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Lexical Mapping Theory Revisited*

ONE-SOON HER

1 Introduction

The version of Lexical Mapping Theory (LMT) outlined in Bresnan & Zaenen (1990) (hereafter BZ), which replaced the earlier stipulated function-changing rules in Lexical Functional Grammar (LFG) and allowed principled accounts of the linking problems between argument roles and grammatical functions, remains the most widely adopted version of LMT among the many contenders, e.g., Zaenen (1988), Bresnan & Kanerva (1989), Bresnan (1989), Huang (1993), Butt, Dalrymple & Frank (1997), Ackerman & Moore (2001a, 2001b), Kibort (2007, 2008), among many others. It is also the version of LMT adopted by Bresnan (2001), by now a standard reference of LFG’s theoretical underpinnings, and Falk (2001), by far the most accessible textbook on LFG.

In this paper I aim to propose an alternative version of LMT which, while maintaining not only the spirit of BZ but also its explanatory power, is more consistent in its principles and also simpler in organization. Section 2 first summarizes and reviews BZ’s version of LMT, section 3 then presents the revisions proposed, and section 4 applies this revised LMT to the same transitive, unaccusative, unergative, and passive examples from BZ to demonstrate that this simpler version works equally well. I shall also review

* I thank the anonymous external and internal reviewers for their very constructive comments, which led to improvement of the paper. I also thank Tracy Holloway King, co-editor of the current volume, for her kind assistance. All remaining errors are my own responsibility.
Zaenen (1988) and apply this revised LMT to the dative alternation and passive in English. Section 5 concludes the paper.

2 LMT in Bresnan & Zaenen (1990)

At the heart of LMT is the a(rgument)-structure, which consists of a predicator with its thematic roles, each of which is marked with a classification feature for its grammatical function. Two examples are given in (1) and (2), where [-r] means unrestricted and [-o], unobjective.

(1) pound < ag, pt >
     [-o] [-r]

(2) freeze < th >
     [-r]

The argument roles in an a-structure are listed left-to-right in a descending order according to their relative prominence in a universal hierarchy, as in (3) (e.g., Bresnan and Kanerva 1989). The most prominent role in an a-structure, e.g., ag in (1) and th in (2), is referred to as $\hat{\alpha}$, or theta hat.

(3) Thematic Hierarchy:
    agent > beneficiary > experiencer/goal > instrument >
    patient/theme > locative

The syntactic features assigned to each role are [+r], (un)restricted (whether a function is restricted to its semantic role), and [+o], (un)objective (whether a function is objective), which serve to classify grammatical functions into natural classes, as in (4). Negative features being unmarked, a hierarchy obtains, as in (5), where SUBJ is the least marked and thus the most prominent, and OBJ$\theta$, the most marked and the least prominent. Note that in (5) OBJ and OBL$\theta$ are indistinguishable for markedness.

(4) Feature Decomposition of Grammatical Functions:

<table>
<thead>
<tr>
<th></th>
<th>-r</th>
<th>+r</th>
</tr>
</thead>
<tbody>
<tr>
<td>-o</td>
<td>SUBJ</td>
<td>OBL$\theta$</td>
</tr>
<tr>
<td>+o</td>
<td>OBJ</td>
<td>OBJ$\theta$</td>
</tr>
</tbody>
</table>

(5) Markedness Hierarchy of Grammatical Functions:
SUBJ([-r -o]) > OBJ([-r +o]) / OBL$\theta$([-r -o]) > OBJ$\theta$([-r +o])
Every role in an a-structure is associated with exactly one feature for its syntactic function by a set of universal unmarked choices, as in (6).

(6) Intrinsic Classification (IC) of A-Structure Roles:
   a. Patientlike roles: $\theta \rightarrow [-r]$
   b. Secondary patientlike roles: $\theta \rightarrow [+o]$\(^1\)
   c. Other roles: $\theta \rightarrow [-o]$

The three unmarked choices in (6) ensure that all roles in an a-structure are underspecified with exactly one feature $[r]$ or $[o]$, never unspecified nor fully specified, for syntactic realization.

Following Bresnan & Kanerva (1989), morphological operations can alter the lexical stock of an a-structure by adding, suppressing, or binding thematic roles, e.g., passive, which suppresses the syntactic realization of $\hat{\theta}$, as shown in (7).

(7) Passive: $\hat{\theta} \rightarrow \emptyset$

There are also universal mapping principles that determine the ultimate mapping of each of the expressed underspecified role.

(8) Mapping Principles:
   a. Subject roles:
      (i) $\hat{\theta}[-o]$ is mapped onto SUBJ; otherwise:
      (ii) $\theta[-r]$ is mapped onto SUBJ.
   b. Other roles are mapped onto the lowest compatible function in the markedness hierarchy (5).

As pointed out by Falk (2001:104) and Her (2003:6), there is an inconsistency between (8a) and (8b). Essentially, (8a) supplies only negative features to the role designated to be SUBJ, while (8b) does exactly the opposite and assigns positive features only. Thus, (8) can be restated as (9) in terms of feature supplement.

(9) Mapping Principles:
   a. Subject roles:
      (i) Add negative features to $\hat{\theta}[-o]$; otherwise:
      (ii) Add negative features to $\theta[-r]$.
   b. Add positive features elsewhere.

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\(^1\) I shall ignore the distinction between symmetric versus asymmetric languages, where only the former allow the secondary patientlike roles to be $[-r]$ as well (Bresnan and Moshi 1990).
Aside from the inconsistency in the mapping of subject roles and non-subject roles, the choice of the ultimate subject role is stipulated. Ideally, the mapping between a role and SUBJ, and indeed any other grammatical function, should be the consequence of a unified mapping principle for subject roles as well as non-subject roles. Furthermore, BZ’s model, like most of the other contenders, also needs additional output constraints, i.e., Function-Argument Biuniqueness (i.e., each α-structure role must be associated with a unique function, and conversely) and the Subject Condition (i.e., every predicate must have a subject) to ensure grammaticality.

Again, ideally, such output constraints, instead of being ad hoc stipulations, should be consequences of a unified mapping principle (e.g., Her 1998, 1999, 2003, 2010; Kibort 2007, 2008).

3 Revisions Proposed

The first change I propose relates to the markedness hierarchy of grammatical functions in (5), which assumes that a negative feature is less marked than its positive counterpart, as shown in (10a) below, but does not distinguish between the two negative features, [-r] and [-o]. OBJ and OBLθ are thus not distinguishable for markedness. That is why Bresnan (2001:309) must call (5) a ‘partial’ ordering of functions. In the spirit of Zaenen (1993:151), Ackerman & Moore (2001b:44), and Kibort (2007), I propose that [-r] should be seen as less marked than [-o]; intuitively, this is because [-r] uniquely identifies argument roles that are ‘empty’, or athematic, as well as grammatical functions not restricted to a specific role (e.g., Bresnan 2001:366). The addition of (10b) enables a comprehensive ordering of argument functions, as in (11).

(10) Markedness Hierarchy of Grammatical Features (revised):
   a. [-f] > [+f]
   b. [-r] > [-o]

(11) Markedness Hierarchy of Grammatical Functions (revised):
   SUBJ([-r -o]) > OBJ([-r +o]) > OBLθ([-r -o]) > θ([-r +o])

The second change is regarding (6), the intrinsic classification of α-structure roles. Following Her (2003), I propose to simplify the classification and only assign patient or theme an intrinsic feature [-r], repeated in (12). Other roles do not receive any intrinsic classification.
(12) Intrinsic Classification (IC) of A-Structure Roles (revised):

\[ pt/th: \theta \rightarrow [-r]^2 \]

In addition, I propose to follow Zaenen (1988), Bresnan & Kanerva (1989), Ackerman (1992), Markantonatou (1995), Kibort (2007, 2008), Her (2003, 2010), among others, and allow morphosyntactic operations, in addition to morpholexical operations such as passive. Ackerman (1992:56) characterizes the difference between morphosyntactic and morpholexical 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: these operations can affect the final GF assignments to arguments but cannot affect the lexical semantics.

Though all morphological operations are by definition language-specific, the default morphosyntactic operation in (13), that Her (2003) proposes for English and Chinese, has the potential to be universal.

(13) Language-specific Default Classification (DC):

If \( \theta \neq \emptyset \), then \( \theta \rightarrow [+r] \)

My strategy is to keep the IC maximally general, invariable, and thus elegant by leaving anything non-universal, thus parametric or language-specific, to the morphological component. This allows a more expressive a-structure, where roles can be unspecified (no [+r] nor [+o]), underspecified (only [+r] or [+o]), or fully specified (both [+r] and [+o]), while in BZ’s model roles are uniformly underspecified (only [+r] or [+o]).

Finally, the most significant revision proposed is to the internally-inconsistent mapping principles in (8). Adopting the spirit of a unified mapping principle in Her (1998, 1999, 2003, 2010) and Kibort (2007, 2008), I propose this precise formulation in (14).

(14) Unified Mapping Principle (UMP):

Map each a-structure role that is available\(^+\) onto the highest function in (13) that is compatible\(^*\) and available\(^+\).

\(^+\) A role \( \theta \) is available for mapping if all roles to the left of \( \theta \) are mapped; a function \( F \) is available for mapping to \( \theta \) if \( F \) is

\(^*\) The IC is open to typological variation and thus parameterization, e.g., Her and Deng (2012) propose that there is no IC in Formosan languages, in order to allow a morphosyntactic operation to map any focused role to SUBJ. Thus, neither BZ’s LMT nor the one proposed in this paper can account for ergative languages in general. See Manning (1996) for discussions.
not fully specified for by another role and also not linked to a role to the left of \( \theta \).

*A function is compatible if it contains no conflicting feature.

The immediate advantage, aside from the obvious simplicity and consistency of this single principle, is that the two stipulated output constraints, Function-Argument Biuniqueness and the Subject Condition, are no longer needed, as both are already implicitly incorporated in (14) and thus can be seen as natural consequences of the mapping principle.

4 Illustrative Examples

The focus of grammatical data in BZ is on the phenomena of deep unaccusativity, so we shall start with the same illustrative examples in BZ to illustrate the revised LMT. Note that \( ag \) in our revised LMT is entirely unspecified in a-structure and yet does receive the desired mapping in (15) and (18).

(15) Transitive (e.g., *John pounded the metal*):
a-structure:  

\[
pound < ag \quad pt > 
\[
\text{[}\mathbf{\cdot r}\text{]} 
\]

---------------------
S/O//O/OBL_\theta  S/O
UMP:  SUBJ  OBJ

(16) Passive (e.g., *the metal was pounded*):
a-structure:  

\[
pound < ag \quad pt > 
\[
\text{[}\mathbf{\cdot r}\text{]} 
\]
Passive:  \( \emptyset \)
---------------------
S/O
UMP:  SUBJ

(17) Unaccusative (e.g., *The river froze*)
a-structure:  

\[
\text{freeze} < \text{th} > 
\[
\text{[}\mathbf{\cdot r}\text{]} 
\]
---------------------
S/O
UMP:  SUBJ
(18) Unergative (e.g., the dog barked):
   a-structure: bark < ag >  
   -------------------------------------
   S/O/O_{θ}/OBL_{θ}
   UMP: SUBJ

Next, we shall illustrate how the dative alternation (e.g., Lee gave her a book/Lee gave a book to her) can be accounted for in this revised LMT. Zaenen (1988:16) proposes the default classification in (19), in addition to the intrinsic classification of ag[-o] and pt/th[-r], to account for the dative construction in (20).

(19) Default Classification (DC) (Zaenen 1988:16):
   a. the highest role → [-r]
   b. the next role → [+o]
   c. the third role → [+r]

(20) Dative (e.g., Lee gave her a book):
   a-structure: give < ag go th >
   IC [−o] [−r]
   DC [−r] [+o]
   -------------------------------------
   OBJ/OBJ_{θ} S/O
   Well-formedness Cond. OBJ/OBJ_{θ} OBJ

However, as pointed out by Her (2010:112), this account does not allow the prepositional dative, where the goal links to OBL_{θ} marked by to. Thus, it can only derive the passivized theme SUBJ and goal OBJ in (21a), but fails to derive the goal OBL_{θ} (21b) and the passivized goal SUBJ in (21c).

(21) Passivized dative:
   a. % A book was given her (by Lee). (√)
   b. A book was given to her (by Lee). (X)
   c. She was given a book (by Lee). (X)
   a-structure: give < ag go th >
   IC [−o] [−r]
   Passive ∅ [+o]
   DC
   -------------------------------------
   OBJ/OBJ_{θ} S/O
   Well-formedness Cond. OBJ/OBJ_{go} SUBJ
Adopting the morphosyntactic operation of the dative alternation put forth in (22) by Her (1999) and thus assuming the prepositional dative, also known as the indirect-object construction (e.g., Haspelmth 2011) and indirective (e.g., Dryer 1986, Siewierska 2003), is the unmarked form and the double-object dative is marked, I now demonstrate how the dative alternation is accounted for in the model proposed here. See (23) and (24).

(22) Dative (English):
If $<ag\ go\ th>$, then $go \rightarrow [+o]$

(23) Prepositional dative (e.g., Lee gave a book to her):
a-structure: give $<ag\ go\ th>$
IC                                  $[-r]$
DC                              $[+r]$
----------------------------------
S/O//O/OBL$_g$ OBJ$_g$ OBJ S/O
UMP                  SUBJ       OBJ

(24) Double-object dative (Lee gave her a book):
a-structure: give $<ag\ go\ th>$
IC                                  $[-r]$
Dative                             $[+o]$  $[+r]$
----------------------------------
S/O//O/OBL$_g$ OBJ$_g$ S/O
UMP                  SUBJ       OBJ

The reason for posing the Dative as a language-specific operation instead of parameterized IC choices on the triadic argument structures is because the dative alternation is not universal. In the 378 languages examined by Haspelmth (2011), exactly 50%, or 189, have the indirect-object construction only; merely 83, or 22%, have the double-object form only. It is thus justifiable to derive the marked case of double-object morphologically. Yet, the unmarked indirect-object form is not universal, as the operation in (22) is language-specific and is absent in the 189 direct-object languages,
but it applies obligatorily in the 83 double-object languages and optionally in some 40 mixed languages like English, which have both constructions.  

Assuming that the morpholexical operation of passive, in addition to the suppression of $\emptyset$, also includes a parameterized option to passivize $go$, as in (25) (Her 1999:102-103), we can now see the interesting interaction between dative and passive in English. Again, the LMT model proposed here correctly accounts for the data observed.

(25) Passive (English)
If $<\theta...(go)...>$, then $\theta \rightarrow \emptyset (\& go \rightarrow [-r])$

(26) a. Prepositional dative & passive w/o the go[-r] option:

<table>
<thead>
<tr>
<th>a-structure:</th>
<th>give</th>
<th>$ag$</th>
<th>$go$</th>
<th>$th$</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC</td>
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<tr>
<td>Passive</td>
<td>$\emptyset$</td>
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<td>DC</td>
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<td>S/O</td>
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<tr>
<td>OBJ</td>
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<tr>
<td>OBL</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SUBJ</td>
<td>$\emptyset$</td>
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<td></td>
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</tbody>
</table>

A book was given to her (by Lee).

b. Prepositional dative & passive w/ the go[-r] option:

<table>
<thead>
<tr>
<th>a-structure:</th>
<th>give</th>
<th>$ag$</th>
<th>$go$</th>
<th>$th$</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passive</td>
<td>$\emptyset$</td>
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<td>OBJ</td>
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<td>S/O</td>
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<td>OBL</td>
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</tr>
<tr>
<td>SUBJ</td>
<td>$\emptyset$</td>
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</table>

She was given a book (by Lee).

Assuming that structures derived via a morphological operation are marked in relation to their counterparts derived without this operation, (26b) is more marked than (26a). In turn, structures in (26) are less marked, with only passive, than the ones in (27) below, with both dative and passive.

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4 However, due to the limited space, this is still a partial account as it leaves primary object constructions (Dryer 1986), also known as the secundative (Siewierska 2003), unaccounted for.

5 As demonstrated in Her (1999, 2010), while languages like English allow this option, languages like Chinese do not. The LMT model proposed here can account for this distinction; due to the limitation of space, I will not go into this interesting typological issue.

6 This analysis does not bring in the co-variation in word order associated with this construction. See Siewierska and Hollmann (2007) for a corpus-based study.
(27) a. Double-object dative & passive w/o go[-r] option

   a-structure:  \[\text{give} < \text{ag} \quad \text{go} \quad \text{th} >\]

   IC \hspace{1cm} [-r]

   Passive \hspace{1cm} \emptyset

   Dative \hspace{1cm} [+o]

   DC \hspace{1cm} [+r]

   \hspace{2cm} ----------------------------------

   OBJ \hspace{1cm} θ

   UMP \hspace{1cm} OBJ, \text{ S/O}

   %A book was given her (by Lee).

b. Double-object dative & passive w/ go[-r] option:

   a-structure:  \[\text{give} < \text{ag} \quad \text{go} \quad \text{th} >\]

   IC \hspace{1cm} [-r]

   Passive \hspace{1cm} \emptyset \hspace{1cm} [-r]

   Dative \hspace{1cm} [+o]

   \hspace{2cm} ----------------------------------

   OBJ \hspace{1cm} S/O

   OBJ \hspace{1cm} \text{SUBJ}

   %A book was given her (by Lee).

The fact that \text{go} in (27) may map onto either OBJ and OBJ, further adds to the obscurity of the output of the interaction of dative and passive and thus further increases its markedness; this high degree of markedness may explain why this construction is only grammatical in British dialects or in certain literary styles (e.g., Jaeggli 1986:596, Anderson 1988:300, Dryer 1986:833). To summarize, the several dative constructions in English are related by Dative, a morphosyntactic rule, and Passive, a morpholexical rule, as shown schematically in (28). The Dative rule marks (28a) and (28e), and the Passive rule marks (28c), (28d), and (28e). (28e) is the only construction marked by both. The degree of markedness is thus directly related to the application of these morphological rules.

(28)a. Lee gave a book to her. (unmarked)

b. Lee gave her a book. (Derived from (a) via Dative, marked)

c. A book was given to her. (Derived from (a) via Passive, marked)

d. She was given a book. (Derived from (a) via Passive, marked)

e. %A book was given her. (Derived from (a) via Dative and Passive, even more marked)
5 Conclusion

The version of Lexical Mapping Theory (LMT) put forth in Bresnan & Zae- nen (1990) (BZ) is the most widely accepted version in the literature of Lex- ical Functional Grammar (LFG). For example, it is adopted by Bresnan (2001), the most authoritative reference of LFG’s theoretical underpinnings, and by Falk (2001), the most accessible textbook on LFG. The goal of this paper is to propose some revisions to BZ’s model to further strengthen its internal consistency, formal rigor, and empirical coverage.

Assuming the same two features [+r] and [+o] for the decomposition of grammatical functions and the unmarkedness of negative features, I further propose that [-r] is less marked than [-o]. This allows a comprehensive ordering of markedness, i.e., SUBJ > OBJ > OBLο > OBL. I also propose a single intrinsic [-r] classification of patient/theme and put in a default [+r] classification for all non-∅ roles. The latter morphosyntactic operations increase the expressivity of the theory but not at the expense of formal rigor. The most significant revision is replacing the stipulated mapping principles for SUBJ roles and non-SUBJ roles and the two output well-formedness conditions with a single unified mapping principle, which consistently favors the unmarked parallel matching between argument roles and grammatical functions. Finally, transitive, unaccusative, unergative, passive, and dative constructions in English are used as illustrations for the model of LMT proposed. Further applications should confirm that the simplicity and internal consistency of the proposed model broadens the LMT’s empirical coverage.

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One-Soon Her

Graduate Institute of Linguistics & Research Center of Mind, Brain, and Learning
National Chengchi University
Taipei, Taiwan
hero@nccu.edu.tw