Lexical Functional Grammar

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The term *Lexical Functional Grammar (LFG)* first appeared in print in the 1982 volume edited by Joan Bresnan: *The Mental Representation of Grammatical Relations,* the culmination of many years of research. LFG differs from both transformational grammar and relational grammar in assuming a single level of syntactic structure. LFG rejects syntactic movement of constituents as the mechanism by which the surface syntactic realization of arguments is determined, and it disallows alteration of grammatical relations within the syntax. A unique constituent structure, corresponding to the superficial phrase structure tree, is postulated. This is made possible by an enriched lexical component that accounts for regularities in the possible mappings of arguments into syntactic structures. For example, the alternation in the syntactic position in which the logical object (theme argument) appears in corresponding active and passive sentences has been viewed by many linguists as fundamentally syntactic in nature, resulting, within transformational grammar, from syntactic movement of constituents. However, LFG eliminates the need for a multi-level syntactic representation by allowing for such alternations to be accomplished through regular, universally constrained, productive *lexical* processes that determine multiple sets of associations of arguments (such as *agent, theme*) with grammatical functions (such as SUBJECT, OBJECT)—considered within this framework to be primitives—which then map directly into the syntax.

This dissociation of syntactic structure from predicate argument structure (a rejection of Chomsky's Projection Principle, in essence) is crucial to the LFG framework. The single level of syntactic representation, *constituent structure (c-structure),* exists simultaneously with a *functional structure (f-structure)* representation that integrates the information from c-structure and from the *lexicon*. While c-structure varies somewhat across languages, the f-structure representation, which contains all necessary information for the semantic interpretation of an utterance, is claimed to be universal.

Phenomena that had been explained by the interaction of transformations are accounted for in LFG by the regular interaction of lexical processes. Bresnan shows that some of the classic arguments for syntactic transformations do not, in fact, distinguish between a transformational and a lexical account of the regularities. In Bresnan 1982b, she argues that the lexical account of passivization is superior to the transformational approach, e.g., in explaining why passivized forms can undergo further lexical rules, such as Adjective Conversion and compounding (giving rise to such forms as “snow-covered”).

Bresnan and other contributors to Bresnan 1982a offer evidence and arguments in support of the formulation of such alternations in terms of alternative assignments of grammatical functions to arguments rather than syntactic movement. They suggest that the model has psychological validity, and is consistent with evidence about grammatical processing and acquisition. It also captures cross-linguistic generalizations about languages that have comparable alternations in the realization of arguments as grammatical functions despite the use of very different syntactic means for expressing functions like subject and object. Bresnan suggests that the “illusion” of NP-movement in the English active/passive alternations is just an artifact of the structural encoding of object and subject through word order in English. This is in contrast with languages like Malayalam (see Mohanan 1982), in which word order is much freer; accordingly, passivization in Malayalam involves an apparent change in morphological case. In LFG, the different realizations of active and passive sentences in Malayalam and English follow directly from independent principles that determine how subject, object, and oblique phrases are expressed syntactically in those languages.

Recent work in Lexical Mapping Theory, an outgrowth and extension of Lexical Functional Grammar, has been refining the principles for association of arguments with grammatical functions, so some of the earlier work could now be recast accordingly to simplify the lexical component. Thanks to a more general set of mapping principles, the associations of grammatical functions with arguments no longer need to be stipulated, and many lexical redundancy rules can be eliminated or greatly simplified since many characteristics of the associations are now predictable. Sections 1-5 below summarize the 1982 framework; Lexical Mapping Theory will be discussed in section 6.

1. Levels of Representation

Lexical Functional Grammar postulates three distinct but interrelated levels of representation: lexical structure, functional structure, and constituent structure, which are present simultaneously. See Kaplan and Bresnan 1982 for details of the LFG formalism, which is briefly summarized below.

1.1 Lexical Structure

The lexical entry (or *semantic form*) includes information about the meaning of the lexical item, its argument structure, and the grammatical functions (e.g., subject, object, etc.) that are associated with those arguments. The verb ‘hit’, for example, has a predicate argument structure that consists of an agentive argument associated with SUBJECT and a patient or theme argument associated with the OBJECT function.

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          (SUB)    (OBJ)       <——  lexical assignment of grammatical functions
            |        |
 ‘hit  (  agent,  theme  )’    <———  predicate argument structure
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Grammatical functions are universal primitives within this framework, and since they are associated both with lexical items and with syntactic positions—by means of annotated phrase structure rules—they mediate between lexical and constituent structure representations. Grammatical functions play an essential role in Lexical Functional Grammar; however, they have no intrinsic significance and are situated at the interface between the lexicon and the syntax. LFG imposes the restriction of *Direct Syntactic Encoding*, which prevents any syntactic process from altering the initial assignment of grammatical function.

Each lexical entry consists of a pairing of arguments and grammatical functions. The principle of *Function-Argument Biuniqueness* requires that each argument be associated with a unique grammatical function (even if that assignment is Ø, which entails that the argument will be interpreted as a bound variable, as in ‘John ate’ where it is implied that there is something John ate), and conversely that no grammatical function may occur more than once within a predicate argument structure. An actual lexical entry for the verb ‘hit’, then, might look something like this:

hit, Verb
(↑ PRED) = ‘{meaning of hit} < SUB, OBJ >’

where the PRED feature has as its value some representation of the “meaning” of ‘hit’, which in this case is a two-place predicate. The variable ‘↑’ in this representation refers to the lexical item under which this entry is found, here ‘hit’.

A grammatical function may, however, be directly associated with no logical argument of the predicate with which it occurs. This is the situation for the object of ‘consider’ in the sentence

John considered *her* to be a fine candidate.

where ‘her’ is the logical subject of the infinitival complement. This is indicated in the lexical entry for ‘consider’ by placement of the function OBJ outside of the angled brackets containing the arguments of the verb. So, the verb ‘consider’ would be represented as:

consider, Verb
(↑ PRED) = ‘{meaning of consider} < SUB, XCOMP > (OBJ)’
(↑ OBJ) = (↑ XCOMP SUB)

where the XCOMP is an open complement, i.e., a complement whose subject is controlled grammatically; the control equation is added (by default).

Any other grammatical information associated with a lexical item will also be encoded in the semantic form. The name ‘Mary’, for example, comes with the grammatical information about gender and number features (expressed here using '–' to indicate the unmarked value of the feature in the Jakobsonian sense; cf. Neidle 1988), which may also be expressed by equations:

Mary, Noun
(↑ PRED) = '{meaning of 'Mary'}'
(↑ NUM) = –PL
(↑ GEND) = +FEM

These equations are referred to as *constituting equations* because the information contained in them will be incorporated into any f-structure that contains this semantic form. It is also possible have *constraint equations* in a lexical entry; in such a case the f-structure would only be well-formed if the equation holds, but the information expressed by the equation would not be added to the functional structure. Verb agreement in English may be accomplished in this way, by associating a constraint equation with a form like 'speaks' (contributed by a redundancy rule added to all forms that have the same inflectional ending):

speaks, Verb
(↑ PRED) = '{meaning of 'speak'} <SUB>'
(↑ SUB NUM) $=_c$ -PL

A sentence like 'They speaks' would be ill-formed since the constraint equation is not satisfied.

Lexical redundancy rules relate alternate pairings of arguments to grammatical functions. So, for example, passivization may involve suppression of the first argument (associated with SUB in the active form) and realization of the second argument (the OBJ in the active) as SUB; the morphological form associated with this operation is the participial form of the verb.

(i) (SUB) —> Ø
(ii) (OBJ) —> (SUB)

Notice that Function-Argument Biuniqueness ensures that part (ii) of the passivization rule is contingent upon part (i); there can be only one subject.

The output of that lexical redundancy rule on the previous lexical form given for ‘hit’ would be:

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                  Ø          (SUB)
                  |            |
‘ hit  (   agent,       theme   ) ‘
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However, the rule applies quite generally to lexical items having the appropriate grammatical functions. Notice that the rule would apply as well to grammatical functions contained within control equations, so the passivized version of ‘consider’ would be:

consider, Verb

(↑ PRED) = ‘{meaning of consider} < Ø, XCOMP > (SUB) ‘

(↑ SUB) = (↑ XCOMP SUB)

Some support for formulation of such rules in terms of grammatical functions rather than structural configuration comes from the contrast illustrated by the following two sentences, distinguished by the fact that ‘a doctor’ is an OBJECT in the first but is a NOMINAL COMPLEMENT in the second. Only the first may be subject to passivization.

John hit a doctor.	A doctor was hit.
John became a doctor.	*A doctor was become.

While the configuration of the post-verbal NP in both cases may be the same, it is the difference in grammatical function that accounts for the contrast with respect to passivization.

1.2 Constituent Structure

Constituent structure encodes linear order, hierarchical groupings, and syntactic categories of constituents, and is the input to the phonological component of the grammar. Language-specific annotations of phrase structure rules identify the grammatical functions that may occur in specific syntactic positions. Examples of phrase structure rules for English:

$$S \longrightarrow \underset{(\uparrow \text{SUB}) = \downarrow}{NP} \quad \underset{\uparrow = \downarrow}{VP} \qquad\qquad VP \longrightarrow \underset{\uparrow = \downarrow}{V} \quad \underset{(\uparrow \text{OBJ}) = \downarrow}{NP}$$

The arrows are variables; '↑' is to be instantiated by the node immediately dominating the constituent under which the arrow is placed, and '↓' by that node itself. So, the first equation for the rule on the left states that the NP under which the equation is written is the SUB of the S that dominates it. The '↑=↓' equation beneath VP indicates that the features of that node are shared with the higher node. This is the default assignment to phrasal heads, which share information with the dominating phrasal node. These equations are used to construct the f-structure representations described in *1.3*.

It should be noted that the equations illustrated here are in the form in which LFG phrase structure rules were written in 1982. Similar associations of grammatical functions could be made with phrase structure rules conforming to current versions of X'-theory.

The terminal nodes of the tree are lexical items. The *Lexical Integrity Hypothesis* requires that fully formed lexical items are inserted into the syntax. A rule like Affix-hopping would be disallowed. Syntactic rules are prohibited from moving any element into or out of lexical categories.

1.3 Functional Structure

Structural and lexical information is integrated and unified within functional structure (f-structure), which consists of hierarchically organized attribute-value matrices. A straightforward algorithm for transferring information from c-structure to f-structure is presented in Kaplan and Bresnan 1982. When the lexical items that occupy the terminal nodes of the tree are inserted into f-structure, the information contained in the lexical entry (including relevant equations) is retrieved and included in the f-structure. It is in this way that lexical information is combined with the structural information available from the c-structure tree.

So, the f-structure corresponding to the sentence ‘John hit Bill’—constructed from the c-structure representation generated by the phrase structure rules illustrated in *1.2* and the lexical information from the entry for ‘hit’ discussed in *1.1*—would include the following information:

SUB	[PRED ‘John’]
PRED	‘hit < SUB , OBJ >’
OBJ	[PRED ‘Bill’]

The validity of the f-structure representation is ensured by a number of well-formedness conditions.

2. Well-formedness Conditions on Functional Structure

The following basic well-formedness conditions, which have counterparts in other frameworks, apply to f-structures.

2.1 Coherence

Coherence requires that every meaningful semantic form be a grammatical function mentioned in the predicate argument structure (or in a constituting equation) of a predicate in its clause. This prevents extraneous material from appearing.

2.2 Completeness

An f-structure is ill-formed if it does not contain values for the grammatical functions that are subcategorized by the predicate. The following sentence, for example, lacks a value for the SUB, and is therefore incomplete:

* Speaks.

2.3 Consistency

Consistency, also known as *functional uniqueness,* requires that each attribute in the matrix have a unique value. So, for example, if an f-structure contained a matrix with the following :

GEND	+ FEM
GEND	– FEM

the f-structure would be inconsistent.

Notice that this comonsense principle can also be used to guarantee the complementary distribution of elements that may fulfill a single grammatical function. This kind of complementary distribution has motivated many syntactic movement analyses, such as clitic-movement. In French, for example, both a full NP object appearing post-verbally and a pre-verbal direct object clitic may be associated with the OBJECT function. Thus, both of the following are grammatical:

Jean le voit.
John him sees
'John sees him'

Jean voit l'homme.
John sees the man
'John sees the man'

However, the following is ungrammatical without a pause before the final NP:

* Jean le voit l'homme.
John him sees the man

While this distribution could be accounted for by a movement analysis (such as Kayne's 1975 proposal that both clitics and full NP's are generated in post-verbal position, and that a rule of clitic-placement applies) there is a straightforward account of these facts without movement. As discussed in Grimshaw 1982, the object function is associated with the pre-verbal clitic and with the post-verbal NP, both of which are optionally included in the phrase structure expansion of VP.

If either a direct object clitic or full NP occurs with a verb that does not subcategorize for an object, then the f-structure is incoherent. If a lexical item like ‘voit’ requires an object, then either the clitic or the full NP must be present; otherwise the sentence will be incomplete. However, if both are present with ‘voit’, then the f-structure is inconsistent because the value of the OBJECT’s PRED would not be unique. Many phenomena for which arguments of functional equivalence and distributional complementarity have been used to argue for syntactic movement (not only NP-movement but also V-movement, for example) could be analyzed in similar fashion.

2.4 Semantic Coherence

All semantic forms that are not semantically empty (i.e., that are not dummy elements) must be linked to the logical argument of another lexical form—in order to be coherently interpreted.

3. Control and Complementation

Among the universal set of grammatical functions are complements and adjuncts. Complements are an essential part of the argument structure (part of the subcategorization frame), while adjuncts provide additional information and are interpreted by association with some other subcategorized argument. Adjuncts are not required for grammaticality, while omission of a complement results in an ill-formed sentence. Adjuncts have greater mobility than complements and are often set off by pauses. The following contrasts illustrate this:

Complement	John didn’t sound *ashamed of himself*.
	*John didn’t sound.
	*John, ashamed of himself, didn’t sound.
Adjunct	John looked down, ashamed of himself.
	John looked down.
	John, ashamed of himself, looked down.

Complements and adjuncts may either be *closed*, i.e., semantically complete, containing within them all the elements required for logical interpretation of the predicate, or *open*, lacking a subject argument, which is then *controlled* by another argument in the sentence. Open complements may be phrases of any lexical category (AP, NP, VP, PP) and so the abbreviation XCOMP is used to designate that set of complements. The same is true for open adjuncts, and the abbreviation XADJ is used.

Open complements predicate something of either the subject or the object of the main predicate with which they occur; this relation is expressed by a control equation (which can be filled in by a lexical redundancy rule on the basis of the argument structure provided), as illustrated here:

consider, Verb
(↑ PRED) = '{meaning of consider} < SUB, XCOMP > (OBJ)'
(↑ OBJ) = (↑ XCOMP SUB)

This control equation sets the object of the main predicate equal to the subject of the XCOMP. This is indicated formally by either coindexing the two f-structures that are set equal, or by drawing an arrow from one to the other. Consider the sentence:

Mary considers John boring.

SUB	PRED	'Mary'
	NUM	–PL
	GEND	+FEM
	PERS	3rd
PRED	'consider <SUB, XCOMP> (OBJ)'	
TENSE	–PAST	
OBJ	PRED	'John'
	NUM	–PL
	GEND	–FEM
	PERS	3rd $]_i$
XCOMP	SUB	[$]_i$
	PRED	'boring <SUB>'

This notation indicates that the two coindexed f-structures are identical in all respects. This relation of f-structure identity is referred to as *grammatical* or *functional* control. It is important to note that the subject of XCOMP is not present in c-structure. It is introduced into f-structure only through the lexical information contained in the entry for 'consider'. A similar analysis applies to the lexical entry for the verbs 'seem' and 'want', which involve subject control over the complement:

seem, Verb

(↑ PRED) = '{meaning of 'seem'} < XCOMP > (SUB) '

(↑ SUB) = (↑ XCOMP SUB)

want, Verb

(↑ PRED) = '{meaning of 'want'} < SUB, VCOMP > '

(↑ SUB) = (↑ XCOMP SUB)

Thus, LFG grammatical control structures include some constructions that would be analyzed in recent Chomskyan frameworks as involving exceptional case marking, NP-movement, and controlled PRO. In each instance, the constituents that are postulated to be structurally present in LFG are those which are observable and which pass the syntactic constituency tests for the grammatical function assigned to them. So, for example, in the sentence 'John considered her to be a fine candidate', 'her' is an object; it bears object case; it passivizes; it behaves syntactically like an object. Its semantic role as a subject argument of the following complement is not encoded in constituent structure in LFG. The kind of structural adjustments that are required in Chomskyan frameworks to compensate for the mismatches between surface syntactic constituency and the underlying argument structure (projected into d-structure) are not required in LFG, since the link between argument structure and c-structure is mediated by grammatical functions and since control properties are functionally rather than structurally encoded.

The analysis of open complements extends naturally to open adjuncts, although there is greater freedom in the argument that may serve as the controller, since this is not lexically determined; the subject of the adjunct may be set equal to a grammatical function from among those that are acceptable adjunct controllers in a given language.

Closed complements contain all arguments required for interpretation, as in the following sentence, where the closed sentential complement is italicized:

Mary thought *that it might rain*.

Such closed sentential complements may contain a phonetically null subject in f-structure (equivalent to PRO) that is then subject to principles of *anaphoric control* for interpretation. The interpretation of PRO is subject to many of the same constraints that hold for interpretation of lexical pronouns, and is freer than in the case of grammatical control.

4. Long-Distance Dependencies and Scrambling

To account for the kind of long-distance dependencies that are traditionally analyzed by wh-movement, the 1982 version of LFG utilizes *constituent control*.. The basic idea is that syntactic identity is established between the element that appears outside the clause and the position left empty within the clause. Long-distance associations are composed of local binding relations that are established. For details of the formalism see Kaplan and Bresnan 1982, or Sells 1985 for a more recent version. Unlike cases of grammatical control—where control information from the lexicon is used to construct functional structure representations of the controlled arguments—constituent control is not lexically determined and involves empty nodes that are syntactically present. The presence of this type of syntactic gap is associated with well-known processing effects and phonological effects (relating to contraction), unlike alternative assignments of arguments to grammatical functions as found in the passive construction, e.g., for which no null c-structure is postulated in LFG.

Rules that change the order of syntactic constituents without modifying their grammatical functions are handled as operations on c-structure rules. Thus, “scrambling” rules are treated as rules that affect c-structure but not f-structure.

5. Case

5.1 What Case Is and Is Not in LFG

Within the LFG framework, “case” is not invoked to account for the distribution of lexically filled NP’s, as it is in recent Chomskyan frameworks. The distribution of arguments that may be subject to grammatical or anaphoric control is handled in LFG by the theory of control, in terms of grammatical functions rather than syntactic positions. Similarly, while case is used in the Chomskyan framework to trigger movement (as in the passive construction, where the d-structure object cannot remain in that position without causing a violation because lexical forms can only occur in casemarked positions and past participles do not assign case), in LFG such alternations are determined by the mapping from argument structure to grammatical functions.

The term ‘case’ is used in LFG in the more traditional sense, to describe the use of inflection to encode syntactic relations. Case is most easily observed and studied in languages that have rich case morphology, and in such languages, the claim that the existence of lexically empty subjects of tenseless clauses correlates with their caselessness has not been validated. As has been shown for many such languages, these empty elements can bear case. For example, in Russian, Neidle 1988 (following a 1974 proposal of Comrie’s) argues that the subject of the embedded clause in the following sentence is, in fact, marked with Dative case, as can be seen from the case marking of case-agreeing modifiers.

On	poprosil	Ivana	[**PRO**]$_{NP}$	pojti.	
he$_{Nom}$	asked	Ivan$_{Acc}$		to go	
On	poprosil	Ivana	[**PRO$_i$**]$_{NP}$	pojti	**odnomu$_i$** / *odnogo .
he$_{Nom}$	asked	Ivan$_{Acc}$		to go	alone $_{Dat\ /\ *Acc}$

Also, subjects of adverbial participle clauses bear Nominative case:

[**PRO$_i$**]$_{NP}$	Podbezav k	stancii	**odin$_i$** , ...	
	having-run	to	station	alone

To accommodate evidence of this kind, a modified notion of case, ‘Abstract case’ is now required to license NP’s in the Chomskyan model; LFG has no such device.

5.2 Syntactic Case Assignment

In LFG syntactic case is associated with either a specific grammatical function or syntactic configuration, and a morphological form that comes from the lexicon with the compatible case inflection is required in that slot. Casemarked forms are generated in the lexicon (according to the regularities appropriate for the morphological class to which a given word belongs) and lexical entries include information about case features. It is in f-structure that appropriate use of case forms is ensured; if the morphological form inserted into c-structure is inconsistent with the case features assigned to the NP, then the corresponding f-structure will be ill-formed.

5.3 Case as a Reflex of Structural and Grammatical Relations

In languages that have rich case systems, overt case marking can provide evidence of grammatical relationships. In Neidle 1988, for example, it is argued that case marking in Russian provides evidence for the distinction between grammatical control and anaphoric control. In instances of grammatical control, the controlled NP shows identity in case with the controller. This can be shown by looking at the case marking of adjuncts that necessarily agree in case with the controlled element, since adjuncts exhibit case agreement with the noun they modify, as shown below:

Ivan	prisel	**odin**.		
Ivan$_{Nom}$	came	alone$_{Nom}$		
Ivan		xotel	prijti	**odin** / *odnomu.
Ivan$_{Nom}$	wanted	to come	alone$_{Nom/*Dat}$	

In the second sentence, **‘odin’** is agreeing with the functional subject of ‘prijti’, which is controlled by the higher subject in f-structure and is thus identical in all respects, including its case features. In cases involving anaphoric control, however, a separate f-structure corresponding to the subject of the embedded infinitive is present, and is casemarked independently of the higher subject. It is with this independently casemarked f-structure that the adjunct agrees in case.

On		poprosil	Ivana	[**PRO** $]_{NP}$	pojti	**odnomu** / *odnogo .
He_{Nom}	asked		$Ivan_{Acc}$		to go	alone $_{Dat / *Acc}$

5.4 Case Alternations and Case Feature Decomposition

Neidle 1988 presents an analysis of Russian case alternations that uses an analytical decomposition of case into case features (in the Jakobsonian tradition). She argues the same features that are relevant to morphological case syncretism are relevant to syntactic case assignment. Case alternations such as the Nominative/Dative alternation in subject position and the Accusative/Genitive alternation found on post-verbal NP's in Russian (giving rise to the so-called Genitive of Negation) are accounted for by assignment of partially specified feature matrices, where the alternation in case can be attributed to the difference in the value of a single case feature. These basic case features may, in fact, be related to the features into which grammatical functions are decomposed within Lexical Mapping Theory.

6. Recent Developments: Lexical Mapping Theory

Much recent work (cf. Bresnan and Zaenen 1990, Bresnan and Kanerva 1989, and Bresnan and Moshi 1990) is focussed on Lexical Mapping Theory, which is an outgrowth of the work of L. Levin (1986) on unaccusativity. The basic idea is that syntactic functions may be analytically decomposed into two binary features: [±r] (±thematically unrestricted) and [±o] (±objective), which are associated with arguments according to universal mapping principles (although there may be some parametric variation in those principles across languages). Syntactic alternations are a result of feature underspecification in the initial assignment.

With these two features, grammatical functions are grouped into natural classes:

		non-objective [–o]	objective [+o]
thematically unrestricted	[–r]	SUB	OBJ
thematically restricted	[+r]	OBL_{Θ}	OBJ_{Θ}

where 'OBL_{ϕ}' and 'OBJ_{ϕ}' are abbreviations for sets of grammatical functions differentiated by their thematic restriction; thus *oblique goal* and *oblique instrumental* would both fall within the class represented by 'OBL_{ϕ}' but are distinct grammatical functions. The ‘+’ and ‘-’ values represent the marked and unmarked values of the features. A markedness hierarchy can be established on this basis: subjects are the least marked grammatical function and restricted objects are the most marked. Not all languages even contain thematically restricted objects. The relative markedness of these functions is significant for the mapping of arguments onto grammatical functions. The arguments appear in *A-structures* ordered according to their relative role prominence, according to the following thematic hierarchy:

agent < beneficiary < experiencer/goal < instrument < patient/theme < locative

The most prominent role in a predicate may be represented by ¥. Each thematic role in the argument structure is also associated with an intrinsic feature classification, a single syntactic feature compatible with that role:

patientlike roles	Θ [-r]
secondary patientlike roles (as found with ditransitives)	Θ [+o]
other roles	Θ [–o]

Illustrations of A-structures:

hit < agent , theme >
[-o] [-r]

fall < theme >
[-r]

The second feature specification, which completes the determination of the grammatical function to be fulfilled by each argument, can be filled in freely, in accordance with a few mapping principles. Basically, if the highest argument on the hierarchy is [-o], then that becomes the subject, otherwise a [-r] argument is mapped onto subject. Function-argument biuniqueness, discussed earlier, still holds: no grammatical function can be associated with more than one thematic role, and no thematic role can be associated with more than one grammatical function. (There can, however, be more than one thematically restricted object, as long as the two are distinct grammatical functions.)

So, unless Θ is suppressed by the following association (a simplified statement compared with that from 1982):

Passive Θ
|
Ø

the agent of the verb ‘hit’ (whose A-structure is illustrated above) will be assigned [-r] and will be realized as the grammatical subject. The [-r] argument will receive the least marked assignment of the second feature compatible with mapping principles. It cannot be assigned [-o], however, because the subject function is already filled and the assignment of [-o] would constitute a violation of function-argument biuniqueness; therefore it will be [+o], a thematically unrestricted object. If that ¥ argument *is* suppressed, however, then the [-r] argument, the theme, of the verb ‘hit’ will be assigned [-o] and will appear as subject.

In other words, the alternations that occur in the grammatical functions that may be associated with a given argument are a result of the intrinsic feature assignment, which is only a partial feature specification. So an argument that is intrinsically specified to be [-r] could potentially appear in the syntax as either a subject or an object, depending upon the subsequent assignment of [±o]. A second example of this kind of alternation is given here:

A book fell.

There fell a book.

This alternation results, within Lexical Mapping Theory, not from syntactic movement but from alternative assignments of grammatical functions to the argument.

Another alternation that is predicted is that between a subject and a thematically-restricted oblique, such as is found in the following English sentences:

John hit Bill.

Bill was hit by John.

Similar alternations occur with experiencers, which may occur either as thematically-restricted obliques or as subjects, and with locatives (see Bresnan and Kanerva 1989).

While many of the mapping principles are claimed to be universal, there appears to be slight parametric variation in the constraints that apply. In Bresnan and Moshi 1990, an explanation is proposed for a clustering of differences between Kichaga (and languages like it) on the one hand and Chichewa (and languages like it) on the other, in terms of a restriction on assignment of intrinsic syntactic features (requiring that not more than one argument have an intrinsic classification of [–r],
based on a proposal by Alsina and Mchombo) that holds only for the latter group.

7. Summary

Thus, the three simultaneous levels of representation in LFG have different formal characterizations. No syntactic derivational process is involved. Syntactic generalizations of the type that inspired transformations such as passivization are instead viewed as resulting from productive relations in the lexicon. In instances where the arguments of a lexical entry may be associated with more than one set of grammatical functions, each different association corresponds to a different mapping from argument structure to syntactic functions, as expressed in a unique lexical entry, and lexical entries themselves may be productively related by “lexical redundancy rules”. This is in contrast to the Government-Binding approach, which assumes an initial mapping of arguments into the syntax determined on the basis of the argument structure and from which alternative structures may be derived by syntactic movement. Thus, in LFG the cross-linguistic generalization about passive constructions is stated in terms of the alternate realization of arguments as grammatical functions, and the generalization about the syntactic position in which particular grammatical functions occur in a given language is stated independently.

Lexical Mapping Theory further analytically decomposes grammatical functions into distinctive features, and establishes principles by which intrinsic syntactic features are associated with logical arguments and by which those arguments map into grammatical functions in conformity with universal principles, with slight parametric variation.

Bibliography

Bresnan J (ed) 1982a *The Mental Representation of Grammatical Relations.* MIT Press, Cambridge, Massachusetts

Bresnan J 1982b The Passive in Lexical Theory. In Bresnan (ed) 1982a

Bresnan J, Kanerva J M 1989 Locative Inversion in Chichewa: A Case Study of Factorization in Grammar. In: *LIn* **20.1:** 1-50

Bresnan J, Mchombo S A 1987 Topic, Pronoun, and Agreement in Chichewa. *Lg* **63**: 741-782

Bresnan J, Moshi L 1990 Object Asymmetries in Comparative Bantu Syntax, *LIn* **21.2**: 147-185

Bresnan J, Zaenen A 1990 Deep Unaccusativity in LFG. In: Dziwirek K, Farrell P, Mejías-Bikandi E (eds) *Grammatical Relations: A Cross-Theoretical Perspective.* CSLI, Stanford, California, pp. 45-57

Grimshaw J 1982 Romance Reflexive Clitics. In Bresnan (ed) 1982

Kaplan R M, Bresnan J 1982 Lexical-Functional Grammar: A Formal System for Grammatical Representation. In Bresnan (ed) 1982a, pp. 173-281

Levin L 1985 *Operations on Lexical Forms: Unaccusative Rules in Germanic Languages.* MIT Dissertation. Published 1989 by Garland Press, New York, New York.

Mohanan K P 1982 Grammatical Relations in Malayalam. In: Bresnan (ed) 1982a pp. 504-589

Neidle C 1988 *The Role of Case in Russian Syntax.* Kluwer, Dordrecht, The Netherlands

Sells, P 1985 *Lectures on Contemporary Syntactic Theories.* CSLI, Stanford, California