applies the concept of functional uncertainty to account for Mandarin data. Her (2006b) introduces the concepts of interaction and optimality to LMT. Her (2012a,b) provides a full account of the classifier system. Finally, Bodomo (2001) and colleagues' work on Cantonese and Zhuang have added to the typological diversity of LFG research.

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Abbreviations

Besides the abbreviations from the Leipzig Glossing Conventions, this chapter uses the following abbreviations.

EXP	experiential	PRT	particle
M	measure word	ZAI	marker meaning 'now' or 'at the moment'

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