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優選詞彙映照理論與英語漢語論旨角色與語法功能之連結

(2/2)

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## 摘要

此一研究計畫檢視LFG中的詞彙映照理論(LMT)，發展出一優選詞彙映照理論；接著以此分析漢語中多項述詞的論旨結構類型、詞彙映照、及功能轉換，並從語法互動的角度對功能轉換(function-changing)的結構提出解釋。

優選理論在音韻研究上已是主流之理論趨勢，但在句法研究上的應用卻仍屬起步階段，且多以詞組結構與詞序為主；國內目前亦尚無OT之語法研究。次項研究計畫以作者研究之互動理論及簡化詞彙映照理論 (Lexical Mapping Theory, LMT) 為基礎，以優選理論 (Optimality Theory, OT) 詮釋語法互動及LMT，將論旨結構 (a-structure) 與語法功能 (lexical form) 之映照原則轉化為有優選排序之映照限制 (constraints)，進而發展出一完整之優選詞彙映照理論 (OT-LMT)，並以其對英語漢語中之多種語法功能轉換現象之分析，驗證此一理論之合理性及普遍性。根據簡化LMT之單一映照原則初步發展出以下OT限制，於{a-structure, lexical form}之candidate set 選取optimal output。以下R指role，F指function。

### (1) Argument-Function Mapping Constraints

(Well-formedness Constraints on Argument Roles)

a. **UniqRol**( $R_a, R_b$ ): Given  $\langle \cdot R_a-F_a \cdot R_b-F_b \cdot \rangle$ ,  $R_a \neq R_b$

b. **DescendRol**( $R_a, R_b$ ): Given  $\langle \cdot R_a-F_a R_b-F_b \cdot \rangle$ ,  $R_a > R_b$

(Well-formedness Constraints on Grammatical Functions)

c. **UniqFun**( $F_a, F_b$ ): Given  $\langle \cdot R_a-F_a \cdot R_a-F_b \cdot \rangle$ ,  $F_a \neq F_b$

d. **DescendFun**( $F_a, F_b$ ): Given  $\langle \cdot R_a-F_a R-F_b \cdot \rangle$ ,  $F_a \geq F_b$

(General Constraints on Argument-Function Linking)

e. **LinkRol**( $R, F$ ): Given  $\langle \cdot R \cdot \rangle$ , R is linked to an F such that  $\langle \cdot R-F \cdot \rangle$ .

f. **LinkFun**( $F, R$ ): Given  $\langle \cdot F \cdot \rangle$ , F is linked to an R such that  $\langle \cdot R-F \cdot \rangle$ .

(Specific Constraints on Argument-Function Linking)

g. **LinkPtTh**( $R, F$ ): Given  $\langle \cdot R-F \cdot \rangle$ , where  $R = pt/th$ , F is  $[-r]$

h. **LinkRolRes**( $R, F$ ): Given  $\langle \cdot R-F \cdot \rangle$ , where  $R \neq \hat{O}$ , F is  $[+r]$

i. **LinkUnobj**( $R, F$ ): Given  $\langle \cdot R-F \cdot \rangle$ , F is  $[-o]$

j. **LinkUnres**( $R, F$ ): Given  $\langle \cdot R-F \cdot \rangle$ , F is  $[-r]$

### (2) OT Ranking of Lexical Mapping Constraints (Chinese)

**UniqRol/DescendRol/UniqFun/LinkRol/LinkFun**

>>

**LinkPtTh**

>>

**LinkRolRes**

>>

**DescendFun**

>>

**LinkUnobj/LinkUnres**

此一優選系統應用於英語漢語之處所詞倒置結構及結果式結構。將簡化LMT的整體（包括普遍的語法特徵派分及各語言中的詞態語法律）全面以OT詮釋，完成OT-LMT；目的二在於將以此OT-LMT分析漢語之詞彙映照，並以此驗證理論。

**關鍵詞：**優選理論、詞彙功能語法、詞彙映照、論旨結構、語法功能、功能轉換

## Abstract

The Optimality Theory (OT) has become the dominant trend in phonological research, while its application in syntactic research is still in its infancy and mostly centers around the study of phrase structures and word order. Thus far, there has not been any syntactic study in the Optimality-Theoretic paradigm. This research project, based on this researcher's previous work on the simplified lexical mapping theory (LMT), aims to interpret the linking between  $\alpha$ -structures and lexical forms in terms of ranked OT constraints and to further validate its aptness and universality in analyzing the function-changing constructions in English and Chinese. The goal is to develop an OT-LMT. Her (2002c), based on the simplified LMT, has tentatively proposed a set of ranked OT constraints to account for the single mapping principle. An optimal output is selected from the set of the candidate set of { $\alpha$ -structure, lexical form} pairs. R refers to 'role' and F to 'function'.

### (1) Argument-Function Mapping Constraints

(Well-formedness Constraints on Argument Roles)

- a. **UniqRol**( $R_a, R_b$ ): Given  $\langle \dots R_a-F_a \dots R_b-F_b \dots \rangle$ ,  $R_a \neq R_b$
- b. **DescendRol**( $R_a, R_b$ ): Given  $\langle \dots R_a-F_a R_b-F_b \dots \rangle$ ,  $R_a > R_b$  in prominence

(Well-formedness Constraints on Grammatical Functions)

- c. **UniqFun**( $F_a, F_b$ ): Given  $\langle \dots R_a-F_a \dots R_a-F_b \dots \rangle$ ,  $F_a \neq F_b$
- d. **DescendFun**( $F_a, F_b$ ): Given  $\langle \dots R_a-F_a R_b-F_b \dots \rangle$ ,  $F_a \geq F_b$  in prominence

(General Constraints on Argument-Function Linking)

- e. **LinkRol**(R, F): Given  $\langle \dots R \dots \rangle$ , R is linked to an F such that  $\langle \dots R-F \dots \rangle$ .
- f. **LinkFun**(F, R): Given  $\langle \dots F \dots \rangle$ , F is linked to an R such that  $\langle \dots R-F \dots \rangle$ .

(Specific Constraints on Argument-Function Linking)

- g. **LinkPtTh**(R, F): Given  $\langle \dots R-F \dots \rangle$ , where  $R = pt/th$ , F is [-r]
- h. **LinkRolRes**(R, F): Given  $\langle \dots R-F \dots \rangle$ , where  $R \neq \hat{\theta}$ , F is [+r]
- i. **LinkUnobj**(R, F): Given  $\langle \dots R-F \dots \rangle$ , F is [-o]
- j. **LinkUnres**(R, F): Given  $\langle \dots R-F \dots \rangle$ , F is [-r]

### (3) OT Ranking of Lexical Mapping Constraints (Chinese)

**UniqRol/DescendRol/UniqFun/LinkRol/LinkFun**

>>

**LinkPtTh**

>>

**LinkRolRes**

>>

**DescendFun**

>>

**LinkUnobj/LinkUnres**

This OT system has been applied to locative inversion constructions and the resultative constructions in English and Chinese. The primary goal of this project is to convert the simplified LMT entirely into OT constraints, including the universal assignment of syntactic features to argument roles and morpho-lexical and morpho-syntactic operations. The second goal is to fully re-analyze lexical mapping in English and Chinese within the newly-developed OT-LMT; doing so also further validate the aptness and universality of OT-LMT. This project thus can also serve as a good model where findings in theoretical linguistics are put into practical application.

**Keywords:** OT, Optimality Theory, LFG, LMT, lexical mapping, argument structure, grammatical functions, function-changing

## 報告內容

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# OPTIMALITY-THEORETIC LEXICAL MAPPING THEORY: A CASE STUDY OF LOCATIVE INVERSION<sup>\*</sup>

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**Abstract** Locative inversion verbs seem to share the same argument structure and grammatical function assignment, i.e.,  $\langle th\text{-OBJ } loc\text{-SUBJ} \rangle$ , cross-linguistically. This paper discusses the nature of argument-function linking in LFG and demonstrates how an LMT rendered in Optimality-Theoretic (OT) terms, where argument-function linking is governed by universal violable constraints that consistently favor the unmarked function, accounts for locative inversion straightforwardly. Within this OT-LMT, locative inversion is due to a universal morphosyntactic constraint and language variation in locative inversion is due to the difference in its relative ranking. This account also offers a potential explanation for the markedness of the locative inversion construction.

## 0. Introduction

The locative inversion construction, as shown in (1a-b), cross-linguistically has similar characteristics in discourse information packaging, which allows the more familiar information to precede the less familiar information (cf., e.g., Ackerman and Moore 2001b:2, Birner 1994, Tan 1991, Cheng 1983). Between the canonical construction in (1a) and the inverted form of (1b), along with the switch of focus from the locative to the theme is the change in syntactic function assignment. An example from Chinese is given in (1). The theme role in is assigned the subject function (1a), and locative an oblique function; the canonical linking is thus  $\langle th\text{-SUBJ } loc\text{-OBL} \rangle$ . In the inverted (1b), however, the locative is the subject, while the theme now occupies the object position (cf., Her 1990, Tan 1991, Huang 1993, Huang and Her 1998).

- (1) a. Amei zuo zai tai-shang.  
Amei sit at stage-top  
'Amei is sitting on the stage.'

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- b. Tai-shang zuo-zhe Amei.  
stage-top sit-ASP Amei  
'On the stage is sitting Amei.'

This  $\langle th\text{-OBJ } loc\text{-SUBJ} \rangle$  argument-function 'mismatch' was first identified, and convincingly argued for, in locative inversion verbs in Chichewa (cf., Bresnan and Kanerva 1989, Bresnan 1994) and in English (cf., Bresnan 1989, Tan 1991). Examples in (2) are from Bresnan and Kanerva (1989).

- (2) a. A-lendo-wo      ku-ba-bwer-a                  ku-mu-dzi. (BK:3 (2b))  
2-visitor-2    those 17 SB-REC-PST-come-IND 17-3-village  
a' 'Those visitors came to the village.'
- b. Ku-mu-dzi      ku-ba-bwer-a                  a-lendo-wo. (BK:3 (1b))  
17-3-village 17 SB-REC-PST-come-IND 2-visitor-2 those  
b' 'To the village came those visitors.'

The subjecthood of the inverted locative phrase *tai-shang* 'stage-top' in (1b) is evidenced by the fact that it is a bare NP and occupies the usual position for subjects. This is further conformed by the usual raising test. As shown in (3) below, *tai-shang* 'stage-top' is indeed the raised subject, while the 'demoted' theme in the postverbal position, also a bare NP, must be recognized as the object.

- (3) a. Tai-shang kanqilai zuo-le    henduo ren.  
stage-top appear sit-ASP many person  
'On the stage appears to be sitting many people.'
- b. Tai-shang you zuo-zhe henduo ren    ma?  
stage-top YOU sit-ASP many person Q  
'Is it the case that on the stage was sitting many people?'

Chinese data thus further confirms Bresnan's (1994) observation that cross-linguistically locative inversion verbs share an identical argument structure  $\langle th\text{ } loc \rangle$  and the function assignment of the canonical  $\langle th\text{-SUBJ } loc\text{-OBL}_{\theta} \rangle$  in (1a) and the inverted  $\langle th\text{-OBJ } loc\text{-SUBJ} \rangle$  in (1b). This paper aims to account for the syntactic assignment of the argument roles in locative inversion verbs and hopefully beyond.

In any syntactic theory that aims at characterizing UG, it would be a considerable compromise to simply leave the syntactic assignment of argument roles to lexical idiosyncrasies (e.g., Pesetsky 1995: 11-13). This paper focuses on how the syntactic assignment of argument roles is accounted for universally in the syntactic theory of the Lexical Functional Grammar, or LFG. This paper is organized as follows. Section 1 discusses how argument-function linking is accounted for by the lexical mapping theory (LMT) in LFG. We will also demonstrate how certain versions of this theory do not account for the locative inversion data from Chinese and English straightforwardly. Furthermore, we will demonstrate how the theory can be improved upon for better consistency and computational efficiency. In section 2 we propose a revised LMT formulated as declarative constraints in Optimality-Theoretic (OT) terms. The locative inversion

data from Chinese is then accounted for in section 3. Section 4 consists of a discussion on implications of this study and section 5 concludes the paper.

The goal of the paper is thus two-fold: 1) to come up with a universal lexical mapping theory based on violable declarative constraints in OT terms, 2) to account for Mandarin locative inversion within this comprehensive OT-LMT.

## 1. Lexical Mapping Theory

LFG posits mainly three distinct, parallel planes of grammatical description: the argument structure, the functional structure, and the constituent structure (e.g., Bresnan 2001, Dalrymple 2001, and Falk 2001). The argument structure, or a-structure, consists of the predicate's thematic and non-thematic argument roles, while the constituent structure, or c-structure, represents the configurational structure, which is the surface structure and allows no syntactic derivation. The functional structure, or f-structure, is the central locus of grammatical information, such as grammatical functions (e.g., SUBJ and OBJ), case, person, number, gender, etc. The linking of these structures, each with a distinct formal nature, is constrained by correspondence principles. The lexical mapping theory (LMT) is the UG component that constrains the linking between a-structure roles and f-structure functions. The f-structure can thus be viewed as the interface level that links the a-structure and the c-structure. An argument role is thus linked to a grammatical function in the f-structure, which is in turn linked to a certain c-structure configuration. The lexical mapping theory (LMT) is the subtheory within LFG which constrains the syntactic assignment of a-structure roles.

The pioneering work by Levin (1987) started the exploration of more principled accounts to replace the earlier stipulated function-changing rules in LFG. The first comprehensive formulation of LMT was proposed in Bresnan and Kanerva (1989). Since then, even though the essential underpinning assumptions have remained largely stable, the issue of argument-function linking, especially its precise formulation, has yet to be resolved (Butt and King 2000:9). A number of different versions of the theory have been proposed, e.g., Zaenen (1987), Bresnan (1989), Ackerman (1992), Huang (1993), Alsina (1996), Butt, Dalrymple, and Frank (1997), Her (1998), Ackerman and Moore (2001a), Bresnan (2001), among others. A review of these existing versions is clearly outside the scope of this paper.<sup>1</sup> Instead, we will outline mainly the version that seems to be the most widely circulated, found in Chapter 14 of Bresnan (2001), which is in turn based largely upon Bresnan and Zaenen (1990).<sup>2</sup>

### 1.1 The theory of a-structure

Conceptually, LMT consists of two components: the theory of a-structure and the mapping constraints. LFG assumes a universal hierarchy among a-structure roles in terms of their relative prominence in the event denoted by the predicate.

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<sup>1</sup> See Bresnan (2001, chp 14) for a brief exposition of other formulations.

<sup>2</sup> Falk (2001) also presents a concise introduction to LMT and a more precisely-defined theory of argument roles. Dalrymple (2001) offers more examples in her introduction to the theory.



This scale descends from the most prominent agent role to the least prominent locative role (e.g., Bresnan and Kanerva 1989, 1992).<sup>3</sup>

(4) Thematic Hierarchy

*agent* > *beneficiary* > *experiencer/goal* > *instrument* >  
*patient/theme* > *locative*

The most prominent role in an a-structure is called the ‘logical subject’ and is designated  $\hat{\theta}$  (pronounced ‘theta-hut’). In (5) below, the two-place predicate *break* requires two argument roles in a-structure, agent (also  $\hat{\theta}$ ) and theme; the three-place predicate *put* requires agent (again the  $\hat{\theta}$ ), goal, and theme. Roles in a-structure, by convention, descend in prominence according to the thematic hierarchy.

- (5) a. *break* < *x* *y* >      (*x* = *ag*, *y* = *th*)  
 b. *give* < *x* *y* *z* >      (*x* = *ag*, *y* = *go*, *z* = *th*)

Grammatical functions, or GFs, that can be linked to argument roles are called argument functions. LFG distinguishes the following argument functions (shown in bold) from non-argument functions (in italics):

- (6) *TOP* *FOC* **SUBJ** **OBJ** **OBJ<sub>θ</sub>** **OBL<sub>θ</sub>**<sup>4</sup> *ADJUNCTS*

It is important to note that in structure-oriented theories, such as Transformational Grammar (TG) and all its later incarnations, notions such as subject and object are secondary and derived from structural configurations. In contrast, in relation-oriented theories, such as Relational Grammar (RG) and LFG, these are primary notions in syntax. However, in LFG, argument functions are further decomposed by two binary features: [*r*] (whether the function is *restricted* to having an argument role) and [*o*] (whether the function is *objective*).

(7) Feature Decomposition of Argument Functions

	<i>-r</i>	<i>+r</i>
<i>-o</i>	<b>SUBJ</b>	<b>OBL<sub>θ</sub></b>
<i>+o</i>	<b>OBJ</b>	<b>OBJ<sub>θ</sub></b>

[*+r*] = (*un*)*restricted*    [*+o*] = (*un*)*objective*

Under this feature system, each argument function is composed of exactly two features and natural classes can be identified, as shown in (5). Furthermore,

<sup>3</sup> The concept of thematic hierarchy is well-established (cf., e.g., Li 1995, Grimshaw 1990). The hierarchy in (13) might also be derived from the proto-role properties proposed by Dowty (1991) (e.g., Bresnan 2001: 321fn, Ackerman and Moore: 2001b).

<sup>4</sup> Note that, following Zaenen and Engdahl (1994), the two propositional argument functions COMP and XCOMP are treated as instances of OBL<sub>θ</sub>.

assuming minus features to be the unmarked value, a markedness hierarchy can also obtain.

- (8) Markedness Hierarchy of Argument Functions  
 $\text{SUBJ}[-r -o] > \text{OBJ}[-r +o]/\text{OBL}_{\theta} [+r -o] > \text{OBJ}_{\theta} [+r +o]$

Similar to the intrinsic classification of argument roles in Bresnan and Kanerva (1989), Bresnan (2001) assumes that the underlying lexical semantics partially determines the syntactic assignment of different event participants. The following universal classification is proposed to capture these predetermined choices of grammatical function assignment.

- (9) Semantic Classification of A-Structure Roles for Function:  
 a. patientlike roles:  $\theta \rightarrow [-r]$   
 b. secondary patientlike roles:  $\theta \rightarrow [+o]$   
 c. other semantic roles:  $\theta \rightarrow [-o]$

Cross-language variation in the syntactic assignment of a-structure roles is thus subject to the above universal constraints. The agent role for example, as a non-patientlike role, is classified as  $[-o]$  by (9c) and thus not encoded as OBJ canonically. Patient and theme roles, with the  $[-r]$  classification, are canonically associated with either SUBJ or OBJ. Under the assumptions in (9), each role in the a-structure is assigned one and only one feature for syntactic function assignment, as morpholexical processes are not allowed to add syntactic features. Language-specific morpholexical operations are allowed, however, to alter the “lexical stock” of an a-structure by adding, suppressing, or binding thematic roles (Bresnan 2001:310-11). Passivization, for example, suppresses  $\theta$ , the most prominent role, from syntactic assignment.

- (10) Passivization:  $\langle \theta \dots \rangle$   
 $\downarrow$   
 $\emptyset$

In summary, the theory of a-structure renders the argument roles a given predicator requires into an a-structure representation, where roles are listed in a descending order in prominence, and each role is assigned exactly one feature specification for function assignment. The second component in LMT, i.e., the universal set of mapping constraints, then determines which GF each role is assigned to exactly.

## 1.2 Mapping principles

Argument-function linking is subject to certain universal constraints; otherwise, each argument role is freely mapped onto any and all GFs with compatible features. Bresnan (2001:311) proposes the mapping principles.

- (11) Mapping Principles (MPs)  
 a. Subject roles:

- (i)  $\hat{\theta}[-o]$  is mapped onto SUBJ when initial in the a-structure;  
Otherwise,
  - (ii)  $\theta[-r]$  is mapped onto SUBJ.
- b. Other roles are mapped onto the lowest compatible function in the Markedness Hierarchy.

Two more well-formedness conditions (WFs) are needed, in addition to the above mapping principles, to further constrain the non-deterministic argument-function linking: function-argument biuniqueness and the subject condition.

(12) Function-Argument Biuniqueness

Each a-structure role must be associated with a unique function, and conversely.

(13) The Subject Condition

Every predicator must have a subject.

The function-argument biuniqueness condition ensures a strict one-to-one mapping relation between roles and functions. Computationally, it forces a deterministic assignment to an ‘unattached’ GF between the two GFs a role is compatible with. The subject condition serves the obvious purpose to ensure that one role in a-structure must be mapped to SUBJ. This condition also forces a deterministic choice when a role’s syntactic assignment is compatible with SUBJ and some other function and all other roles in the a-structure, if any, are incompatible with SUBJ.

We now demonstrate how three different types of verbs receive correct argument-function linking in the LMT just described above. An unaccusative verb is given in (14), while an unergative verb is illustrated in (15). A typical transitive verb is given in (16).

- (14) Bing hua le.  
ice melt ASP  
‘The ice has melted’

SC:	‘melt < $x$ >’	$(x = th)$
	[ $-r$ ]	
	-----	
	S/O	
MPs:	S	
WFs:	S	

- (15) Mama xiao le.  
Mama laugh ASP  
‘Mama laughed.’

SC:	‘laugh < x >’ (x = ag)
	[-o]
	-----
	S/OBL <sub>θ</sub>
MPs:	S
WFs:	S

- (16) Amei mai changpian.  
 Amei sell record  
 'Amei sells records.'

SC:	‘sell < x y >’ (x = ag, y = th)
	-o -r
	-----
	S/OBL <sub>θ</sub> S/O
MPs:	S O
WFs:	S O

### 1.3 Improvement to the conventional LMT

There are several areas on the theoretical level where the conventional LMT may be improved upon. First of all, the uniform underspecification of each role with exactly one syntactic feature can be relaxed to allow the formalism more expressivity, yet without compromising its formal power. This classification scheme may also be too rigid in that it does not allow the possibility of agentive objects, which have been observed in several languages (e.g., Bresnan 2001: 378 and references cited, Dalrymple 2001: 205). A desirable improvement to the theory is to allow such linking possibilities and at the same time be able to express the marked nature of such a linking as *agent-OBJ*.

As for the mapping principles, two disjunctions are observed. The first one is in the mapping principles of subject roles: a disjunction exists between  $\hat{\theta}[-o]$  and  $\theta[-r]$ , each a stipulation for linking to SUBJ. In a more general theory of UG, it would be desirable not to include such *function-specific* linking conditions. Notice also the specification that  $\hat{\theta}[-o]$  be the initial role in the a-structure. This principle thus must explicitly refer to ordering in the a-structure.<sup>5</sup> The second disjunction is found between subject roles and non-subject roles. For the former, a qualified role is mapped to SUBJ, i.e., the *most* prominent GF. However, non-subject roles, quite the contrary, require the linking with the *least* prominent compatible GF. A consistent principle for all roles would make a simpler and more general theory.

Finally, note that the Subject Condition in LFG must state explicitly that every clause must have a subject. Similar constraints are also necessary in other syntactic frameworks; for example, the same is accomplished by the Extended Projection Principle (EPP) in the transformational grammar and the Final-1 Law

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<sup>5</sup> Note that  $\hat{\theta}$  refers to the most prominent role in the a-structure; the fact that it is also the leftmost role within the angled brackets is inconsequently.  $\hat{\theta}$  is usually also the initial role, unless there is an initial athematic argument.

in Relational Grammar. However, as it has been often noted, such an inflexible stipulation may not be empirically accurate.<sup>6</sup> As cited in Ackerman and Moore (2001a:149), clauses may truly be without a subject (e.g., Babby 1989, Simpson 1991, and McCloskey 2001). Bresnan (2001:321, fn 9), thus hinted that this condition should perhaps be stipulated as a parameter. Again, ideally a UG theory should be able to account for such subjectless clauses and their marked nature at the same time.

Assuming that the conventional LMT takes the same position advocated first in Alsina and Mchombo (1993) and does not allow morphological operations to add features, this version of LMT described above also does not seem to account for locative inversion straightforwardly.

- (17) Amei zuo zai tai-shang.  
 Amei sit at stage-top  
 ‘Amei is sitting on the stage.’

SC:	‘sit < x	y >’	(x = th, y = loc)
	-r	-o	
	-----		
	S/O	S/OBL <sub>θ</sub>	
MPs:	S	OBL <sub>θ</sub>	
WFs:	S	OBL <sub>θ</sub>	

- (18) Tai-shang zuo-zhe Amei.  
 stage-top sit-ASP Amei  
 ‘On the stage is sitting Amei.’

SC:	‘sit < x	y >’	(x = th, y = loc)
	-r	-o	
	-----		
	*O	*S	

As shown in (16), the argument-function linking of <th-OBJ loc-SUBJ> in the locative inversion construction cannot be obtained, even though the canonical linking of <th-SUBJ loc-OBL<sub>θ</sub>> is accounted for in (17). Therefore, it would make sense empirically to allow morphological processes in the theory to alter syntactic assignments by adding features, as proposed in Zaenen (1987), Ackerman (1992), Markantonatou (1995), and Her (1998, 2003). The locative default classification employed by Bresnan and Kanerva (1989) and Bresnan (1989), which assigns loc[-r] when th is focused, can likewise be viewed as such a feature-adding morphological operation. In section 4, we will also discuss the advantage of feature-adding morphological operations from the standpoint of expressivity and formal power.

In section 2, we will propose an LMT in OT terms, thus an OT-LMT, that attempts to incorporate the desirable improvements suggested here.

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<sup>6</sup> Alsina (1996) also argue that the function-argument biuniqueness condition, which is fully integrated in the OT-LMT proposed below, is too strong.

## 2. An Optimality-Theoretic LMT

The Optimality Theory has exerted great influence over the field of phonology; however, its application in syntactic theory is still in its infancy. Recently, there have been some explorations within the OT-LFG framework, a.k.a. Optimal Syntax (cf. Bresnan 2000). From the OT point of view, OT-LFG can be seen as OT with a universal LFG as GEN. From the point of view of LFG, a constraint-based grammatical framework, generalizations are interpreted in OT terms with (violable) constraints ranked in relation to one another (cf. Sells 2001). A number of studies have been carried out within this general framework (cf., Mikkelsen 2003, Sells 2001 and references cited). There have also been efforts in rendering argument-function linking in OT terms, e.g., Butt *et al* (1997) and Lødrup (1999).

### 2.1 An OT-LFG overview

Bresnan (2000) depicts the basic structure of OT-LFG, or Optimal Syntax, where LFG's correspondence theory of parallel structures serves as a model for GEN. The standard OT-LFG assumes input to be "a (possibly underspecified) feature structure representing some given morphosyntactic content independent of its form of expressions" (Bresnan 2000, sec.1.1); an example is given in (19), which assumes *I saw her* as its optimal form of expression. Note that in the input structure  $\langle x, y \rangle$  is the a-structure of *see* and that  $GF_1$  and  $GF_2$  are unspecified grammatical functions that argument roles  $x$  and  $y$  are associated with.

(19) Input f-structure: *I saw her*.

PRED	‘see $\langle x, y \rangle$ ’								
GF <sub>1</sub>	<table style="border-collapse: collapse; border: none;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘PRO’</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PERS</td> <td style="padding: 2px 5px;">1</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">NUM</td> <td style="padding: 2px 5px;">SG</td> </tr> </table>	PRED	‘PRO’	PERS	1	NUM	SG		
PRED	‘PRO’								
PERS	1								
NUM	SG								
GF <sub>2</sub>	<table style="border-collapse: collapse; border: none;"> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘PRO’</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">PERS</td> <td style="padding: 2px 5px;">3</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">NUM</td> <td style="padding: 2px 5px;">SG</td> </tr> <tr> <td style="border-right: 1px solid black; padding: 2px 5px;">GEND</td> <td style="padding: 2px 5px;">FEM</td> </tr> </table>	PRED	‘PRO’	PERS	3	NUM	SG	GEND	FEM
PRED	‘PRO’								
PERS	3								
NUM	SG								
GEND	FEM								
TNS	PAST								

The candidate set comprises of pairs of f-structure and corresponding c-structure (and perhaps other corresponding planes of information) generated by the LFG grammar (Bresnan 2000, sec. 1.2, Kuhn 2001, sec. 8.2.3). For ease of presentation I am simplifying the matter by taking the input to be the a-structure  $\langle x, y \rangle$ , and a set of  $\langle x-GF_1, y-GF_2 \rangle$  pairs as candidates in OT-LMT, which is a module within OT-LFG that constrains argument-function linking specifically.

The candidates are ranked by a universal set of lexical mapping constraints; output is taken to be the most harmonic, or optimal, candidate pair, namely the one with the least (serious) violations (cf., Kuhn 2001).

## 2.2 A comprehensive OT-LMT

The OT-LMT proposed here modifies and expands the LMT component in Bresnan (2001) and is specifically based on the particular formulation of LMT in Her (1997), Huang and Her (1998), and Her (2003), where syntactic feature assignments are simplified and the multiple mapping principles and well-formedness conditions in the conventional LMT are all unified into a single consistent mapping principle. Here I will take this further and reinterpret the entire simplified LMT as Optimality-Theoretic constraints and thus offer a comprehensive OT-LMT.

Crucial to the theory are two prominence scales discussed earlier: a universal thematic hierarchy and markedness hierarchy of grammatical functions (GFs).

(20) *ag* > *ben* > *go/exp* > *inst* > *pt/th* > *loc*

(21) SUBJ[-r -o] > OBJ[-r +o]/OBL<sub>θ</sub>[+r -o] > OBJ<sub>θ</sub>[+r +o]

Mapping constraints are classified into three categories: well-formedness constraints on argument roles, well-formedness constraints on argument functions, and constraints on linking. Note that we are ignoring athematic arguments in this paper.<sup>7</sup> ‘R’ is thus a thematic role in a-structure, ‘F’ a corresponding grammatical function. We first examine the well-formedness constraints on the representation of argument roles.

(22) Well-formedness Constraints on Argument Roles

a. **UniqRol**( $R_a, R_b$ ): Given  $\langle ..R_a-F_a..R_b-F_b.. \rangle$ ,  $R_a \neq R_b$

b. **DescendRol**( $R_a, R_b$ ): Given  $\langle ..R_a-F_a R_b-F_b.. \rangle$ ,  $R_a > R_b$  in prominence

UniqRol ensures the uniqueness of each and every role in the a-structure and thus rules out a-structures like  $\langle ag ag th \rangle$  and  $\langle th loc loc \rangle$ . DescendRol further formalizes the a-structure representation, where argument roles descend in prominence. For example, given the locative verb *sit* and its two roles, theme and locative, in a-structure,  $\langle th loc \rangle$  is the only well-formed representation;  $\langle loc th \rangle$  is ill-formed. Two corresponding constraints are proposed for argument functions.

(23) Well-formedness Constraints on Grammatical Functions

a. **UniqFun**( $F_a, F_b$ ): Given  $\langle ..R_a-F_a..R_b-F_b.. \rangle$ ,  $F_a \neq F_b$

b. **DescendFun**( $F_a, F_b$ ): Given  $\langle ..R_a-F_a R_b-F_b.. \rangle$ ,  $F_a \geq F_b$  in prominence

UniqFun ensures the uniqueness of each and every function in mapping the a-structure; thus, both of the following are ill-formed:  $\langle \theta_a\text{-SUBJ } \theta_b\text{-SUBJ} \rangle$ ,  $\langle \theta_a\text{-OBJ}$

<sup>7</sup> A constraint for athematic roles must restrict such roles to [-r]. Alternatively, a constraint may be proposed to outrank LinkFun in (24b) and thus allow a GF in a-structure to be unmatched.

$\theta_b$ -OBJ>. DescendFun penalizes a candidate with a violation of the descending order in prominence. For example, because SUBJ outranks OBJ,  $\langle\theta_a$ -SUBJ  $\theta_b$ -OBJ> has 0 violation and is favored over the inverted  $\langle\theta_a$ -OBJ  $\theta_b$ -SUBJ>, which constitutes 1 violation. Thus, given  $n$  GFs in a candidate form, there are at most  $n-1$  violations as there are  $n-1$  consecutive pairs (cf., Kuhn 2001:317). Inversion is still possible given that all OT constraints are violable in order to preserve higher-ranked constraints, including language-specific morphosyntactic operations. (We will discuss the possibility of language-specific component in the next section.) Next we move on to the general constraints on the linking between roles and functions.

(24) General Constraints on Argument-Function Linking

- a. **LinkRol**(R, F): Given  $\langle..R.. \rangle$ , R is linked to an F such that  $\langle..R-F.. \rangle$ .
- b. **LinkFun**(F, R): Given  $\langle..F.. \rangle$ , F is linked to an R such that  $\langle..R-F.. \rangle$ .

These two constraints LinkRol and LinkFun ensure that each expressed role is linked to a GF and each GF is linked to a role. A role that is not linked to an argument function causes incompleteness, while an argument function that is not linked to an argument role in a-structure causes incoherence. Notice that there is no need to specify a constraint just to ensure that a role is linked to a GF with *compatible* features. This is accomplished automatically by the following universal constraints on the morphosyntactic properties of argument roles.

(25) Specific Constraints on Argument-Function Linking

- a. **LinkPtTh**(R, F): Given  $\langle..R-F.. \rangle$ , where  $R = pt/th$ , F is  $[-r]$
- b. **LinkRolRes**(R, F): Given  $\langle..R-F.. \rangle$ , where  $R \neq \hat{Q}$ , F is  $[+r]$
- c. **LinkUnobj**(R, F): Given  $\langle..R-F.. \rangle$ , F is  $[-o]$
- d. **LinkUnres**(R, F): Given  $\langle..R-F.. \rangle$ , F is  $[-r]$

LinkPtTh reflects the unaccusative hypothesis that cross-linguistically the primary patient/theme is encoded as an unrestricted  $[-r]$  GF, i.e., SUBJ or OBJ (cf., e.g., Bresnan and Kanerva 1989, Bresnan and Zaenen 1990, and Zaenen 1993)<sup>8</sup>. LinkRolRes captures the generalization that a non-patient/theme internal argument prefers the syntactic assignment of a thematically restricted function. Finally, LinkUnobj and LinkUnres consistently favor the assignment of a role to the unmarked function, SUBJ,  $[-r -o]$ .<sup>9</sup> Each function thus may have 0 to 2 violations. These two constraints together are more general and insightful than the

<sup>8</sup> An additional constraint is needed for the secondary patient/theme, which restricts the secondary *pt/th* to  $[+o]$ . Again, we will ignore this issue in this paper.

<sup>9</sup> DescendFun and DescendRol effect a parallel alignment between the thematic hierarchy and the markedness hierarchy. This parallel alignment is similar to a harmonic alignment, but with an important difference. In a harmonic alignment, according to Prince and Smolensky (2004), the correspondence between a more prominent element on one scale and a less prominent element on the other scale is worse than the correspondence between two elements that are equal in prominence (cf., also Aissen 1999, Lee 2001, Sharma 2001, Asudeh 2001). Thus, it is better for agent, the most prominent role, to link to SUBJ, the most prominent function, and likewise for locative, the least prominent role, to link to OBJ. However, in our scheme here, due to LinkUnobj and LinkUnres, a more prominent GF is favored regardless of the prominence of the role.



previous Subject Condition, which simply stipulates that every clause should have a subject.

Note that LinkRolRes does not apply to agent, the external argument. Being the highest-ranked role, it is linked to SUBJ due to LinkUnobj and LinkUnres. This thus accounts for the fact that for the majority of the world's languages, agent cannot be realized as an object. However, given the violable nature of these constraints and variable ranking, the possibility of *agent-OBJ* does exist as a marked morphosyntactic option. This reflects the insight of Falk (1989:49, cited in Lødrup 2000:173) that in Norwegian “what has been called external theta roles are in fact structurally unspecified theta roles.”

I will follow the standard view in OT and assume that these constraints are universal but their ranking may be language-specific. For Chinese I propose the following ranking.

(26) OT Ranking of Lexical Mapping Constraints (Chinese)

**UniqRol/DescendRol/UniqFun/LinkRol/LinkFun**

>>

**LinkPtTh**

>>

**LinkRolRes**


>>

**DescendFun**


>>

**LinkUnobj/LinkUnres**

### 2.3 An illustration of OT-LMT


We will now look at the lexical mapping of three different verbs in their canonical active construction as examples: ‘melt<*th*>’, ‘laugh<*ag*>’, and ‘sell<*ag th*>’. To save time and space, the (many) candidates that violate any of the highest-ranked five well-formedness constraints will be excluded and we will only be concerned with the lower five. Following standard OT notation, in the following tableau, a violation is marked with ‘\*’, the ‘fatal’ violation causing a candidate to lose out in evaluation is highlighted with ‘!’, the shaded area covers the constraints that are no longer relevant in the evaluation of a particular candidate, and finally the  sign indicates the optimal selection.

(27) Input a-structure: ‘melt <th>’

	Candidate	LinkPtTh	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
 C1	<th-SUBJ>					
C2	<th-OBJ>				*!	
C3	<th-OBL <sub>θ</sub> >	*!			*	*
C4	<th-OBJ <sub>θ</sub> >	*!			*	*


The candidate *C1*, <th-SUBJ>, with no violation, is clearly the optimal selection, where SUBJ is an unrestricted [-r] function allowed by LinkPtTh and also the unmarked [-r -o] function preferred by LinkUnobj and LinkUnres. Next, we turn to the a-structure of an unergative verb ‘laugh<ag>’. Here the only relevant constraints are LinkUnobj and LinkUnres, which again select SUBJ, the unmarked function.

(28) Input a-structure: ‘laugh <ag>’

	Candidate	LinkPtTh	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
 C1	<ag-SUBJ>					
C2	<ag-OBJ>				*!	
C3	<ag-OBL <sub>θ</sub> >					*!
C4	<ag-OBJ <sub>θ</sub> >				*!	*

Again, the candidate with no violation, i.e., *C1*, is the optimal selection. The final example, *sell*, is a transitive verb with an agent and a theme role. Again, the following tableau excludes candidates that violate any of the five highest-ranked constraints.

(29) Input a-structure: ‘sell <ag th>’


	Candidate	LinkPtTh	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
 C1	<ag-SUBJ th-OBJ>				*	
C2	<ag-SUBJ th-OBL <sub>θ</sub> >	*!				*
C3	<ag-SUBJ th-OBJ <sub>θ</sub> >	*!			*	*
C4	<ag-OBJ th-SUBJ>			*!	*	
C5	<ag-OBJ th-OBL <sub>θ</sub> >	*!			* *	*
C6	<ag-OBJ th-OBJ <sub>θ</sub> >	*!			* *	*
C7	<ag-OBL <sub>θ</sub> th-SUBJ>			*!		*
C8	<ag-OBL <sub>θ</sub> th-OBJ>				*!	*
C9	<ag-OBL <sub>θ</sub> th-OBJ <sub>θ</sub> >	*!				* *
C10	<ag-OBJ <sub>θ</sub> th-SUBJ>			*!	*	*
C11	<ag-OBJ <sub>θ</sub> th-OBJ>			*!	* *	*
C12	<ag-OBJ <sub>θ</sub> th-OBL <sub>θ</sub> >	*!		*	*	* *

Among the candidates, *C1*, <ag-SUBJ th-OBJ>, is the optimal selection, even though it does violate one of the two lowest-ranked constraints, i.e., LinkUnobj, due to the linking of theme to OBJ, a function with the marked feature [+o]. All other candidates, however, violate at least one higher-ranked constraint. Note that a candidate a-structure where both roles are linked to the unmarked function, thus <ag-SUBJ th-SUBJ>, violates the highest ranked UniqFun and is therefore not included in the tableau.

### 3. An OT-LMT Account of Locative Inversion in Chinese

We first apply the OT-LMT to the canonical a-structure of the locative verb. The theory correctly predicts the following optimal argument-function linking: <th-SUBJ loc-OBL<sub>θ</sub>>.

(30) Input a-structure: ‘sit <th loc>’

	Candidate	LinkPtTh	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
<i>C1</i>	<th-SUBJ loc-OBJ>		*!		*	
 <i>C2</i>	<th-SUBJ loc-OBL <sub>θ</sub> >					*
<i>C3</i>	<th-SUBJ loc-OBJ <sub>θ</sub> >				*!	*
<i>C4</i>	<th-OBJ loc-SUBJ>		*!	*	*	
<i>C5</i>	<th-OBJ loc-OBL <sub>θ</sub> >				*!	*
<i>C6</i>	<th-OBJ loc-OBJ <sub>θ</sub> >				*! *!	*
<i>C7</i>	<th-OBL <sub>θ</sub> loc-SUBJ>	*!	*	*		*
<i>C8</i>	<th-OBL <sub>θ</sub> loc-OBJ>	*!	*		*	*
<i>C9</i>	<th-OBL <sub>θ</sub> loc-OBJ <sub>θ</sub> >	*!			*	* *
<i>C10</i>	<th-OBJ <sub>θ</sub> loc-SUBJ>	*!	*	*	*	*
<i>C11</i>	<th-OBJ <sub>θ</sub> loc-OBJ>	*!	*	*	* *	*
<i>C12</i>	<th-OBJ <sub>θ</sub> loc-OBL <sub>θ</sub> >	*!		*	*	* *

With *C2*, <th-SUBJ loc-OBL<sub>θ</sub>>, as the optimal selection, this constraint system obviously does not account for locative inversion, which is represented in candidate *C4*, <th-OBJ loc-SUBJ>. An additional constraint is needed.

(31) **LinkLocInv**(R, F): Given a-structure <R<sub>a</sub>-F<sub>a</sub> R<sub>b</sub>-F<sub>b</sub>>, where R<sub>a</sub> = th[foc] and R<sub>b</sub> = loc, F<sub>b</sub> is [-r -o].

This constraint draws on the insight found in the default rule for focused theme posited by Bresnan and Kanerva (1989) and also faithfully reflects Bresnan’s (1994) observation on the universals of locative inversion verbs. Given the fact that the complement of the predicator usually carries the discourse function of marking the less familiar information and that the subject is the default grammatical function for topic or more familiar information, the locative inversion operation forces the locative to map onto SUBJ in order that the focused theme can surface as a complement of the locative verb. With this constraint in place, we now have an important decision to make, whether to posit LinkLocInv as a language-specific constraint. Recall that locative inversion is found in many languages and locative inversion verbs share an identical a-structure and function assignment. However, locative inversion certainly does not occur in all languages. In non-configurational languages with extensive case markings for grammatical relations, Korean and Japanese, for example, locative inversion may not be found (e.g., Huang and Her 1998). The following is a Japanese example.


- (32) a. Herikoputa ga yama no ue ni orimashita.  
 helicopter NOM mountain POSS top LOC land  
 ‘A helicopter landed on top of the mountain.’
- b. Yama no ue ni herikoputa ga orimashita.  
 mountain POSS top LOC helicopter NOM land  
 ‘On top of the mountain landed a helicopter.’
- c.\*Yama no ue ga herikoputa o orimashita.  
 mountain POSS top NOM helicopter ACC land  
 ‘On top of the mountain landed a helicopter.’

Notice that even though the locative phrase may indeed invert positions with the subject and thus affect the focus in (32b), their grammatical functions remain the same. In other words, locative inversion does not affect argument-function linking. Recall the standard OT view that constraints are universal and only the ranking is subject to variation. Therefore, if we follow the standard OT view and posit LinkLocInv as a universal constraint, languages such as Japanese must also be accounted for, but only with a different ranking of the same constraints. This is the path we will explore. The following is the revised ranking we propose for Chinese. Notice that LinkLocInv outranks LinkRolRes and is outranked by LinkPtTh. Again, we continue to ignore the five highest-ranked well-formedness constraints.

(33) OT Ranking of Lexical Mapping Constraints (Chinese, revised)

**LinkPtTh**  
 >>  
**LinkLocInv**  
 >>  
**LinkRolRes**  
 >>  
**DescendFun**  
 >>  
**LinkUnobj/LinkUnres**

(34) Input a-structure: ‘sit <th[foc] loc>’ (Chinese)


	Candidate	LinkPtTh	LinkLocInv	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
<i>C1</i>	<th-SUBJ loc-OBJ>		*!	*		*	
<i>C2</i>	<th-SUBJ loc-OBL <sub>θ</sub> >		*!				*
<i>C3</i>	<th-SUBJ loc-OBJ <sub>θ</sub> >		*!*			*	*
 <i>C4</i>	<th-OBJ loc-SUBJ>			*	*	*	
<i>C5</i>	<th-OBJ loc-OBL <sub>θ</sub> >		*!			*	*
<i>C6</i>	<th-OBJ loc-OBJ <sub>θ</sub> >		*!*			* *	*
<i>C7</i>	<th-OBL <sub>θ</sub> loc-SUBJ>	*!		*	*		*
<i>C8</i>	<th-OBL <sub>θ</sub> loc-OBJ>	*!	*	*		*	*
<i>C9</i>	<th-OBL <sub>θ</sub> loc-OBJ <sub>θ</sub> >	*!	**			*	* *
<i>C10</i>	<th-OBJ <sub>θ</sub> loc-SUBJ>	*!		*	*	*	*
<i>C11</i>	<th-OBJ <sub>θ</sub> loc-OBJ>	*!	*	*	*	* *	*
<i>C12</i>	<th-OBJ <sub>θ</sub> loc-OBL <sub>θ</sub> >	*!	*		*	*	* *

We also need to point out that LinkLocInv is irrelevant in the selection of the canonical (30) because here the theme is not focused. Now, to account for the data from languages like Japanese, where the focused theme does not result in mismatches of function assignment of the argument roles, we posit the following ranking. Notice that here LinkLocInv is outranked by all other constraints.

(35) OT Ranking of Lexical Mapping Constraints (Japanese, Korean, etc.)

**LinkPtTh**  
 >>  
**LinkRolRes**  
 >>  
**DescendFun**  
 >>  
**LinkUnobj/LinkUnres**  
 >>  
**LinkLocInv**

(36) Input a-structure: ‘land <th[foc] loc>’ (Japanese)

	Candidate	LinkPfTh	LinkRolRes	DescendFun	LinkUnobj	LinkUnres	LinkLocInv
C1	<th-SUBJ loc-OBJ>		*!		*		*
 C2	<th-SUBJ loc-OBL <sub>θ</sub> >					*	*
C3	<th-SUBJ loc-OBJ <sub>θ</sub> >				*!	*	**
C4	<th-OBJ loc-SUBJ>		*!	*	*		
C5	<th-OBJ loc-OBL <sub>θ</sub> >				*!	*	*
C6	<th-OBJ loc-OBJ <sub>θ</sub> >				*! *!	*	**
C7	<th-OBL <sub>θ</sub> loc-SUBJ>	*!	*	*		*	
C8	<th-OBL <sub>θ</sub> loc-OBJ>	*!	*		*	*	*
C9	<th-OBL <sub>θ</sub> loc-OBJ <sub>θ</sub> >	*!			*	* *	**
C10	<th-OBJ <sub>θ</sub> loc-SUBJ>	*!	*	*	*	*	
C11	<th-OBJ <sub>θ</sub> loc-OBJ>	*!	*	*	* *	*	*
C12	<th-OBJ <sub>θ</sub> loc-OBL <sub>θ</sub> >	*!		*	*	* *	*

#### 4. Discussion

This section discusses three issues in further detail. The first issue relates to the nature and the scope of the OT-LMT proposed in the paper. The second issue concerns the potential advantages that the OT-LMT may have over the conventional LMT. And lastly we explore some of the directions for further research concerning the OT-LMT.

##### 4.1 Morphosyntactic versus morpholexical processes

Given the often idiosyncratic nature of language-specific lexical information, it is not yet clear how the technical integration of lexicon should be envisaged in OT syntax in general (Kuhn 2001:318, fn. 8). This paper clearly does not address this larger issue. In order to have an insightful lexical mapping theory in OT syntax, we first must be explicit about its nature and its scope. The OT-LMT envisioned here is the part of a universal OT-LFG theory that constrains argument-function linking. In other words, it constrains the syntactic function assignment of argument roles required by a predicator. Thus, this OT-LMT, as it is currently formulated, has nothing to say about *morpholexical* processes that alter the ‘lexical stock’ in a-structure (c.f., e.g., Bresnan and Kanerva 1989, Bresnan 2001:310). It is therefore purely *morphosyntactic* in nature and scope. Crucially,

Ackerman (1992:56) differentiates and characterizes morpholexical and morphosyntactic operations as follows:

...Morpholexical (Operations), affect the lexical semantics of predicates by altering the semantic properties associated with predicates...Morphosyntactic (Operations), assign features supplemental to those supplied by IC assignment<sup>10</sup>: these operations can affect the final GF assignments to arguments but cannot affect the lexical semantics...

Morpholexical operations are thus word-formation processes that produce predicates with an altered inventory of argument roles, or a-structures, which serve as input to OT-LMT. Morphosyntactic operations, however, are within the proper domain of LMT. Assuming that only morpholexical operations may be language-specific, the OT-LMT proposed thus *universally* governs how argument roles are mapped to GFs, with constraints that may vary from language to language only in terms of ranking. Thus, as Huang and Her (1998) have argued, given the nature of syntactic assignment of argument roles in the theory, it in fact makes a more coherent theory to allow syntactic feature assignment in morphosyntactic operations. This is precisely how we treated locative inversion. Similar proposals that allow morphological processes to affect syntactic assignments by adding features are found as early as Zaenen (1987) and Her (1990) and later in Ackerman (1992), Markantonatou (1995), Her (2003), among others.

Allowing feature-adding morphosyntactic operations in fact also offers a computational advantage. Morpholexical operations constitute a much more powerful formal device computationally in that they are not subject to the general monotonicity condition that information can only be added but cannot be deleted or changed (e.g. Bresnan 1990, Falk 2001:9).<sup>11</sup> Monotonic morphosyntactic operations with the feature-adding capacity enable a formalism which is more consistent and also more expressive, without any increase in its formal power. Empirically, such operations have also been adopted to account for syntactic variations in several languages, for example, Greek (Markantonatou 1995), Chinese (Huang 1995, Her 1999), and English (Zaenen 1987).

We will now illustrate this view of the OT-LMT with two more constructions from Chinese that are related to locative verbs. The first one is a passivized locative construction. Three-place transitive predicates like *xie* 'write', with the argument structure  $\langle ag\ th\ loc \rangle$ , do not allow inversion in spite of the locative role it requires. However, locative inversion does obtain when the agent role is suppressed. This is observed in Chinese (e.g., Huang and Her 1998) and other languages (e.g., Bresnan 1989 and Bresnan and Kanerva 1989). The following examples are from Chinese and English.

- (37) a. Amei xie le yi ge zi zai qiang-shang.  
Amei write ASP a CL character at wall-top  
'Amei wrote a Chinese character on the wall.'

---

<sup>10</sup> IC refers the intrinsic classification of argument roles; see (7) above.

<sup>11</sup> Therefore, as I have proposed elsewhere, e.g., Her 2003, morpholexical operations can likewise add features and thus alter syntactic assignments of argument rules, besides changing the lexical semantics of a predicator.



b\*Qiang-shang xie le yi ge zi Amei.  
 wall-top write ASP a CL character Amei  
 \*'On the wall was written a Chinese character (by) Amei.'

c. Qiang-shang xie le yi ge zi.  
 wall-top write ASP a CL character  
 'On the wall was written a Chinese character.'

(38) Passivization:  $\langle \theta \dots \rangle$   
 $\downarrow$   
 $\emptyset$

Recall that passivization, repeated in (38), suppresses the logical subject; it thus in effect gives rise to an argument structure  $\langle \theta \dots \rangle$ , precisely that of a locative inversion verb. Locative inversion is therefore allowed, as in (37c). Passivization thus falls outside of the realm of LMT and is regarded as a language-specific operation. One indication of its language-dependence is in the indirect expression of the suppressed agent role as an adjunct, for example the English *by*-expression (Bresnan 1994:81). Chinese, however, does not allow such indirect expressions.<sup>12</sup>

The second construction we will examine is the transitivized locative verb. It has been noted that in Chinese the two-place locative verb, with argument structure  $\langle th \ loc \rangle$ , in fact allows its locative phrase to be a PP or an NP and thus alternate between OBL and  $OBJ_{\theta}$  (e.g., Huang and Her 1998); however, this is not allowed in English, as shown below.

(39) a. Amei zuo zai yizi-shang.  
 Amei sit at chair-top  
 'Amei sits on the chair.'

b. Amei shui zai diban-shang.  
 Amei sleep at floor-top  
 'Amei sleeps on the floor.'

(40) a. Amei zuo yizi-shang.  
 Amei sit chair-top  
 'Amei sits \*(on) the chair.'

b. Amei shui diban-shang.  
 Amei sleep floor-top  
 'Amei sleeps \*(on) the floor.'

Huang and Her (1998) treat this function change as a morphosyntactic variation of the same argument structure, thus  $\langle th\text{-}SUBJ \ loc\text{-}OBL_{\theta} \rangle$  in (39) and

<sup>12</sup> See Her (1989) and Ting (1998), among others, for compelling arguments against viewing the *bei*-NP phrase as a PP *by*-phrase.

<th-SUBJ loc-OBJ> in (40). However, further evidence indicates that this view may be incorrect and locative transitivity involves a morphological change instead. In other words, without the preposition *zai*, the argument structure is in fact no longer <th loc>. Note that the presence of the locative preposition *zai* requires a place noun as its complement; see (41). In Chinese certain nouns are place nouns inherently, such as *xuexiao* ‘school’, *zheli* ‘here’, and *gongyuan* ‘park’ and can thus be the complement of preposition *zai* directly. Non-place nouns, however, must form a constituent with a locative affix, such as *-shang* and *-xia*, a locative noun, such as *shangmian* and *xiamian*, or a place noun to be the complement of locative preposition *zai*. Notice in (42), the object required by the transitivized verb *zuo* ‘sit’ and *shui* ‘sleep’ is free of this restriction.

(41) a. Amei zuo zai yizi-\*(shang).  
 Amei sit at chair-top  
 ‘Amei sits on the chair.’

b. Amei shui diban-\*(shang).  
 Amei sleep floor-top  
 ‘Amei sleeps on the floor.’

(42) a. Amei zuo yizi.  
 Amei sit chair  
 ‘Amei sits \*(on) the chair.’

b. Amei shui diban.  
 Amei sleep floor  
 ‘Amei sleeps \*(on) the floor.’

It is therefore clear that the objects in (42) do not denote the location where the theme that undergoes the movement ends up; rather, they themselves are the entities that receive the action denoted by the verbs. To account for this construction, I propose a morphological operation.

(43) Locative Transitivity: <th loc> → <ag th>

Two more syntactic tests confirm this argument structure is now <ag th>: passivization and resultative compounding.

(44) a. Yizi bei zuo le.  
 Chair BEI sit ASP  
 ‘The chair has been sat \*(in).’

b. Diban bei shui le.  
 Floor BEI sleep ASP  
 ‘The floor has been slept \*(on).’

(45) a. Yizi zuo-lan le.

Chair sit-threadbare ASP

‘The chair is threadbare from (over)sitting.’

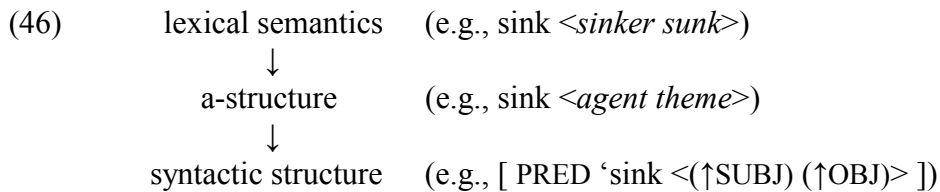
b. Diban shui-kua le.

Floor sleep-collapse ASP

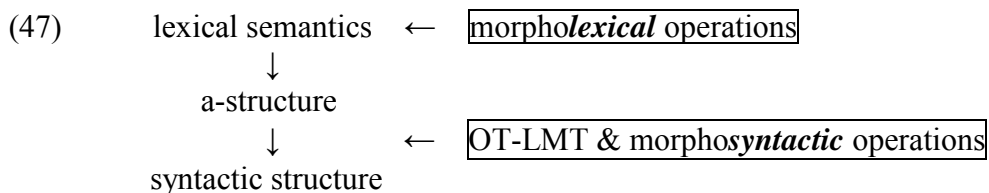
‘The floor was slept on and collapsed.’

In the passive construction, the suppression of the agent results in the theme role’s ‘promotion’ to SUBJ, as seen in (44). In (45), the single composite role, formed by the binding of the theme role of the action verb and the theme of the result state verb, maps to SUBJ (Her 2004)<sup>13</sup>. Based on the prevailing evidence, locative transitivity should be treated as a morpholexical operation that alters the lexical stock of an argument structure, and as such it is again outside of the realm of the OT-LMT proposed here.

According to the discussion above, it is now possible to indicate how exactly the OT-LMT system is envisaged as the module in LFG that links the lexical semantic structure and the syntactic structure of a predicator (cf., e.g., Bresnan and Kanerva 1989, Bresnan and Zaenen 1990). The particular conception of the a-structure assumed here, as shown in (46), is based on Bresnan (1996, 2001: chp. 14), which in turn follows Baker (1983).



The a-structure is a lexical syntactic representation with the minimally necessary information on the syntactic arguments of a predicator, such as the number of arguments, their thematic and syntactic types, and their hierarchical organization. As shown in the example above, the a-structure ‘sink <*ag pt*>’ states that the verb *sink* requires two arguments, one of the type *agent* and the other *theme*, and also that *agent* is thematically more prominent than *theme*. The a-structure thus contains information necessary for the final syntactic manifestation, or more precisely, the mapping of *agent* and *theme* to SUBJ and OBJ respectively.



Morpholexical operations interact specifically with lexical semantics and as such are outside the proper domain of the LMT, while morphosyntactic operations are part of the LMT, which constrain the syntactic assignment of a-structure roles.

<sup>13</sup> In fact, the same concept of suppression in passives is used here as well. See Her (2004) for details of mapping the composite role, formed by two roles, to a single GF.

All OT-LMT constraints are thus conceived to be morphosyntactic and universal in nature, while morpholexical operations may be language-specific.

## 4.2 Potential Advantages of OT-LMT

The OT-LMT proposed here targets specifically the universal constraints on argument-function linking. We leave the OT formulation of morpholexical operations to further research. In this section we discuss some of the advantages that the OT-LMT may afford.

We start from the fact that all OT constraints are declarative. In the conventional LMT, the two subject conditions must apply sequentially, not simultaneously, to prevent  $\theta[-r]$  from mapping to SUBJ when  $\hat{\theta}[-o]$  is present. Likewise, only after the mapping of the subject role can other roles be mapped. In contrast, all constraints in OT-LMT apply declaratively and thus simultaneously. Furthermore, in the conventional LMT, all roles are uniformly assigned exactly one feature for function assignment, while the OT-LMT allows a more expressive system with only the patient/theme role pre-assigned to unrestricted functions. This OT-LMT thus allows the possibility of *agent-OBJ* as a marked morphosyntactic selection, which is ruled out in the conventional LMT.

Recall also that two disjunctions are observed in the conventional LMT: the disjunction between the two principles of subject role mapping and the disjunction between subject roles and non-subject roles. The OT-LMT, however, consistently favors the unmarked values for all roles. This characteristic may ultimately lead to the replacement of the stipulation in the Subject Condition while preserving its insight. Thus, in general, this revised LMT formulated in OT formalism offers a potentially more consistent and simpler computational system.<sup>14</sup>


As noted earlier, the LinkLocInv constraint proposed in the OT-LMT account essentially reflects the insight of Bresnan and Kanerva's (1989) locative default, which assigns *loc[-r]* when *th* is focused. Thus, both accounts are descriptively equivalent in explicating locative inversion in the various languages observed, Chinese included. However, Bresnan and Kanerva's account would need to state that languages like Japanese and Korean lack the mechanism of linking *loc* to *[-r]*. The OT account, on the other hand, has the advantage of a more general solution in attributing the presence or absence of locative inversion in a language to the relative ranking of LinkLocInv, which like all OT constraints is universal.<sup>15</sup>


Finally, we will indicate how exactly the OT-LMT better reflects the intuition that the locative inversion construction of *<th-OBJ loc-SUBJ>* is marked in comparison to the canonical locative construction of *<th-SUBJ loc-OBL<sub>θ</sub>>*. Let's examine the constraints that each of the two violates.

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<sup>14</sup> Note that I am only referring to computational efficiency in formulation and formalism, not in practical terms of an actual computational implementation. See Kuhn (2003) for extensive discussions on the computational aspects of OT. However, there is little practical evidence of the computational efficiency of a large-scale OT implementation of a grammar, as there seem to be no such practical systems yet. For the computational efficiency of LFG in general, see Maxwell and Kaplan (1996, 1993, 1991), and for LFG in practice, refer to Kaplan et al (2004). I thank the anonymous reviewer who made this point and provided the references.

<sup>15</sup> I thank a different anonymous reviewer for pointing this out to me.

	Candidate	LinkPtTh	LinkLocInv	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
 C2	<th-SUBJ loc-OBL <sub>θ</sub> >						*

	Candidate	LinkPtTh	LinkLocInv	LinkRolRes	DescendFun	LinkUnobj	LinkUnres
 C4	<th-OBJ loc-SUBJ>			*	*	*	

Notice that the canonical form constitutes only one violation of one of the two lowest-ranked constraints. The inverted form, on the other hand, violates two of the higher-ranked constraints, LinkRolRes and DescendFun, in addition to one of the two lowest-ranked constraints. Nonetheless, even with such violations, the inverted form still outranks all other candidates. It is therefore still the optimal choice, in spite of its markedness. The OT-LMT is therefore more expressive and flexible and accounts for a wider range of data and reveals the (un)markedness of different linking relations. It is in short a simpler, more consistent, and more general theory.

### 4.3 Directions of further research

Considering its limited number of principles, LMT is a relative small theory but with ambitious goals. In the previous sections, an OT version of the theory has been laid out and tested out against the cross-linguistic data of locative inversion as generalized by Bresnan (1994). However, there are locative constructions closely related to locative inversion that have not been covered. For instance, locative inversion might bear some relation to sentences with an expletive subject and a locative argument (Bresnan 1994). Following is an example from French.<sup>16</sup>

- (48) Il est arrivé beaucoup de gens à la plage  
it is arrived many of people at the beach  
‘There were many people arriving at the beach.’

The expletive subject is an athematic argument, and as such it must receive an intrinsic [-r] classification by the very nature of [r], thematic restrictedness, (e.g., Bresnan 2001:309) and given its initial position it invariably links to SUBJ.<sup>17</sup> Similar to the locative inversion discussed earlier, this construction also indicates that the object function of the *theme* role renders it more focal than the oblique *locative* role. An *athematic* argument in the a-structure is indicated by the

<sup>16</sup> I thank the anonymous reviewer who suggested this direction of further research and provided this French example and its discourse analysis.

<sup>17</sup> Refer to Bresnan (2001, sec. 14.1) for a more in-depth discussion on athematic arguments in raising constructions.

underscore outside of the angled brackets, while thematic arguments are within the angled brackets. Thus, the a-structure of (48) is ‘arrive  $\_ <th[foc] loc>$ ’. A expletive subject may also be associated with the linking of agentive objects; (49) is an example from French.

- (49) Il travaille deux mille ouvriers dans cette usine  
 it works two thousand workers in this factory  
 ‘There are two thousand workers working in the factory.’

Similar phenomena are also observed in Bantu languages, e.g., Demuth (1990), Harford (1990), Machobane (1995), and Demuth and Mmusi (1997). All these issues are important and interesting, but cannot be adequately addressed in the current paper. Further research is needed as to how the a-structure ‘arrive  $\_ <th[foc] loc>$ ’ and ‘work  $\_ <ag[foc]>$ ’ come about, whether they are morpholexically or morphosyntactically related to ‘arrive  $<th loc>$ ’ and ‘work  $\_ <ag[foc]>$ ’ respectively, and how best to incorporate such relations within the OT-LMT proposed here.

Further development of this OT-LMT will also need to address the issue of secondary patientlike roles as a parameter of variation in double object constructions, known as the Asymmetrical Object Parameter (AOP) (cf., Alsina and Mchombo 1993, Bresnan 2001:321 and references cited). In a non-AOP language, all patientlike roles are linked to an unrestricted function, while AOP languages must link the secondary patient/theme to an object function. An additional constraint may be necessary and constraint ranking may then reflect this variation. This asymmetrical object parameter is stated in (50).

- (50) Asymmetrical Object Parameter (AOP):  

$$\begin{array}{cccc} * & \theta & \theta & \Rightarrow & \theta & \theta \\ & [-r] & [-r] & & [-r] & [+o] \end{array}$$

Finally, the OT-LMT developed here needs to be applied to a much wider range of data cross-linguistically, for example complex predicates in various languages (cf., e.g., Ishikawa 1985; Abaitua 1988; Ackerman 1992; Alsina, Bresnan, and Sells 1997; Her to appear), the valence-changing morphemes and inversion constructions in Georgian (cf., e.g., Holisky 1981, Harris 1981, Blevins 2005), among others. A solid analysis of some of these facts would be a significant test of the linking theory proposed here.

## 5. Conclusion

In this paper we set out to accomplish two goals. The more ambitious one is to come up with a simpler and more general lexical mapping theory in OT terms, or OT-LMT. The second one is to test this theory out and account for locative inversion in Chinese, English and Chichewa on the one hand and Japanese and Korean on the other hand. Following the standard view in the Optimality Theory, the mapping constraints we proposed are all universal and language variation in

locative inversion is accounted for with different constraint ranking. The OT-LMT we proposed is the UG component that constrains the argument-function linking, or morphosyntactic processes; it thus does not govern the language-specific morpholexical processes, such as passivization, locative transitivization, and resultative compounding. Locative inversion, on the other hand, involves only morphosyntactic operations and is therefore accounted for within the OT-LMT.

In summary, the OT-LMT we proposed not only covers a wider range of empirical data, it also affords a simpler, more consistent, and more general theory.

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## 附件

# 專題研究計畫國外研究心得報告

計畫主持人：何萬順

計畫執行單位：國立政治大學語言學研究所

計畫名稱：優選詞彙映照理論與英語漢語論旨角色與語法功能之連結(2/2)

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計畫編號：NSC93 - 2411 - H - 004 - 024

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計畫主持人於93學年暑假期間及寒假期間兩度應澳洲邦德大學資訊科技學院 (School of Information Technology, Bond University) 院長 Professor Ron Davison 之邀，前往該校客座訪問並從事研究。為期共四個月。於研究期間與該校教語言及相關學門（如資訊科學）之教授與博士生多有互動研討並參與其各項學術活動，也曾數次走訪政大之姊妹校 Griffith University 與該省最大之大學 Queensland University（此二所大學主持人分別於2001及2003正式客座訪問），與有關學者會面切磋。並亦利用此一機會與澳洲他地學者聯絡交換研究心得。在以下幾個議題上甚有收穫：Lexical Functional Grammar 之形式組、語法在機器翻譯上的應用、英語及漢語之論旨解構、句法與言談功能之互動、優選理論、統計與句法研究、資訊經濟之特質、拼音系統的經濟效益等。在學術研究成果上，撰寫以下六篇論文之部分內容，其中第一篇已投稿 *Natural Language and Linguistic Theory*，另外五篇均已正式出版或已被接受。

1. One-Soon Her. Argument-function mismatches in Mandarin Chinese: A lexical mapping account. *Natural Language and Linguistic Theory* (AHCI) (審查中)
2. One-Soon Her. 2006. Justifying Part-of-speech Assignments for Mandarin Gei. *Lingua* (to appear in 2006) (SSCI, AHCI)
3. One-Soon Her. 2005. 「全球化」與「在地化」：從新經濟的角度看台灣的拼音問題。《人文及社會科學集刊》17.2. (to appear in December 2005) (TSSCI)
4. One-Soon Her. 2005. Optimality-Theoretic Lexical Mapping Theory: A case study of locative inversion. *International Journal of Technology and Human Interaction* 2.1. (to appear in June 2005)
5. One-Soon Her. 2005. 'Driving' towards simplicity: In (partial) defense of the 'armchair linguist'. *Journal of Language and Linguistics* 4.1, 56-73.
6. One-Soon Her. 2004. Argument-Function Linking in Resultatives. *Concentric: Studies in Linguistics* 30.2, 1-34.