

The Prepositional Passive: a Lexical Functional Account

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Chapter 1

Introduction

1.1 The phenomenon

Some languages (including English, Norwegian, Prince Edward Island French, and others) allow passives where the subject appears to correspond, in the active, to the object not of the main verb, but of a preposition; as a result, these constructions involve so-called ‘stranded’ prepositions. This construction is known as either the pseudopassive (e.g. in Truswell 2008) or the prepositional passive (e.g. in Alsina 2009), both of which are sometimes abbreviated as P-passive.

Some examples of the P-passive from English and Norwegian are given below:¹

¹When it makes sense to do so, example sentences have been taken from naturally occurring data. Where this is the case, the source is indicated in brackets afterwards. In addition to the World Wide Web and published material, I have made use of two large reference corpora, which I have abbreviated as follows: BNC = the British National Corpus (Davies 2004–; 100 million words); COCA = the Corpus of Contemporary American English (Davies 2008–; 450 million words).

- (1) English:
 - a. This is something that is spoken about a lot in Mexico. (COCA)
 - b. Context is relied on much more often than in English or Bali to establish time reference. (BNC)
 - c. This pen was written with by T. S. Eliot.
- (2) Norwegian (Lødrup 1991: 118, 120):
 - a. De må bli passet bedre på.
they must be looked better after
‘They must be better looked after.’
 - b. Sengen ble sovet i.
the.bed was slept in
‘The bed was slept in.’

This construction is of interest to linguistic theory for a number of reasons. Firstly, it is typologically unusual. The prepositional passive is cross-linguistically rare, even in languages which allow prepositions to be stranded as part of a long-distance dependency (LDD; e.g. in a *wh*-question or relative clause). Thus, alongside languages like (Metropolitan) French, which do not allow any preposition stranding at all, there are also languages like Danish, which allow preposition stranding in *wh*-questions, but not in the passive:

- (3) French:
 - a. *Qui as-tu parlé de?
who have-you spoken of
‘Who did you speak about?’
 - b. *Jean a été voté pour.
John has been voted for
‘John was voted for.’
- (4) Danish (Truswell 2008: 135):
 - a. Hvem har Peter snakket med?
who has Peter talked with
‘Who has Peter talked with?’

		P-stranding by LDD	
		yes	no
P-stranding by passive	yes	English, Norwegian	
	no	Icelandic, Swedish	French, other Romance languages

Table 1.1: The typology of preposition stranding (after Alsina 2009: 47)

- b. *Han blev grinet af.
he was laughed at
 ‘He was laughed at.’

However, the general consensus in the literature is that there are no languages like Danish but with the judgements reversed. That is, there is no language in which preposition stranding in the passive is possible, but stranding in a long-distance dependency is not. This leads to an interesting typological gap, which we can represent graphically, as in Table 1.1.

Secondly, this construction has proven surprisingly recalcitrant to analysis. Various attempts have been made, in different theoretical frameworks, to explain the possibility of, and constraints on, the prepositional passive, which I survey in Chapter 3. However, none of these has ultimately proved successful, for the reasons I outline in that chapter, and so a formal analysis is still wanting. This is especially true in Lexical Functional Grammar (LFG), the syntactic framework assumed in this thesis (for more on which, see the following chapter), where two formally quite different analyses have been proposed. In this thesis, I argue that neither is correct, although the

intuitions behind each are well-founded.

Thirdly, the prepositional passive offers an informative piece of evidence in favour of what Needham & Toivonen (2011) have called *derived arguments*, an intermediate category in the argument-adjunct dichotomy which is fundamental to most modern theories of syntax/semantics. The passive is an argument alternation: the internal argument of a transitive verb appears with the grammatical function, subject, usually reserved for the external argument. However, the prepositional passive allows subjects which, in the corresponding active sentence, are adjuncts under most traditional analyses:

- (5) a. Kim slept in the bed.
b. The bed has been slept in (by Kim).

The standard analysis of (5a) is that it consists of an intransitive verb, *sleep*, which is modified by a locative *in*-phrase, an adjunct. However, as we see in (5b), the object of the preposition can be promoted to subject in the passive, which is a privilege supposedly reserved for arguments. Nevertheless, there are other putative prepositional adjuncts which cannot participate in the passive, including other locatives:

- (6) a. The Joneses left after dinner.
b. *Dinner was left after (by the Joneses).
(7) a. Lincoln died in this theatre.
b. *This theatre was died in (by Lincoln).

I argue that this is evidence for the fact that the *in*-phrase in (5) is in fact a derived argument. These are arguments which do not constitute part of the verb's core selectional restrictions, but which can be optionally added to certain classes of verb. In this case, the verb *sleep* permits an optional

locative argument to be added. Since it is an argument, it is available to participate in the passive alternation. Adjuncts continue to be barred, even if they play the same semantic role as a derived argument, e.g. the locative in (7) as compared with the locative in (5).

1.2 Terminology

One thing we might wonder regarding the P-passive is what we are to make of the terminological vacillation noted above. What is the difference, if any, between the terms ‘prepositional passive’ and ‘pseudopassive’? I presume that the name ‘pseudopassive’ comes from two related facts about the construction that make it seem somehow defective in comparison with a canonical passive: firstly, the fact that the subject of this construction corresponds to the object of a preposition in the active, as opposed to the object of a verb; secondly, that this construction exhibits the apparent argument-adjunct permeability just discussed. However, I do not believe that these facts are as probative as they may seem. As we have just observed, the confusion over arguments and adjuncts can be attributed to an incorrect description of the prepositional phrases in question, rather than a different interpretation of the passive alternation. And the fact that it is the object of a preposition which is promoted rather than the object of the main verb is explained by special properties of the syntax-semantics interface, which I lay out in Chapters 6–7.

Beyond these two exceptions, the prepositional passive behaves exactly like the canonical passive, and is subject to the same constraints, such as

the affectedness condition (see Chapter 5). Given this basic similarity of the construction to the canonical passive, I do not believe that the P-passive is defective or deviant in any important respect, and so I prefer the term ‘prepositional passive’ over ‘pseudopassive’. This being said, however, for the sake of brevity I will often simply refer to the ‘P-passive’, which conveniently also elides any such terminological dispute.

1.3 Categorising the prepositional passive

Kim (2009: 3) gives a useful classification of the types of verbs which participate in the P-passive, based on their selectional criteria:

- (8) a. Intransitive P-verb:
They often **speak of** King’s Canterbury.
- b. Particle P-verb:
They **looked up to** the professor.
- c. Transitive P-verb:
The students **paid attention to** the teacher.

This divides P-verbs, or verbs which take prepositional arguments, into those which select just a PP argument, those which select a particle plus a PP, and those which select a direct object and a PP. This is a useful classificatory system, but there is a crucial distinction which it does not touch on, and which will be fundamental in the following analysis. This is between what I call the semantic prepositional passive (SPP) and the idiosyncratic prepositional passive (IPP). In the SPP, the preposition still contributes its usual meaning; in (9), for example, the bed has been slept *in*, and not *on*, *under*, or *near*, etc.; while in (10), *Julian* has been spoken

to, and not *about*, or *through*, etc.:

- (9) The bed has been slept in.
- (10) Julian was spoken to.

This contrasts with the IPP, where the preposition is idiosyncratically selected by the verb, and in fact contributes no meaning of its own. There is nothing inherently locational, for example, about being relied *on*, nor anything inherently instrumental or comitative about being dealt *with*:

- (11) Peter can be relied on.
- (12) The problem has been dealt with.

What is more, there are no meaningful contrasts possible with the prepositions in (11–12):

- (13) * Peter can be relied off/to/with/onto/in/from/about.
- (14) * The problem has been dealt off/to/on/onto/in/from/about.

In fact, the verbs involved in the IPP *always* idiosyncratically select their prepositions, in the active just as in the passive, and they are fundamentally different from the verbs involved in the SPP—for example, they are intrinsically binary predicates, unlike the verbs involved in the SPP, which can often be interpreted as unary predicates (*sleep*, *speak*, etc.). These verbs therefore constitute a class apart, which I call idiosyncratic prepositional verbs (IPVs). I will present an analysis of their active forms alongside their P-passives in Chapter 7.

Finally, there is also considerable lexical variation which cross-cuts the divisions just outlined (Huddleston & Pullum 2002; Kim 2009: 3–4):

- (15) a. Jones was spoken to.

- b. * Paris was gone to.
- (16) a. Fred could be counted on.
b. * Both capital and interest were consisted of (by the repayments).
- (17) a. The neighbour's noise was put up with.
b. * My sister wasn't gotten along with.
- (18) a. Our goal was lost sight of.
b. * The secretary was lost patience with.
c. * His motives were cast doubt on.

Some of this variation can be accounted for by general principles, and some will simply be down to lexical idiosyncrasy. The analysis presented in Chapters 4–8 will attempt to explain this behaviour.

1.4 A note on particle verbs

The prepositional passive is superficially similar to the passive of particle verbs such as (19–20):

- (19) There was a clatter as the phone was put down. (BNC)
(20) In the valley below the power station was lit up like a tangle of pearls. (BNC)

However, these two classes are not to be confused.² There is a crucial difference between prepositional verbs and particle verbs in that the former, but not the latter, always involve a PP constituent.³ Whatever precise analysis of particle verbs one adopts (see Svenonius 1994: Ch3 and Toivonen 2003

²Although of course, as we saw above, there are prepositional verbs which also sub-categorise for a particle.

³Toivonen (2003) argues that the English verb-particle construction *does* involve a PP, but only when the particle follows the direct object (so the PP is objectless).

for some discussion of the various theories), there are certain syntactic facts that set them apart from verbs with genuine prepositional complements.

Firstly, the preposition+object complex following prepositional verbs is a constituent (a PP), and thus can act as a syntactic unit, while the particle+NP string in particle verb constructions is not (and cannot). A number of constituency tests bear this out:

- (21) Topicalisation:
- a. But our Mighty God changes not... / [On Him] we can rely.
(<http://faithpoetry.com/faith9/godchangesnot.shtml>)
 - b. * [Up Susie] we called.
- (22) Coordination:
- a. For accurate detection and interception of hostile warheads, the system would rely [[on satellites] and [on ground-based radar]]. (COCA)
 - b. * Annabeth picked [[out the flowers] and [out the decorations]].
- (23) Clefting:
- a. It was [for Dr. Breeland] that Zoe worked.
 - b. * It was [on the lights] that Wade turned.

What is more, particles are relatively mobile (in English), and can appear either before or after the object of the particle verb; this is not true of the the PP complements of prepositional verbs, which must appear in the order P+NP:

- (24) a. Beowulf pulled off Grendel's arm.
b. Beowulf pulled Grendel's arm off.
- (25) a. Our hero dealt with the monster.
b. * Our hero dealt the monster with.

For these reasons, I believe we are justified in treating the prepositional passive as a separate phenomenon from the passive of particle verbs, and in

what follows we will not consider the latter.

1.5 The present work

Although the prepositional passive is present in several languages, the focus of this thesis will be on English. This is partly because it is better studied than the other languages implicated, and partly because it is the language that the author is most familiar with. I believe, however, that the fundamentals of my analysis should carry over to the other cases, *mutatis mutandis*.

The present work is organised into nine parts. After this initial chapter, Chapter 2 introduces the theoretical frameworks within which the analysis will be couched, Lexical Functional Grammar and Glue Semantics. Chapter 3 looks at previous analyses of the P-passive and asks how well they account for the phenomenon. It will be shown that they are either formally untenable or lacking in empirical coverage. With this in mind, Chapters 6–8 present my own analysis of the prepositional passive. Before this, though, Chapters 4–5 lay the theoretical foundations by introducing two key aspects of the analysis: a theory of prepositions in general, and a theory of the passive. Chapter 6 builds on these foundations to present a formal analysis of the syntax and semantics of the semantic prepositional passive (SPP). Chapter 7 deals with idiosyncratic prepositional verbs (IPVs), in both the active and the passive, and Chapter 8 looks at a problematic set of data regarding transitive P-verbs. Finally, Chapter 9 concludes and suggests directions for further research.

Chapter 2

Theoretical Framework

This chapter gives a basic introduction to both Lexical Functional Grammar (LFG; Kaplan & Bresnan 1982; Bresnan 2001; Bresnan et al. forthcoming; Dalrymple 2001; Dalrymple et al. forthcoming; Falk 2001; Asudeh & Toivonen 2009) and Glue Semantics (Glue; Dalrymple 1999, 2001; Asudeh 2005, 2012), which I will be using in my analysis of the syntax and semantics of the P-passive.

LFG is a theory of syntax which grew out of the collaboration of the linguist Joan Bresnan and the computer scientist Ron Kaplan. It stemmed from a dissatisfaction with both the psychological plausibility and computational tractability of then-current theories in mainstream, Chomskyan, generative grammar. Although the reasons for this dissatisfaction are well worth exploring, reasons of space prevent me from doing so here (the interested reader should consult Dalrymple et al. 1995a on the history of LFG). Instead, I will begin in Section 2.1.1 with an overview of the lexical-functional approach taken in LFG. Sections 2.1.2–2.1.5 will then explain the

main points of the theory in more detail.

Glue Semantics is a theory of formal semantics and the syntax-semantics interface that is frequently used with LFG. In contrast to common approaches in the generative vein (e.g. Heim & Kratzer 1998) which make use of a hierarchical syntactic tree structure to determine the order of combination, Glue is a *deductive* approach to meaning assembly, where the order of composition is based on the unordered information given in LFG's functional structures (to be discussed in Section 2.1.2). Section 2.2.1 introduces the motivations for this theory, while Sections 2.2.2–2.2.3 will discuss the formal details.

2.1 Lexical Functional Grammar

2.1.1 Overview

Unlike transformational theories in the Chomskyan tradition (originating in e.g. Chomsky 1955, 1957, 1965), LFG rejects the idea of a derivational approach to syntax in favour of a *parallel architecture*. There are still multiple formal objects, but they are assumed to exist simultaneously, as mutually constraining parallel structures, rather than as separate steps in a derivational process.

Two key structures in this architecture are called *c(onstituent)-structure* and *f(unctional)-structure*. The first is a phrase structure tree, while the second is a radically different formal object, namely an attribute-value matrix. LFG departs from Chomskyan approaches in seeing the locus of cross-

linguistic similarity not as c-structure but as f-structure, taking traditional grammatical terms such as subject and object not as derivable from constituent structure, but rather as theoretical primitives. This means that no constituent structure is privileged as underlying or ‘deep’ in any sense: surface word orders are purely a matter of language-specific phrase structure rules.

The way LFG formalises the connection between c- and f-structure is via a function ϕ , which generates f-structures from c-structures and the lexical entries associated with the leaves of the c-structure trees. The lexicon is thus central to LFG, and lexical entries are richly endowed with functional information.

The above characterises (much of) the purely syntactic component of LFG. When we bring semantics in to the picture, we introduce a new level of structure, *s(emantic)-structure*, related to f-structure by the correspondence function σ . This provides the meaning resources used by the theory of Glue Semantics which will be the focus of Section 2.2.

We now examine each of these components in more detail.

2.1.2 F-structure

F-structures can be thought of formally as functions from their attributes (also called features) to their values, or as sets of pairs, where the first member of the pair is the attribute and the second its value (Dalrymple 2001: 30). They are most commonly represented as matrices, as exemplified by the schematic f-structure in (26) (Dalrymple’s (2001:30) ex. (60)):

$$(26) \begin{bmatrix} \text{ATTRIBUTE1} & \text{VALUE1} \\ \text{ATTRIBUTE2} & \text{VALUE2} \end{bmatrix}$$

The values of f-structure attributes can themselves be f-structures, or sets of f-structures, allowing for complex nested structures. This is demonstrated below, where the value of ATTRIBUTE2 is a further f-structure, and the value of ATTRIBUTE5 is a set of two f-structures:

$$(27) \begin{bmatrix} \text{ATTRIBUTE1} & \text{VALUE1} \\ \text{ATTRIBUTE2} & \begin{bmatrix} \text{ATTRIBUTE3} & \text{VALUE3} \\ \text{ATTRIBUTE4} & \text{VALUE4} \end{bmatrix} \\ \text{ATTRIBUTE5} & \left\{ \begin{bmatrix} \text{ATTRIBUTE6} & \text{VALUE6} \\ \text{ATTRIBUTE7} & \text{VALUE7} \end{bmatrix}, \begin{bmatrix} \text{ATTRIBUTE8} & \text{VALUE8} \end{bmatrix} \right\} \end{bmatrix}$$

What is more, f-structure values can be shared when that value is itself an f-structure; that is, a single f-structure can be the value of multiple attributes. This is conventionally illustrated by drawing a line from one occurrence to another, as below:

$$(28) \begin{bmatrix} \text{ATTRIBUTE1} & \begin{bmatrix} \text{A1} & \text{v1} \\ \text{A2} & \text{v2} \end{bmatrix} \\ \text{ATTRIBUTE2} & \text{_____} \end{bmatrix}$$

Some of the most important attributes used in LFG are the *grammatical functions* (GFs). These are abstract syntactic categories used to characterise the relations between different elements of a sentence, and many of them

LFG abbreviation	Grammatical function
SUBJ	Subject
OBJ	Object
OBJ _θ	Object (indexed by thematic role)
COMP	Closed sentential complement
XCOMP	Open sentential complement
OBL _θ	Oblique (indexed by thematic role)
ADJ	Adjunct
XADJ	External (open) adjunct

Table 2.1: Grammatical functions in LFG

are familiar from traditional grammars. They are taken to be theoretical primitives, and to constitute a universal set. Thus, while not all languages use all of them, they are nonetheless made available by Universal Grammar (UG). The complete list is given in Table 2.1 (taken from Lipps 2011: 44; see Dalrymple 2001: 8–28 for further discussion). It is conventional to define the abbreviation GF as a meta-category which represents a disjunction over all the possible attributes listed in Table 2.1, thereby allowing for easy reference to a non-specific attribute:

$$(29) \quad \text{GF} \equiv \{\text{SUBJ} \mid \text{OBJ} \mid \text{OBJ}_\theta \mid \text{COMP} \mid \text{XCOMP} \mid \text{OBL}_\theta \mid \text{ADJ} \mid \text{XADJ}\}$$

Other attributes (such as NUMBER or PERSON) are proposed on an empirical basis, but once again these are supposed to form a closed and finite set, which is made available to individual languages by UG.

Values of f-structure attributes can, as we have seen, be f-structures, or sets thereof. They can also be what are called *atomic* values (Dalrymple 2001: 31), such as SG or PL for singular and plural (potential values of NUM, for example). They can also be rather more complex animals, called

semantic forms. These are the values of PRED features, to which we now turn.

The feature PRED is used in traditional LFG for two things: to capture the semantic content associated with a particular f-structure, and to describe subcategorisation information. The value of a PRED feature, as we have said, is called a semantic form, and is enclosed in single quotes, as in (30):

(30) [PRED ‘yawn(SUBJ)’]

The subcategorisation information is described by the GFs appearing after the name of the PRED value (those appearing inside the angled brackets are thematic, those appearing outside, non-thematic). Example (30) says that *yawn* subcategorises for a (thematic) subject.

The exact role the semantic part of the semantic form plays is an open debate (see e.g. Andrews 2008 for some discussion), and so I will not dwell on it here.

On the other hand, the subcategorisation role is crucial in defining the well-formedness constraints of Completeness and Coherence, which state that an f-structure must contain all and only the grammatical functions which are subcategorised for by its PRED value. (This can then be applied recursively to generalise to more complex f-structures—see Kaplan & Bresnan 1982 and Dalrymple 2001: 35–39 for formal definitions and discussion.) However, in what follows, I will not make use of these syntactic versions of Completeness and Coherence. Rather, as we shall see below, I will assume (following ideas in e.g. Dalrymple et al. 1999; Kuhn 2001; Asudeh 2012; Asudeh & Giorgolo 2012) that these constraints can be subsumed under a

resource-sensitive semantic theory. This means that I will write semantic forms without their subcategorisation information, i.e. (31) instead of (30):

$$(31) \quad \left[\text{PRED} \quad \text{'yawn'} \right]$$

One remaining constraint is Consistency, also known as the Uniqueness Condition (again, see Kaplan & Bresnan 1982 and Dalrymple 2001: 39 for a formal definition and discussion). This constraint says that a given f-structural attribute may have at most one value. This rules out agreement conflicts such as (32):

$$(32) \quad * \text{The students dances.}$$

The f-structure for this sentence would have to satisfy mutually incompatible constraints: *the students* is a plural phrase, but the verb *dances* requires that its subject be singular:

$$(33) \quad \left[\begin{array}{ll} \text{PRED} & \text{'dances'} \\ \text{SUBJ} & \left[\begin{array}{ll} \text{PRED} & \text{'students'} \\ \text{NUM} & \text{SG/PL} \end{array} \right] \end{array} \right]$$

Consistency rules out such an f-structure, explaining the ungrammaticality of (32). This constraint cannot be so easily taken over by semantics, and so it will remain in what follows.

Before concluding our discussion of f-structures, we must observe one notational point: just as it is customary to abbreviate elements of a syntactic tree that we are not interested in by using a triangle, so too can we abbreviate elements of f-structure whose analysis does not concern us by using double quotation marks. This is exemplified in (34), where the f-structural analysis of *really rather tasty* is obscured in the f-structure for

Kevin devoured the really rather tasty sandwich:

$$(34) \left[\begin{array}{ll} \text{PRED} & \text{'devour'} \\ \text{SUBJ} & \left[\text{PRED} \text{ 'Kevin'} \right] \\ \text{OBJ} & \left[\begin{array}{ll} \text{PRED} & \text{'sandwich'} \\ \text{SPEC} & \left[\text{PRED} \text{ 'the'} \right] \\ \text{ADJ} & \left\{ \left[\text{"really rather tasty"} \right] \right\} \end{array} \right] \\ \text{TENSE} & \text{PAST} \end{array} \right]$$

There is more to be said about the properties of f-structures, but the foregoing will suffice for our purposes (and specific details will be introduced where they are needed in what follows). Now let us turn to the other main level of representation in LFG, constituent-structure.

2.1.3 C-structure

Most modern syntactic theories make use of ‘trees’ in one way or another. This is because they are an excellent way of describing the linguistic fact of *constituency*. I will not go into the details of this notion here, assuming it to be well established in the linguistics literature (see Dalrymple 2001: 45ff. for overview and discussion). The general idea is that certain contiguous sets of words in some sense operate together as units, or constituents, and that each node of a syntactic tree represents one of these constituents.

In addition to this function, syntactic trees also categorise constituents. Partly, this consists in giving labels to individual words: some are familiar from the traditional parts of speech such as noun (N), verb (V), adjective (Adj), etc.; others are less familiar—the so-called functional categories, such

as inflection (I), determiner (D) and complementiser (C). But in addition to classifying individual words, we also give labels to larger constituents, structures which are projected from the head word. Examples include noun phrases (NP), verb phrases (VP), etc., as well as the intermediate ‘bar-level’ constituents (N', V', etc.) which are iterable. At its core, LFG’s c-structure follows X-bar theory (first explicitly formalised in Jackendoff 1977). One important point of departure is that, unlike e.g. Chomsky (1986a), LFG takes all c-structure positions to be optional, their presence or absence determined by f-structural considerations, which means that if a node is not required by the f-structure, it will not be present in the c-structure. This principle is known as Economy of Expression.¹

The c-structures of a language are described by *phrase structure rules* (PSRs), of which some simplified examples are given in (35):

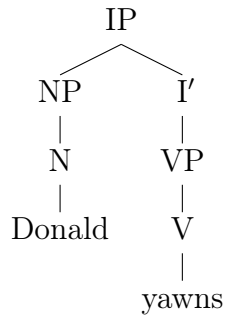
- (35) a. IP → NP I'
 b. NP → N
 c. I' → VP
 d. VP → V

These mean that an IP consists of an NP and an I', that an NP consists of an N, etc. Originally conceived of as rewrite rules, we can instead view these as *node admissibility conditions* (McCawley 1968), describing the set of trees which our theory admits of. Each language will have different PSRs, accounting for the different word orders and constituency facts observed cross-linguistically.

¹For general discussion, see Dalrymple (2001: 60), Bresnan (2001) and Dalrymple et al. (2013). Kroeger (1993) and King (1995) present some of the original motivation. Snijders (2012) expresses some worries about the generality of the principle.

The PSRs given in (35), along with some appropriate lexical entries, will allow us to generate the tree in (36), for example:

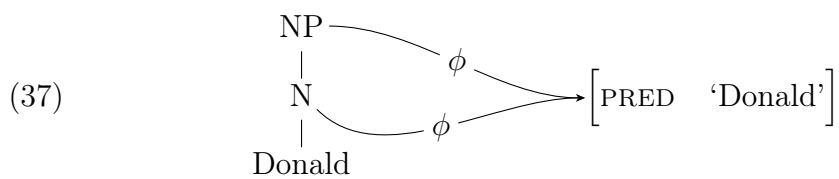
(36) *Donald yawns.*



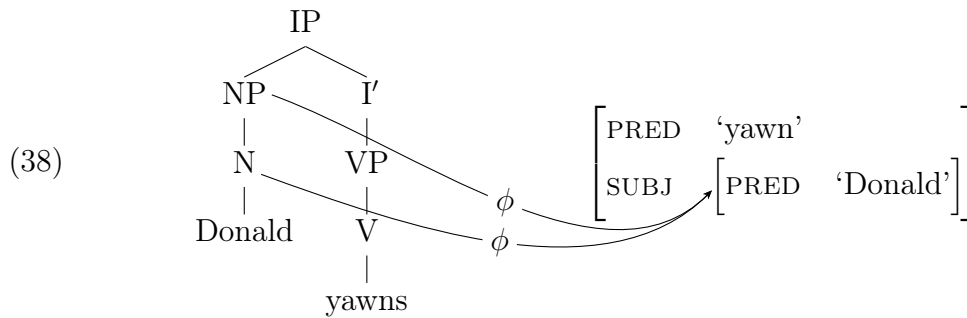
The question now arises as to how c-structure and f-structure are related.

2.1.4 The Correspondence Architecture

LFG provides a *correspondence function* called ϕ which maps c-structure nodes to f-structures (since it is a function, a particular c-structure node will only map to one f-structure, although many nodes may map to the same f-structure). For example, take the NP from (36): both its nodes map to the f-structure shown in (37).



They also both map to this f-structure when it is embedded in the larger f-structure of the whole sentence, as in (38).

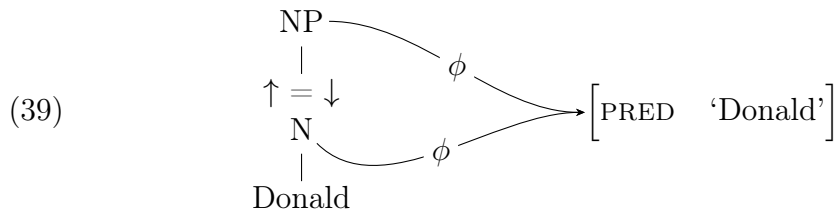


Two questions naturally arise. How do we encode the fact that each of the nodes in the NP maps to the same f-structure? And how do we specify which f-structure it is when it is embedded in a more complex f-structure? In order to answer these questions, we need a little formal apparatus.

Firstly we define some variables. Call the c-structure node we are interested in $*$, and its mother node $\hat{*}$ (after Butt et al. 1997). Now, the result of applying ϕ to this node can be represented in several ways, such as $\phi(*)$ or, which is more common in the LFG literature, by using a subscript, $*_{\phi}$. Since we will be referring to these expressions frequently, we give two shorthand ways of referring to $*_{\phi}$ and $\hat{*}_{\phi}$, namely the metavariables \downarrow and \uparrow respectively. With this technical apparatus in hand, we can begin to annotate our c-structures to say things about the f-structure built from them. We do this by writing expressions in a regular language above each node in the tree.²

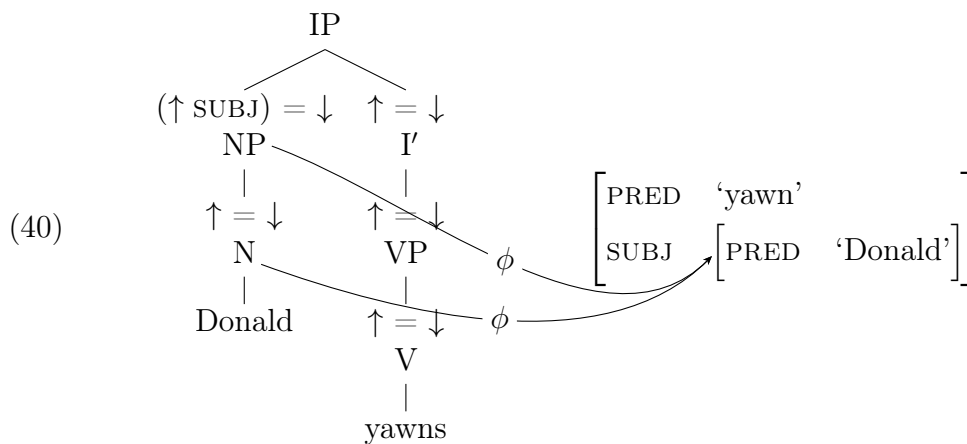
The simplest thing we can state is identity. ' $\uparrow = \downarrow$ ' says that my mother's f-structure is identical to mine. This is exactly what we need for (37), for example:

²Modern usage tends to put the annotations under the nodes, but this completely undoes the intended iconicity of the arrows (since they no longer point to the right nodes). I thus freely admit that I am going against the grain in annotating above c-structure nodes, but I think readability is a good reason to do so.



This will ensure that whatever f-structure is contributed by *Donald* (to which we will turn in Section 2.1.5) is passed up the tree.

Although LFG claims that grammatical functions are theoretical primitives and not reducible to c-structure positions, it is true that in some languages (called configurational), structural position is the only or at least the clearest signal of a constituent's grammatical function. English is such a language: beyond limited case marking, the clearest indication of subject-hood, for example, is linear order with respect to the verb (*viz.*, preceding it). Indeed, this seems to be the answer to the question we posed about (38): the reason the NP nodes all correspond to the f-structure they do, i.e. the SUBJ, is because they are in the subject position in the c-structure. We can capture this with the annotation $(\uparrow \text{SUBJ}) = \downarrow$ on the appropriate node, as demonstrated below:



The expression $(\uparrow \text{SUBJ}) = \downarrow$ says this: find my mother’s f-structure (\uparrow); now find the SUBJ feature in that f-structure ($(\uparrow \text{SUBJ})$); the value of that feature is my f-structure ($= \downarrow$).

C-structural annotations like this can be written on PSRs. Thus we can amend our toy grammar from (35) as follows:

- (41) a. IP \rightarrow $\begin{array}{c} (\uparrow \text{SUBJ}) = \downarrow \\ \text{NP} \end{array}$ $\uparrow = \downarrow$
 I'
- b. NP \rightarrow $\begin{array}{c} \uparrow = \downarrow \\ \text{N} \end{array}$
- c. I' \rightarrow $\begin{array}{c} \uparrow = \downarrow \\ \text{VP} \end{array}$
- d. VP \rightarrow $\begin{array}{c} \uparrow = \downarrow \\ \text{V} \end{array}$

Now, given the right lexical entries, we can generate all sorts of intransitive sentences.

Obviously this basic framework can be expanded to other cases, both in English (e.g. using the annotation $(\uparrow \text{OBJ}) = \downarrow$ on a DP sister node of V to mark direct objects) and in other languages. What is more, now we have a principled way of projecting one structure from another, we can expand our inventory of structures (see Asudeh 2012: 49–54 for a good discussion and historical overview of the development of this ‘Correspondence Architecture’). One such structure, important for our purposes, is s(ematic)-structure, to which we will turn in Section 2.1.7. For now, though, let us discuss the role of the lexicon in LFG.

2.1.5 The lexicon

LFG, as the name suggests, is a theory for which the lexicon plays a central role. It is conceived of as a highly structured and information-rich object (rather than simply a repository for exceptions to otherwise general rules, as the lexicon was conceived of in early transformational work). Formally, the lexicon for a language in LFG consists of a set of 3-tuples $\langle W, C, F \rangle$ containing a word form W , a lexical category C , and a set of functional descriptions F . Let us consider each of these.

The word form is the form of the word as it actually appears on a c-structure leaf, as opposed to a ‘dictionary form’ or any other underlying representation. LFG adheres to the Lexical Integrity Principle (see Dalrymple 2001: 83–85, Bresnan 2001: Ch6, and references cited therein), which holds that “no syntactic rule can refer to elements of morphological structure” (Lapointe 1980: 8). This means that morphology is invisible to syntax; while the lexicon can certainly be generated by morphological principles, the ‘finished product’, so to speak, no longer has access to those principles.

The lexical category is just the ‘part of speech’ (such as N, V, P, Adj, etc.) which determines where the lexical item can appear in a c-structure.

The functional descriptions are the functional contributions of a lexical item, corresponding to the functional annotations on phrase structure rules (indeed, formally, lexical items are equivalent to annotated phrase structure rules, where the words are terminal expansions of their lexical categories).

An example will help clarify. An initial lexical entry for *Donald* is given in (42):

$$(42) \quad \textit{Donald} \quad \text{N} \quad (\uparrow \text{PRED}) = \text{'Donald'}$$

The contribution made by (42) is, as we have mentioned, threefold. Firstly, it says the word form of this lexical item is '*Donald*'. Secondly, it identifies it as being of category N(oun). Thirdly, it states that the f-structure projected from *Donald*'s c-structure mother (i.e. the lexical category N) has 'Donald' as the value of its PRED feature. Extra information can be added regarding e.g. person and number, as in (43):

$$(43) \quad \textit{Donald} \quad \text{N} \quad (\uparrow \text{PRED}) = \text{'Donald'}$$

$$\quad \quad \quad (\uparrow \text{NUM}) = \text{SG}$$

$$\quad \quad \quad (\uparrow \text{PERS}) = 3$$

This, coupled with the lexical entry for *yawns* in (44) and the PSRs in (41) will generate the correct f-structure for *Donald yawns*, given in (45).

$$(44) \quad \textit{yawns} \quad \text{V} \quad (\uparrow \text{PRED}) = \text{'yawn'}$$

$$\quad \quad \quad (\uparrow \text{TENSE}) = \text{PRESENT}$$

$$\quad \quad \quad (\uparrow \text{SUBJ NUM}) = \text{SG}$$

$$\quad \quad \quad (\uparrow \text{SUBJ PERS}) = 3$$

$$(45) \quad \left[\begin{array}{ll} \text{PRED} & \text{'yawn'} \\ \text{SUBJ} & \left[\begin{array}{ll} \text{PRED} & \text{'Donald'} \\ \text{NUM} & \text{SG} \\ \text{PERS} & 3 \end{array} \right] \\ \text{TENSE} & \text{PRESENT} \end{array} \right]$$

Incidentally, the lexical entry in (44) exemplifies the use of a longer regular expression in the functional descriptions: ($\uparrow \text{SUBJ NUM}$) refers to the value of my mother's f-structure's SUBJ's NUM feature, and ($\uparrow \text{SUBJ PERS}$) to the value of my mother's f-structure's SUBJ's PERS feature.

2.1.6 Templates

Templates (Dalrymple et al. 2004; Crouch et al. 2012; Asudeh et al. 2013) are a shorthand way of abbreviating functional descriptions. Since they are merely abbreviations, a grammar with templates is extensionally equivalent to one without, although the grammar with them will potentially be able to capture generalisations which the one without cannot. An example of a template is given in (46):

$$(46) \quad 3SG = \\ \quad \quad (\uparrow \text{SUBJ NUM}) = \text{SG} \\ \quad \quad (\uparrow \text{SUBJ PERS}) = 3$$

This abbreviates some of the information in the lexical entry for *yawns* given above. The symbol '@' is used to *invoke* or *call* a template, and this can be done wherever functional descriptions can appear, *viz.* in lexical entries or on annotated c-structure rules. When a template is called, it is simply replaced by its contents. Using the 3SG template, we can rewrite the lexical entry for *yawns* as below:

$$(47) \quad \textit{yawns} \quad V \quad (\uparrow \text{PRED}) = \text{'yawns'}$$

$$\quad \quad \quad (\uparrow \text{TENSE}) = \text{PRESENT}$$

$$\quad \quad \quad @3SG$$

This expands, given the definition of 3SG in (46), as (48), which is just the original lexical entry:

$$(48) \quad \textit{yawns} \quad V \quad (\uparrow \text{PRED}) = \text{'yawns'}$$

$$\quad \quad \quad (\uparrow \text{TENSE}) = \text{PRESENT}$$

$$\quad \quad \quad (\uparrow \text{SUBJ NUM}) = \text{SG}$$

$$\quad \quad \quad (\uparrow \text{SUBJ PERS}) = 3$$

2.1.7 S-structure

In traditional LFG, semantic structures are relatively uninteresting affairs. Projected from f-structures by the function σ , they serve as the resources for the glue logic used in meaning assembly (see below). While they may include some independent features (such as the ANTECEDENT feature on pronouns, which links them with their referential antecedent), they are unconnected, and are for the most part represented simply as empty matrices. This state of affairs is exemplified in (49), for the sentence *Chomsky loves endnotes*. (Structures are labelled by prefixing them with a letter; f_σ , as discussed above, is the result of applying σ to f .)

$$(49) \quad f: \begin{bmatrix} \text{PRED} & \text{'love'} \\ \text{SUBJ} & g: \begin{bmatrix} \text{PRED} & \text{'Chomsky'} \end{bmatrix} \\ \text{OBJ} & h: \begin{bmatrix} \text{PRED} & \text{'endnotes'} \end{bmatrix} \end{bmatrix} \begin{array}{l} \xrightarrow{\sigma} f_\sigma: [\quad] \\ \xrightarrow{\sigma} g_\sigma: [\quad] \\ \xrightarrow{\sigma} h_\sigma: [\quad] \end{array}$$

However, following a suggestion by Asudeh & Giorgolo (2012), in what follows I will assume a rather different conception of s-structure. Eliminating argument structure (Butt et al. 1997) from the architecture, we encode information which would have been represented there in a *connected* semantic structure, as in (50), meaning that relations can be stated between arguments of a predicate without having to track back through f-structure.

$$(50) \quad f: \begin{bmatrix} \text{PRED} & \text{'love'} \\ \text{SUBJ} & g: \begin{bmatrix} \text{PRED} & \text{'Chomsky'} \end{bmatrix} \\ \text{OBJ} & h: \begin{bmatrix} \text{PRED} & \text{'endnotes'} \end{bmatrix} \end{bmatrix} \begin{array}{l} \xrightarrow{\sigma} \begin{bmatrix} \text{REL} & \text{love} \\ \text{EVENT} & ev: [\quad] \\ \text{ARG}_1 & g_\sigma: [\quad] \\ \text{ARG}_2 & h_\sigma: [\quad] \end{bmatrix} \\ \xrightarrow{\sigma} f_\sigma: [\quad] \\ \xrightarrow{\sigma} g_\sigma: [\quad] \\ \xrightarrow{\sigma} h_\sigma: [\quad] \end{array}$$

Each verb specifies the mappings between its GFs and its ARGs in its functional descriptions. For example, the following is a partial lexical entry for the relevant (active voice) version of *loves*:

$$(51) \quad \textit{loves} \quad V \quad \begin{array}{l} (\uparrow \text{SUBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1) \\ (\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_2) \end{array}$$

This links the σ -projection of its SUBJ with its ARG₁, and the σ -projection of its OBJ with its ARG₂, as illustrated in (50). In a full version of this theory, these equations will be provided by a version of Lexical Mapping Theory (Bresnan & Kanerva 1989; Bresnan 1990; Butt et al. 1997). See the following section for more on this.

There is some debate on the exact role of the REL feature,³ but for the purposes of this thesis, I will treat it as an unanalysable feature which simply serves to identify the semantic relation in question.

This is all I have to say at present on the architectural facts of semantic structure (see Asudeh & Giorgolo 2012 generally for more details of this proposal, and especially pp. 69–71 on the elimination of argument structure). We turn to the question of how these structures are used in meaning assembly in Section 2.2.

2.1.8 Argument structure

Following the approach suggested by Asudeh & Giorgolo (2012), argument structure and semantic structure are collapsed. Nevertheless, the question

³Recent unpublished work by John Lowe suggests it may be eliminable or that it may be identified in some way with the semantic structure of the verb (as opposed to the whole clause, as is the outer s-structure)—this is in some ways akin to the approach of Asudeh et al. (2013), where the REL feature is associated with a predicate specifying the nature of the clause’s event variable.

of how best to represent the arguments of a verb, and where to draw the line between arguments and adjuncts, is an open one. I mentioned above that a fully developed version of this theory will include an explanation of how Lexical Mapping Theory (LMT) applies to it. Findlay (2014) provides the groundwork for such a theory, which I will follow here. In this version of LMT, the attributes ARG₁–ARG₄ are reserved for the core arguments of a verb, which are involved in mapping theory proper. These are associated with default correspondences with GFs at f-structure, much in the style of some recent work by Kibort (2001, 2007, 2008, 2013a,b). For example, the default mapping of an ARG₂ is to OBJ (e.g. in the active) or to SUBJ (e.g. in the passive)—this is akin to the treatment of Patient-like arguments in standard LMT (Bresnan & Kanerva 1989). The full details of this theory need not concern us here. What will be relevant, though, is the distinction between core and derived arguments. As well as core arguments, which are inherent in their meaning, predicates can take what have been called *derived arguments*. Needham & Toivonen (2011) argue that certain kinds of expressions which have often been traditionally described as adjuncts should be treated as arguments which can optionally be added to various different types of verb. This includes, for example, instrumentals, beneficiaries, and directionals:

(52) Felix wrote the essay **with my pen**.

(53) Anna danced **for Belle**.

(54) Peter ran **to the shops**.

These kinds of arguments are not adjuncts, but nor are they core arguments either, which is taken to account for their often mixed behaviour with

respect to tests for argumenthood (Needham & Toivonen 2011: 408–413). In the approach of Findlay (2014) adopted here, derived arguments are labelled mnemonically at s-structure for uniqueness and distinctness, but do not figure as the value of the ARG attributes, which are reserved for core arguments. The s-structure for *Anna danced for Belle* is therefore as given in (55):

$$(55) \begin{bmatrix} \text{REL} & \text{dance} \\ \text{EVENT} & [\] \\ \text{ARG}_1 & [\] \\ \text{BENEFICIARY} & [\] \end{bmatrix}$$

We will have more to say about derived arguments in Chapter 4.2.3.

2.2 Glue Semantics

We now turn to Glue Semantics. I will begin with a brief exploration of the motivations behind the theory, in Section 2.2.1, before discussing the theory in more detail.

2.2.1 Why Glue?

Traditional approaches to semantic composition make use of phrase-structure trees to determine the order of application of terms in the lambda calculus (for such an approach, see, among others, Heim & Kratzer 1998). This means they are reliant on linear order, and so variations in word order (and therefore in phrase-structure configuration), both between languages and within the same language, pose problems (for more on which see Dalrymple et al. 1995b).

The solution which Glue offers to these problems is to not rely on surface constituent order and hierarchical structure, but rather on a more abstract level of syntactic representation, namely, LFG’s f-structures. Glue does not make reference to f-structure directly, however. Instead, it uses semantic structure as an intermediate “scaffolding”. These s-structures become the meaning resources used in the linear logic deductions to be discussed in Section 2.2.2.

Glue sees lexical entries as contributing premises, known as *meaning constructors*, to a logical deduction. The question then arises: which logic should we use? Classical/intuitionistic logic is not, it turns out, appropriate for this task. This is because lexical contributions to meaning are not “context-independent assertions that may be used or not in the derivation of the meaning of the sentence depending on the course of the derivation”; rather, they are “*occurrences* of information which are generated and used exactly once” (Dalrymple et al. 1995b: 8; emphasis in original). In classical logic, premises are either true or not true, and they continue to be so, whatever we use them for. What is more, we can choose whether to use premises in a deduction or not, and we can use the same one multiple times. But this is not how natural language works—as Dalrymple (2001: 242) points out, “it would be incorrect to deduce the same meaning for the sentence if words or phrases are added or subtracted”. This claim is discussed in some detail by Asudeh (2012: Ch5), where he argues for what he calls the Resource Sensitivity Hypothesis, namely, that natural languages are resource sensitive in that “elements of combination in grammars cannot be freely *reused* or *discarded*” (Asudeh 2012: 97; emphasis in original). Expressions in natural

language utterances contribute their meaning exactly once, no more and no less; what we need therefore is a logic which is sensitive to this conception of meaning contributions as *resources*. We achieve this with *linear logic*.

2.2.2 Linear logic

We can describe the typology of different logics by reference to *sub-structural* rules. Three important such rules are *Weakening*, *Contraction*, and *Commutativity* (Restall 2000; schematic natural deduction proofs from Asudeh 2012: 97):

1. **Weakening:** Premises can be *freely added*.
2. **Contraction:** Additional occurrences of a premise can be *freely discarded*.
3. **Commutativity:** Premises can be *freely reordered*.

A schematic representation of Weakening is given in (56):

$$(56) \quad \frac{\Gamma \vdash B}{\Gamma, A \vdash B}$$

That is, if we can prove B from the set of premises Γ , we can also prove it from Γ and A (we can freely add A).

Example (57) gives a representation of Contraction:

$$(57) \quad \frac{\Gamma, A, A \vdash B}{\Gamma, A \vdash B}$$

In other words, if we can prove B from Γ and two instances of A , we can also prove it from Γ and a single instance of A (we can freely discard A).

Finally, Commutativity is as in (58):

$$(58) \quad \frac{\Gamma, A, B \vdash C}{\Gamma, B, A \vdash C}$$

If we can prove C from Γ, A , and B in that order, then we can also prove it from Γ, B , and A in *that* order (we can freely reorder our premises).

Classical logic possesses all of these properties, which makes it inappropriate for modelling semantic composition. This is because, as we noted above, semantics is resource sensitive; in other words, we cannot freely add or discard premises, and so we must not include Weakening or Contraction in our logic. If we remove these two rules, while maintaining Commutativity (see Asudeh 2012: 99-100 on the motivation for preserving this rule), we obtain a *resource logic*, whereby logical formulae become dynamic resources which require “strict accounting” (Asudeh 2012: 97). The particular resource logic used in Glue is linear logic (Girard 1987), specifically the *tensor fragment* of linear logic, which is closed under implication, conjunction, and universal quantification (Dalrymple 1999: 25–6).⁴ This includes two main operators: linear implication, \multimap (the linear logic counterpart of classical logic’s material conditional, \rightarrow or \supset), and multiplicative conjunction, \otimes (the counterpart of classical logic’s conjunction, \wedge). We will not have recourse to use multiplicative conjunction in this thesis, so I will focus here on linear implication. The two proof rules associated with this operator are given in (59) and (60) (after Asudeh 2012: 78–9):

⁴More precisely, to quote Asudeh (2012: 78): “The fragment of linear logic that is assumed here is a limited modality-free, multiplicative fragment of intuitionistic linear logic, MILL_l . The logic MILL_l does not have existential quantification or negation. The logic has universal quantification, but it is not fully higher order, since the quantification is strictly limited to universal quantification over t -type atoms of the linear logic (Crouch & van Genabith 2000: 124)”.

(59) **Implication Elimination** (*/modus ponens*):

$$\frac{\begin{array}{c} \vdots \\ A \end{array} \quad \begin{array}{c} \vdots \\ A \multimap B \end{array}}{B} \multimap_{\varepsilon}$$

(60) **Implication Introduction** (*/abstraction/hypothetical reasoning*):

$$\frac{\begin{array}{c} [A]^1 \\ \vdots \\ B \end{array}}{A \multimap B} \multimap_{\mathcal{I},1}$$

Remembering that the premises listed as A and B stand for semantic resources, the rule of Implication Elimination in (59) tells us that if we have a resource $A \multimap B$, it can consume a resource A to produce a resource B (note that the implication resource is also consumed). Implication Introduction, (60), tells us that if we can assume a resource A and produce a resource B , then we can consume B to produce $A \multimap B$, while discharging our assumption of A .

This linear logic is used both to constrain the ways in which meanings can be combined in natural language, without making explicit reference to the content of those meanings, and also to connect the semantic resources to the syntax. Because it is used in this way to ‘hold things together’, we call this the *glue logic*. In order to guarantee the correct combinations of resources, we type our semantic resources using the familiar type system involving e for entities in the universe of discourse, and t for truth values. We can then define complex types from these by combining them. For example, the type of an intransitive verb is $\langle e \rightarrow t \rangle$, a function from type e to type t (it takes an entity, namely the subject, as input, and gives a truth value as

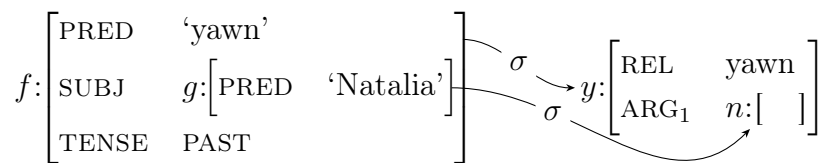


Figure 2.1: Structures and correspondences for *Natalia yawned*

an output).

Let us give a simple example of how this works. Consider the sentence *Natalia yawned*, with the f- and s-structures shown in Figure 2.1. (To simplify, we ignore tense and the event variable for the time being (on which see Section 2.2.4 below).)

Partial lexical entries are given for *Natalia* and *yawned* below, where the second line in each is a meaning constructor:

$$(61) \quad \textit{Natalia} \quad \text{N} \quad (\uparrow \text{PRED}) = \text{'Natalia'}$$

$$\textit{natalia} : \uparrow_{\sigma_e}$$

$$(62) \quad \textit{yawned} \quad \text{N} \quad (\uparrow \text{PRED}) = \text{'yawn'}$$

$$\lambda x.\textit{yawn}(x) : (\uparrow_{\sigma} \text{ARG}_1)_e \multimap \uparrow_{\sigma_t}$$

Meaning constructors are of the form $\mathcal{M} : \mathcal{G}$, where \mathcal{M} is the meaning component, and \mathcal{G} is the glue component; here we will focus on the right-hand side of the meaning constructor, that is, the glue component, only.

These meaning constructors are instantiated relative to a particular syntactic parse, with the metavariables being replaced with the label for the f-structure in question. If we do this with respect to the f-structure in Figure 2.1, we obtain the glue components of the meaning constructors given in (63). For ease of reference, we can give meaning constructors labels; for the meaning constructor contributed by *Natalia*, we write **[Natalia]**, for

example.

$$(63) \quad \begin{array}{l} \mathbf{[Natalia]} \\ g_{\sigma_e} \\ \\ \mathbf{[yawned]} \\ (f_{\sigma} \text{ ARG}_1)_e \multimap f_{\sigma_t} \end{array}$$

Furthermore, if we look at the mappings in Figure 2.1, the value of $(f_{\sigma} \text{ ARG}_1)$ is given by g_{σ} , so we can perform a further substitution on **[yawned]**:

$$(64) \quad \begin{array}{l} \mathbf{[yawned]} \\ g_{\sigma_e} \multimap f_{\sigma_t} \end{array}$$

In practice, it is often useful to name the glue side of a meaning constructor mnemonically, and suppress the σ and type subscripts, as below:⁵

$$(65) \quad \begin{array}{l} \mathbf{[Natalia]} \\ n \\ \\ \mathbf{[yawned]} \\ n \multimap y \end{array}$$

We can now perform the following deduction (on the glue side) for *Natalia yawned*, using the rule of implication elimination. (Since implication elimination is used so commonly, I will omit the rule name from this step in future proofs.)

$$(66) \quad \frac{n \quad n \multimap y}{y} \multimap_{\mathcal{E}}$$

That is, we consume the resources for *Natalia* and *yawned*, and produce the resource corresponding to the whole sentence. Each of the resources is used exactly once, and we only reach a conclusion once all of the resources have

⁵In this thesis, I will generally omit type subscripts, since they are usually inferable. Mnemonic names will be used in coordination with a syntactic parse to make reading proofs easier.

been used up—we stipulate that the final term must be of the sentential type t and not some complex type. This is how semantic resource accounting can subsume the syntactic principles of Coherence and Completeness (as discussed above).⁶ Consider sentences (67–68):

(67) * Wade loves the doctor his job.

(68) * Zoe devours.

Incoherent sentences like (67) will result in *resource surplus*—there is nothing to consume the resource for *his job*, so we have not used up all the resources at the end of the proof. On the other hand, incomplete sentences like (68) will result in *resource deficit*—the meaning constructor for *devours*, like any transitive verb, wants to consume two argument resources; in (68) there is only one resource available, and so once we have used up all available resources, we are left with an implicational type $\langle e \rightarrow t \rangle$, not the sentential type t which we need.

2.2.3 Connecting meaning and glue

The right-hand side of a meaning constructor tells us purely about the assembly procedures we should follow to combine it with other semantic resources, based strictly on principles of linear logic, and informed by the semantic type of each resource. However, it says nothing about the actual meaning of the expressions (indeed, all intransitive verbs will have largely the same glue formula in their meaning constructors as **[yawned]**, above).

⁶One exception is the case of material which does not make a semantic contribution but which is necessary for syntactic reasons, e.g. the expletive pronoun *it* in *it rains*. For further discussion see Dalrymple et al. (1999).

The left-hand side of a meaning constructor gives this information. Any suitable *meaning language* can be used, but it is common to use some form of the lambda calculus, and that is the approach we will follow here. Since we know how linear logic formulae can combine (through the proofs given in (59–60), among other ways), this now raises the question of what happens to the left-hand side of the meaning constructors when they are combined—how do the lambda expressions combine? It turns out that there is an exact mapping between proof rules in constructive logics (such as our linear logic fragment) and operations in the lambda calculus, discovered over several decades during the 20th century, and known as the *Curry-Howard Correspondence* or the *Curry-Howard Isomorphism* (CHI). We will not discuss the formal details here (on which see Crouch & van Genabith 2000), but the fundamental insight of the CHI is that implications in the linear logic correspond to functional types in the lambda calculus. Specifically, implication elimination corresponds to functional application, while implication introduction corresponds to lambda-abstraction. This allows us to flesh out the linear logic proofs in (59–60) with the left-hand meaning terms as well, as in (69–70) (after Asudeh 2012: 79):

(69) **Implication Elimination** (= functional application):

$$\frac{\begin{array}{c} \vdots \\ a : A \end{array} \quad \begin{array}{c} \vdots \\ f : A \multimap B \end{array}}{f(a) : B} \multimap\epsilon$$

(70) **Implication Introduction** (= lambda-abstraction):

$$\frac{\begin{array}{c} [x : A]^1 \\ \vdots \\ f : B \end{array}}{\lambda x.f : A \multimap B} \multimap_{\mathcal{I},1}$$

We are now in a position to give a full proof of the meaning assembly of *Natalia yawned*. Reinstating the meaning side of the meaning constructors from (61–62), we get the following:

(71) **[Natalia]**
natalia : *n*

[yawned]
 $\lambda x.yawn(x) : n \multimap y$

The meaning constructor for **[Natalia]** says “the meaning of the resource *n* is the constant *natalia*”, while the meaning constructor for **[yawned]** says “the meaning of the sentence, *y*, is the result of applying the function $\lambda x.yawn(x)$ to the meaning of *n*”. Now, given the rules in (69–70), we have the following deduction:

$$(72) \quad \frac{\frac{natalia : n \quad \lambda x.yawn(x) : n \multimap y}{\lambda x.yawn(x)(natalia) : y}}{yawn(natalia) : y} \Rightarrow_{\beta}$$

Thus, we have correctly predicted that the meaning of *Natalia yawned*, the semantic resource *y*, is *yawn(natalia)*, a result which follows automatically from combining premises according to the glue logic.

2.2.4 Events

I will be using a Davidsonian-style event semantics for my meaning language (see e.g. Davidson 1967; Parsons 1990). This means that the representation of a sentence like (73) is as in (74):

(73) Ivan kissed Pyotr.

(74) $\exists e[kiss(e, ivan, pyotr) \wedge past(e)]$

The expression in (74) says that there is an event e , which is a kissing event between Ivan and Pyotr, and which is in the past.⁷

The addition of events to our semantics means that our inventory of semantic types must be augmented from the standard e (for entities) and t (for truth values) to include a type for events, which we call ev . We can easily amend the standard formal definition of the inventory of types (after e.g. Heim & Kratzer 1998: 28) to include this information:

(75) **Semantic types:**

- a. e , t , and ev are semantic types.
- b. If σ and τ are semantic types, then $\langle \sigma \rightarrow \tau \rangle$ is a semantic type.
- c. Nothing else is a semantic type.

Note that the type of a standard intransitive verb like *yawn* is now no longer simply $\langle e \rightarrow t \rangle$, but rather $\langle e \rightarrow \langle ev \rightarrow t \rangle \rangle$, incorporating an event

⁷I am simplifying somewhat by using Davidson's original formulation whereby n -place predicates are expanded to $n+1$ -place predicates incorporating an argument position for events. Subsequent work has argued in favour of the need for 'thematic separation', whereby the meaning of (73) would actually be given as in (i):

(i) $\exists e[kiss(e) \wedge agent(e, ivan) \wedge patient(e, pyotr) \wedge past(e)]$

While this is necessary for some situations, it will not prove so for what follows, and so I retain the older formulation for the sake of brevity. For some arguments in favour of thematic separation, see Pietroski (2002: 97–102) and references cited therein.

argument; similarly, the type of a transitive verb is $\langle e \rightarrow \langle e \rightarrow \langle ev \rightarrow t \rangle \rangle$; etc. An example meaning constructor for *yawned* is given below:

$$(76) \quad \lambda x \lambda e. \text{yawn}(e, x) : (\uparrow_{\sigma} \text{ ARG}_1) \multimap (\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$$

In general, the event variable will be existentially closed by a meaning constructor which introduces tense. For simplicity's sake, all of the examples analysed in this thesis are presented in the past tense, and therefore make use of the following meaning constructor, usually introduced by the verb:

$$(77) \quad \lambda P. \exists e [P(e) \wedge \text{past}(e)] : [(\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}] \multimap \uparrow_{\sigma}$$

On the glue side, this consumes a dependency on the clause's event, and returns the clause's resource. On the meaning side, it takes a relation corresponding to the meaning of the verb once it has combined with its non-event arguments, existentially closes the event variable, and specifies that the event is in the past.

In what follows, we abbreviate this meaning constructor, along with the relevant f-structural tense information, in the template PAST:

$$(78) \quad \text{PAST} = \\ (\uparrow \text{ TENSE}) = \text{PAST}$$

$$\lambda P. \exists e [P(e) \wedge \text{past}(e)] : [(\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}] \multimap \uparrow_{\sigma}$$

The new lexical entry for *yawned* is therefore as follows:

$$(79) \quad \text{yawned} \quad \text{V} \quad (\uparrow \text{ PRED}) = \text{'yawn'} \\ \quad \quad \quad \text{@PAST}$$

$$\lambda x \lambda e. \text{yawn}(e, x) : (\uparrow_{\sigma} \text{ ARG}_1) \multimap (\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$$

Reinstating the EVENT attribute at s-structure, we have the structures and correspondences given in Figure 2.2 (p. 42) for *Natalia yawned*. The

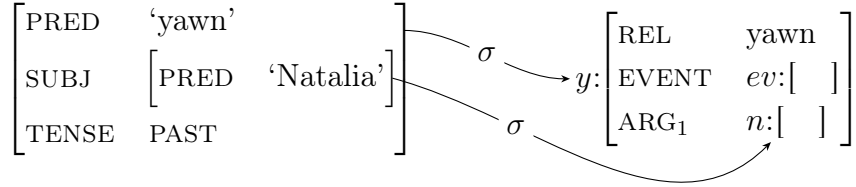


Figure 2.2: Structures and correspondences for *Natalia yawned*

[PAST]	[Natalia]	[yawned]
$\lambda P. \exists e [P(e) \wedge \text{past}(e)] :$	n	$\lambda x \lambda e. \text{yawn}(e, x) :$
$[ev \multimap y] \multimap y$		$n \multimap ev \multimap y$
$\exists e [\text{yawn}(e, \text{natalia}) \wedge \text{past}(e)] : y$		

Figure 2.3: Proof for *Natalia yawned*

modified Glue proof for the sentence, making use of the **[PAST]** meaning constructor, is given in Figure 2.3.

2.2.5 Re-ordering arguments

One useful fact to note is that a function which takes multiple arguments can always be rewritten so that it takes its arguments in a different order. This can be achieved directly in the Glue proof, by providing hypothetical premises and then discharging them in the same order. (80) gives an example for *love* (without an event variable), using arbitrary labels for the glue resources:

$$(80) \quad \frac{\frac{\frac{\lambda y \lambda x.love(x, y) : A \multimap B \multimap C \quad [v : A]^1}{\lambda x.love(x, v) : B \multimap C} \quad [u : B]^2}{love(u, v) : C} \multimap_{\mathcal{I},1}}{\lambda v.love(u, v) : A \multimap C} \multimap_{\mathcal{I},2}}{\lambda u \lambda v.love(u, v) : B \multimap A \multimap C} \Rightarrow_{\alpha}}{\lambda x \lambda y.love(x, y) : B \multimap A \multimap C}$$

The new version of the *love* function produced at the end of the proof combines with its first (lover) argument before its second (loved) one, in contrast to the original, which combines in the opposite order. This can often be useful or even essential in a proof. Given the generality of this procedure, for the remainder of this thesis, I will make use of whichever ordering of arguments is convenient for the situation at hand, leaving the re-ordering implicit.

2.2.6 Conclusion

Glue Semantics offers a flexibility, and therefore a cross-linguistic applicability, absent in many standard approaches to meaning assembly, while at the same time being constrained enough to constitute a rigorous and serious theory of compositionality. The fact that semantic composition proceeds via deductive proof, replete with commutativity, frees compositionality from the restrictions of word order and gives a greater power to the semantics.

This concludes our overview of the theoretical framework of this thesis. In Chapters 4–8, I will make use of this to develop my analysis of the prepositional passive. But first, in the next chapter, we consider previous analyses of the P-passive, both from within and outside of LFG.

Chapter 3

Previous Analyses of the Prepositional Passive

The prepositional passive is superficially related to the broader phenomenon of preposition stranding, and there is therefore a perfectly understandable tendency to treat the two together in the literature. However, given the typological data which were presented in Chapter 1, we must make a distinction between preposition stranding in long-distance dependencies such as *wh*-questions and relative clauses, and preposition stranding in the passive. In what follows, I will refer to the former as *P-stranding* and the latter as the *P-passive*, while reserving the full term *preposition stranding* for the two considered together.

P-stranding, as an example of a long-distance dependency, is one of those phenomena which LFG considers to be best explained in functional terms, rather than by reference to constituent-structure. It is therefore no surprise that the P-passive has received a similar treatment in LFG, in contrast to traditional transformational accounts, which focus on phrase-structure relations. In this chapter, I will first examine the c-structure based

analyses popular in more mainstream generative grammar, before turning to the LFG, f-structure based analyses. In the end, we will see that neither approach has all the answers, and the analysis that is advanced in this thesis will go beyond the syntactic analyses traditionally given for the P-passive, turning to the syntax-semantics interface for an explanation.

3.1 C-structural accounts

In the earliest transformational accounts (e.g. van Riemsdijk 1978; Hornstein & Weinberg 1981), the P-passive is claimed to involve a rule of *Reanalysis* which combines a verb and preposition into a morphologically complex verb, with the basic form given in (81):

$$(81) \text{ Reanalysis: } [_{VP} V [_{PP} P NP]] \rightarrow [_{VP} [V V P] NP]$$

After this reanalysis, the object of the preposition is now the object of the complex verb, which allows the traditional passivisation procedure, which involves moving the NP directly to the right of the verb into the subject position (specifier of IP), to proceed as usual. For all the appeal of the simplicity of this rule, it is unfortunately beset by many issues, which we explore presently.

3.1.1 Constraining the rule

First of all, we note that the Reanalysis rule must be optional, since there are undoubtedly times when the PP behaves as a unit:

- (82) a. Politicians cannot be relied on to lead that debate. (BNC)
 b. This study gives us data on which we can rely. (COCA)
 c. On whom can you rely? (COCA)
 d. If on our Author, we rely [...]. (BNC)¹

Example (82a) shows that *rely on* can take part in the P-passive, and so is a candidate for Reanalysis, but (82b–82c) demonstrate that the preposition can pied-pipe in a relative clause or a *wh*-question, and (82d) shows that the PP can be fronted/topicalised, meaning that the PP is not obligatorily broken up.

There are, however, cases where Reanalysis seems to be obligatory, or at least where the PP does not readily operate as a unit:

- (83) a. The rubbish has been disposed of.
 b. * The rubbish is something of which I have disposed.
 c. * Of what have you disposed?
 d. * Of the evidence, I have disposed.

Thus, our first issue with the Reanalysis hypothesis is that a more rigorous explanation of its scope is needed, i.e. when it must or must not be applied.

For reasons which need not detain us here, Hornstein & Weinberg (1981) suggest that Reanalysis applies not only in the P-passive, but in cases of P-stranding, too. However, this results in the rule given in (81) being too restrictive, since additional material may intervene between the verb and the preposition in cases of P-stranding: consider (84a), which must be re-analysed as (84b) to allow the *wh*-question in (84c):

- (84) a. Alicia [_{VP} [_V gave] [_{NP} the cash] [_{PP} [_P to] [_{NP} Harry]]]
 b. Alicia [_{VP} [_V gave the cash to] [_{NP} Harry]]

¹From the poem *Man the Monarch* by Mary Leapor.

- c. Who did Alicia give the cash to?

With this requirement in mind, Hornstein & Weinberg (1981: 60) phrase their version of the Reanalysis rule in even more general terms:

There is a general syntactic rule of Reanalysis which says that in the domain of VP, a V and any set of contiguous elements to its right can form a complex V. The rule would be roughly of the form [(85)].

$$(85) \quad V \rightarrow V^* \text{ (where } V \text{ c-commands all elements in } V^*)$$

While this solves the problem for P-stranding, it now overgenerates when it comes to P-passives, as Hornstein & Weinberg themselves discuss (p. 65):

- (86) a. Who did Sam talk to Harry about?
 b. * John was talked to Harry about.
- (87) a. What country does Ethiopia rely heavily on for aid?
 b. * The United States is relied heavily on for aid.

3.1.2 Possible semantic words

In order to escape this undesirable consequence, Hornstein & Weinberg (1981) and others have proposed that the passive is subject to a further semantic restriction based on the notion of *possible semantic words*, which are “semantically possible though actually unrealized words” (Hornstein & Weinberg 1981: 65). This concept can be operationalised in different ways: van Riemsdijk (1978: 218ff), for example, suggests that the rule of Reanalysis be restricted to apply only to possible semantic words, while Hornstein & Weinberg (1981) prefer to allow Reanalysis to apply freely, while restricting the application of Predication, which is a further semantic operation

involved in passivisation, to possible semantic words only.² Thus, if we can show that *talked to Harry about* and *relied heavily on* are not semantic words, they will be prevented from participating in passivization, explaining the ungrammaticality of (86b) and (87b) (but, at least under Hornstein & Weinberg’s analysis, still correctly allowing *wh*-movement, since Reanalysis can still apply). In order to do this, we need a clearer picture of what exactly constitutes a semantic word.

Hornstein & Weinberg (1981: 65) give two characteristics of semantic words:

1. The meanings of strings that correspond to semantic words are non-compositional, while those which do not are compositional. Thus, the meanings of expressions like *take advantage of* or *keep tabs on* are not functions of the meanings of their parts, and these are semantic words. On the other hand, the meaning of *talked to Harry about* is clearly related in a systematic way to the meaning of other, similar strings like *talked to Susie about*, and so this does not constitute a semantic word.
2. “Subparts of semantic words are not referential in meaning”; that is, one cannot ask *What was kept on Bill?* if one wants to know whether or not tabs were kept on him, although one could ask *Who did Sam*

²For Hornstein & Weinberg (1981: 65), passivisation is “a cover term which includes two operations: NP Movement and a semantic rule of Predication (see Fiengo 1974; Chomsky 1975)”. Reanalysis allows NP Movement to apply as usual in the P-passive, but the result must be a viable input to Predication, i.e. must be a possible semantic word. Truswell (2008) discusses the general problem more broadly, and compares different candidates for ‘Factor X’ and ‘Factor Y’, where Factor X permits P-stranding and Factor X + Factor Y combined allow the P-passive.

talk to about Bill?, expecting the answer *Harry*.

Baltin (1978) also discusses the relationship between adjectives derived from complex verbal sequences and the notion of semantic word, noting that example (88a) is grammatical, while (88b) is not, since the string *taken advantage of* is a semantic word, but *referred to in 1964* is not.

- (88) a. a taken advantage of saint
 b. * a referred to in 1964 solution

This proposal is not without its problems, however. Above all else, we might wonder how rigorous a definition of ‘semantic word’ we have actually obtained from the above discussion. But quite apart from this overarching concern, there are other more specific complaints. First of all, there are empirical failings relating to idiom chunks (Bresnan 1982: 59):

The verb *kept* is precisely *not* a semantic unit in *Tabs were kept on Jane Fonda*; *pulled* is not a semantic unit in the the idiomatic *Your leg is being pulled*. In what sense is being kept on Jane Fonda a property of tabs, or being pulled a property of someone’s leg (in the idiomatic example)?

That is, although *kept tabs on* could be claimed to be a semantic word in (89a), *kept (on)* in (89b) is only *part* of a larger idiom, and does not make up a semantic unit on its own.

- (89) a. Jane Fonda was kept tabs on.
 b. Tabs were kept on Jane Fonda.

If this is true, then restricting passives to possible semantic words might be expected to rule out sentences such as (89b), when these are in fact perfectly acceptable.

3.1.3 Further formal issues

Even if we were able to save the semantic word constraint, however, that is not the only formal issue facing the Reanalysis theory. Baltin & Postal (1996: 135–141) comment on the lack of “formally adequate formulations of [Reanalysis operations] internal to the frameworks in which they are suggested” (p. 127). That is, while much work has made appeals to informal definitions of Reanalysis, or relied on loose formalisations such as those presented in (81) or (85), it is not clear that there are any formally satisfying definitions. In short, no one has managed to explain what precisely Reanalysis *is*.

Baltin & Postal discuss several attempts to do so (Radford 1981; Baker 1988; Napoli 1993), and show that they all fall short of formal adequacy. For example, if Reanalysis is seen as an incorporation operation, specifically head-to-head movement from P to V, then, under standard assumptions of transformational grammar, it ought to leave the PP structure intact, and leave a trace in the place of the preposition, which would not help explain the behaviour of preposition stranding constructions at all. That is, instead of (81), we would have (90):

$$(90) \quad [_{VP} V [_{PP} P NP]] \rightarrow [_{VP} [_{V} V P] [_{PP} t NP]]$$

But now we must invoke a rule of ‘pruning’ (in the sense of Ross 1966) to remove the extraneous material—and here we run into the problem that there is no formally satisfactory definition of *that* operation in modern syntactic theories. This is in part due to the commitment of Government and Binding theory and its successors to (some form of) the Projection Principle

(Chomsky 1981, 1986b; etc.), which states that heads must project phrases. If we ‘prune’ the relevant trees in such a way as to establish the correct syntactic relations (c-command, etc.), we will end up with non-projecting heads, which is a problem in this kind of theory (see Baltin & Postal 1996: 136–140 for more details).³

3.1.4 Incorrect predictions

As we have seen, there are many formal issues with the Reanalysis hypothesis: deciding where and how it should apply is a difficult challenge (although perhaps not impossible). This is problematic in its own right, but if it makes the correct predictions, one might be tempted to leave the minutiae of the formal implementation for the theorists to puzzle out. Unfortunately, however, the Reanalysis theory actually makes a number of erroneous predictions, which we turn to presently.

On the Reanalysis account, once a ‘complex verb’ has been formed, it should be syntactically indistinguishable from a morphologically simplex one, and the apparent object of the preposition should behave exactly like the object of a verb. This, however, is not what we observe. Baltin & Postal (1996: 129–131) give a number of compelling examples; (91–97) are taken from their discussion.

Firstly, prepositional objects do not behave like regular verbal objects with respect to heavy NP shift (a property first noted by Ross 1967):

³Of course, non-projecting categories are not necessarily a problem in other theories, such as LFG—see Toivonen (2003) for an example of an approach to c-structure which incorporates non-projecting categories.

- (91) a. I discussed ____₁ with Lorenzo [the problems he was having with deliveries]₁.
 b. *I argued with ____₂ about such problems [the drivers' union leader]₂.

Secondly, in gapping constructions like (92), a morphologically simplex verb can be deleted in the second conjunct, whereas the putative [V-P] verb cannot be ((92b) is ungrammatical without the preposition):

- (92) a. Frank called Sandra and Arthur ____ Louise.
 b. Frank talked to Sandra and Arthur ____ *(to) Louise.

The same obtains in comparative ellipsis, as in (93):

- (93) a. Frank called Sandra more often than Arthur did ____ Louise.
 b. Frank talked to Sandra more often than Arthur did ____ *(to) Louise.

Thirdly, the Reanalysis claim is that the preposition is morphologically incorporated into the verb, but in examples (94a–e) (taken from Postal 1986: 283, fn. 14), the prepositions display a high degree of syntactic freedom which argues against this:

- (94) a. The bridge was flown (both) over and under.
 b. Communism was talked, argued, and fought about.
 c. The bridge was flown over and then, but only then, under.
 d. Fascism was fought for by Goebbels and (then) against by De Gaulle.
 e. Fascism was fought for by Goebbels and then, but I assure you, only then, against by De Gaulle.

As Baltin & Postal (1996: 130) point out, for the Reanalysis account to explain examples like (94d), it must claim that [*fought for by Goebbels and then against*] is not only a morphological word, but also a possible semantic

word, which seems highly implausible. But if it isn't, then it is not clear what word *against* could be said to have been incorporated into by Reanalysis, and one might therefore expect, incorrectly, that (94d) should be ruled out.

Fourthly, prepositional objects behave differently from genuine verbal direct objects when it comes to the phenomenon of *subdeletion* (Bresnan 1973, 1977a,b):

- (95) a. Jane read more of these books than Sally read ____ of those books.
b. *Jane read from more of these books than Sally read from ____ of those books.

Crucially, subdeletion from PPs whose objects can be promoted to passive subject (and where Reanalysis must therefore, by hypothesis, be possible) is no better than from those whose objects cannot; specifically, (96c) and (97c) are both ungrammatical, despite the difference in status of the (b) sentences:

- (96) a. Jane talked about many people.
b. Many people were talked about (by Jane).
c. *Jane talked about more of these people than Sally talked about ____ of those people.
- (97) a. Marsha acted up in algebra class.
b. *Algebra classes should not be acted up in.
c. *Marsha acted up in more of those algebra classes than Jane acted up in ____ of these algebra classes.

This gives a sample of the erroneous empirical predictions which the Reanalysis account makes. There are several more empirical problems with this hypothesis, and the reader is directed to Baltin & Postal (1996) for

further discussion and exemplification of the many “expected syntactic consequences of hypothesized ‘reanalysis’ [which] fail to appear” (p. 134).

The Reanalysis account is, as we have now seen, beset by empirical and formal problems (as well as some typological objections I have not discussed: see Maling & Zaenen 1985), and ultimately I see it as best to reject the hypothesis and seek an explanation elsewhere.

3.2 Early work in LFG

The earliest analysis of the P-passive in LFG is by Bresnan (1982) (developing ideas from Bresnan 1972, although this predates LFG as a formal framework). This also makes use of a form of reanalysis, but it does so in a very different way from the approaches discussed above. Instead of an operation on constituent structure which makes no reference to semantic information or grammatical relations, Bresnan employs a *lexical rule*, i.e. one which acts on lexical items. The rule employed by Bresnan (1982: 51) is given in (98):

- (98) **V–P Incorporation:**
 Operation on lexical form: (P OBJ) \mapsto (OBJ)
 Morphological change: V \leftrightarrow [V P]_V

This takes a verb which subcategorises for a preposition P followed by an OBJECT, and maps it to a morphologically complex verb which just takes a direct OBJECT. For example, it will derive (100a) from (99a) (where each lexeme is used in the associated (b) structures):

- (99) a. [speak]_V, ‘SPEAK-OF((SUBJ),(OF OBJ))’
 b. [s We won’t [VP speak [PP of [NP John]] here]]

- (100) a. [[speak]_V [of]_P]_V, ‘SPEAK-OF((SUBJ),(OBJ))’
 b. [s We won’t [VP [speak of]_V [NP John] here]]

Although the effects are similar to the c-structural Reanalysis proposal, the fact that the rule in (98) applies to lexical entries and not c-structure sequences means that many of the objections raised in Section 3.1 cease to apply. For example, it is no longer anomalous that **Jeremy was talked about Brenda to* is ungrammatical, since presumably there is no lexeme ‘TALK-ABOUT-BRENDA-TO’. This concrete appeal to the lexicon also obviates the need for the nebulous notion of ‘semantic word’, avoiding the problems inherent in that.

But this is not to say such a proposal is without its own problems. First of all, we note that it is rather anomalous that the string *We won’t speak of John here* is now ambiguous between (99b) and (100b) in terms of its constituent structure. This recapitulates the problem mentioned above about the optionality or otherwise of the reanalysis rule. Exactly when should it apply? Of course, we might appeal to Economy of Expression and claim that the reanalysed (100b) requires less structure, and so will be the default unless some exigent circumstance dictates that we need the underived structure; such circumstances might include the fronting and pied-piping examples in (82b–d) with which we began our assessment of c-structural Reanalysis. In fact, this flexibility allows a simple explanation for the existence of pairs like (101a–b), since they are just derived from different structures—specifically, those in (102a–b).

- (101) a. It is John that they look on with pride.
 b. It is on John that they look with pride.

- (102) a. [S They [VP [V look on] [NP John] [PP with pride]]]
 b. [S They [VP [V look] [PP on John] [PP with pride]]]

Nevertheless, we still might prefer an explanation which did not introduce this level of indeterminacy and/or redundancy into the grammar.

Secondly, although Bresnan's lexical rule-based approach solves many of the objections in Sections 3.1.1–3.1.3, the same cannot be said for the empirical predictions of Section 3.1.4. The properties discussed there, where genuine verbal objects and supposedly derived verbal objects differ in their behaviour, are properties of grammatical functions, not of phrase structure positions.⁴ Since the lexical rule in (98) makes prepositional verbs' subcategorization frames look like regular transitive verbs', the properties of their OBJs ought to be indistinguishable, and so the contrasts we saw above are still problematic, even for Bresnan's lexicalist account.

A more technical issue with Bresnan's approach from a modern point of view is that the status of lexical rules is far from clear in contemporary

⁴Baltin & Postal (1996: 131, fn. 4) discuss and ultimately reject the suggestion that the heavy NP shift and subdeletion data in (91) and (95–97) merely show that extraction out of the context [V P ____ P NP] is disallowed in English; i.e. that this precisely *is* a question of phrase structure, and not of grammatical functions. They point out that, first of all, the surface configuration given is not adequate, since simply modifying it by, say, inserting an adverb between the two prepositions does nothing to improve the bad sentences:

- (i) *Jane talked to more of these people than Sally talked to ____ (recently) of those people.

What is more, such an attempt to explain the data ultimately amounts to sidestepping the issue. As the authors put it, "What is being considered is the possibility of independent constraints that would preclude what 'reanalysis' treats as 'derived' direct objects from behaving as such". But then the question arises: "By what unlikely circumstances does the grammar of English contain principles that in a wide variety of ways conspire to preclude direct object behaviour for a class of putative direct objects whose direct object status can be independently challenged?" (*ibid.*).

LFG. Although they are still available in the theory, much recent work has attempted to do without them (for example, treating argument alternations like the passive in terms of Lexical Mapping Theory: see e.g. Bresnan & Kanerva 1989; Butt et al. 1997; Kibort 2001).

What is more, much of this body of work extends the principle of *monotonicity* beyond the c-structure to f-structure mapping (as described in Bresnan 2001), into the lexicon itself (see e.g. Kibort 2007; Asudeh & Giorgolo 2012). A monotonic function is one in which information is added, but never removed or changed, and this feature is important in terms of constraining computational complexity. Obviously a rule like the first part of Bresnan's V-P Incorporation rule is not monotonic, since it deletes part of its input:

$$(103) \quad (P \text{ OBJ}) \mapsto (\text{OBJ})$$

Thus, if we take monotonicity to be a desirable property not only of the correspondence functions, but also of any operations within the lexicon, then we cannot look to Bresnan's approach to the prepositional passive for the solution.

All in all, whatever the advantages of Bresnan's approach, it cannot be the full story; once again, there are empirical and formal problems which have no immediate solution.

3.3 The prepositional passive as structure-sharing

More recent work in LFG has adopted a very different approach to the prepositional passive. Lødrup (1991) suggests that the P-passive in Nor-

wegian be analysed as a structure-sharing relation, much like the standard treatment of raising verbs. This idea has been further elaborated on by Alsina (2009), who also applies it to English.

Let us illustrate the proposal with an example: Lødrup (1991: 22–23) provides the f-structure in (105) for the sentence in (104):

argument of the lower one (the XCOMP). Lødrup's claim is that both (107) and (104)/(105) therefore have a non-thematic subject.

There is some empirical motivation for such a move. Lødrup (1991: 126–128) uses the fact that the SUBJECT in (104) is non-thematic to draw a parallel with another non-thematic subject construction in Norwegian: existential (presentational focus) sentences. In both of these constructions, any direct object must be indefinite (Lødrup 1991: 126):

- (108) Barna ble skiftet bleier/*bleiene på.
the.children were changed napkins/the.napkins on
 ~‘The children were changed napkins/the napkins on.’
- (109) a. Det kom en mann/*mannen på veien.
it came a man/the.man on the.road
 ~‘There came a man/the man on the road.’
- b. Det ble sett en bjørn/*bjørnen.
it was seen a bear/the.bear
 ~‘There was seen a bear/the bear.’

Lødrup suggests that we can therefore state this constraint more simply as a rule which applies generally to constructions with non-thematic subjects.

Although this is pleasing as far as it goes, it is not without its shortcomings, as Lødrup himself discusses. The parallelism between the P-passive and the existential construction is far from perfect: for example, an agent phrase is possible in the P-passive, but rather awkward with an existential construction (Lødrup 1991: 126, fn. 7), and direct objects cannot be modified in the former, but can be freely modified in the latter (Taraldsen 1979; Lødrup 1991: 127). And, in fact, there are reasons to expect restrictions on the object of a P-passive independently of the thematic status of the subject. Generally, P-passives of transitives are considered somewhat marginal

(even more so in English than in Norwegian),⁵ and this is surely, as Lødrup mentions in passing, because the OBJ of a verbal predicate is, in general, a more prominent argument, and so a preferable candidate for promotion by passivisation, than the OBJ of an oblique. This means that if the oblique's object has been made the passive subject, the direct verbal object “should not be too prominent when it gives up this privilege” (Lødrup 1991: 128)—and indefiniteness is a good way of achieving this. All in all, it seems to me that this empirical argument for the structure-sharing account is somewhat lacking.

In addition to its paucity of positive empirical support, the structure-sharing hypothesis also seems to make incorrect predictions (I thank Mary Dalrymple, p.c., for bringing this to my attention). In the proposed structure-shared relation, we would expect case identity between the two positions, since the f-structures which are shared must be (token) identical. However, this is not what we observe:

⁵We are discussing genuine transitives here, as opposed to idiom chunks like *take advantage of* or *keep tabs on*, which of course appear with an object unproblematically in the passive (for more on which see Chapter 8). Aside from these idiomatic constructions, English, unlike Norwegian, does not readily allow P-passives with direct objects:

- (i) *The table was put polish on.
- (ii) *Kim was given dessert to.

Despite this, examples do arise in naturally occurring language; Lødrup gives the following from Riddle & Sheintuch (1983):

- (iii) ?Every time I sit down [...] I get dumped confetti on.

This seems marginal to me at best, and I have been unable to find any similar examples in the BNC or COCA. One thing to note about example (iii) is that it involves the auxiliary *get* rather than *be*, and is therefore not strictly speaking an example of the passive *simpliciter*. There are known differences between the *get*-passive and the canonical passive in English (see e.g. Alexiadou 2005), and (iii) might be taken to provide evidence that the restriction on direct objects in the P-passive is one such contrast.

- (110) I rely on him.
 NOM ACC
- (111) a. He is relied on.
 NOM
- b. *Him is relied on.
 ACC

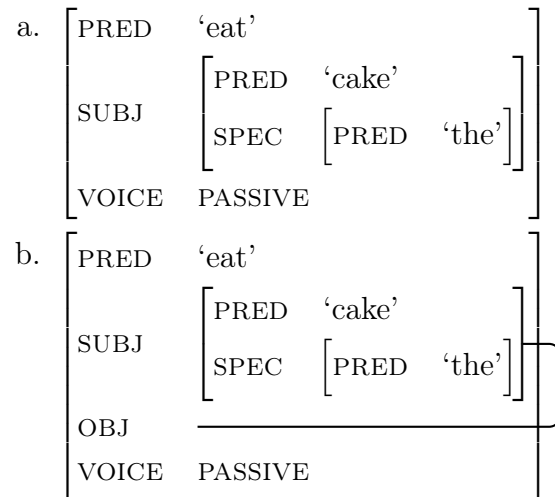
As we can see in (110), the object of the preposition *on* takes ACCusative case, and yet the subject in the P-passive, which, by hypothesis, is structure-shared with the object of the preposition, can only appear in the NOMinative, and is ungrammatical in the accusative—exactly the opposite of what the structure-sharing theory would predict.

In formal terms, construing the P-passive as a structure-sharing relation makes it very different from the regular passive, which is a kind of argument alternation instead. With only questionable empirical motivation, it is not clear to me that such a departure is well motivated. As Alsina (2009: 45) points out, the P-passive “has all the features of a canonical passive construction, except for one”, *viz.* that the passive subject corresponds to a prepositional object in the active, rather than a direct object of the verb. Given its similarities to the canonical passive, it seems sensible to me to treat the P-passive as much like the canonical passive as is possible.

With this in mind, one reason to dislike the structure-sharing approach from an LFG perspective is that it could be seen to go against the non-transformational spirit of the theory. On one interpretation of (105), it looks to be claiming that the subject of a P-passive is still *really* the object of the preposition, but has simply been ‘displaced’ in some way reminiscent of NP Movement. The standard LFG analysis of the passive of a two-place

predicate like *eat* is as in (112a), but given the structure-sharing analysis of the P-passive, one might wonder why it isn't (112b):

(112) *The cake was eaten.*



The structure-sharing account therefore involves a radical divorce between the regular passive and the P-passive, and such a move requires justification. One possible motivation for such a distinction, and one which Alsina (2009: 52) alludes to, is that in the canonical passive *The cake was eaten*, the subject is still a semantic argument of the verb, whereas in a P-passive like *The pen was written with*, it is just an argument of the preposition. But this does not seem satisfactory either: given the theory of derived arguments we are assuming (Needham & Toivonen 2011), the semantic arguments of prepositions involved in the P-passive *are* also (derived) arguments of the main verb (an instrument in the case of *The pen was written with*), and in fact it is precisely this difference which we can appeal to in order to rule out the bad P-passives with adjuncts, such as **The show was left after*. What is more, with idiosyncratic prepositional verbs like *deal with*, or *rely on*, the subject of the P-passive is emphatically *not* an argument of the preposition,

which is semantically inert in these cases.

This point highlights a general problem with the reasoning appealed to in the argument for the structure-sharing account. Certainly, the prepositional passive is a *prima facie* challenge to traditional accounts of argument structure and/or of the passive alternation; but I do not believe that it is obvious *a priori* which of these concepts is in need of change. Alsina (2009) starts from the position that prepositional objects are not arguments of the verb, and therefore concludes that the passive alternation is different in the case of the P-passive (in that it exceptionally involves structure-sharing). But the fact that prepositional objects can be promoted to subject by passivisation could equally well, it seems to me, be taken as evidence that they *are* in fact arguments of the verb, and that it is our conception of argument structure that needs to change, with our analysis of the passive remaining the same. Given the case presented in Needham & Toivonen (2011) and elsewhere (e.g. Asudeh & Giorgolo 2012; Asudeh 2013) in favour of the need to recognise derived arguments, I believe that this latter approach is independently motivated and therefore preferable; but certainly, the issue cannot be decided in isolation—what Alsina and Lødrup see as evidence in favour of their approach(es) can, without any incoherence, be taken as precisely the opposite.

The structure-sharing hypothesis taps into a certain intuition about the P-passive, *viz.* that, at least in some cases, the subject of a P-passive is related semantically to the preposition. However, I believe the proponents of this hypothesis are wrong to make the further claim that it is also related *syntactically*: the empirical evidence is lacking, and there are formal

problems which arise as a result of such an analysis.

I hope to have shown in this chapter that while the existing analyses of the prepositional passive have their strengths, they are all ultimately untenable. In what follows, I will take seriously the intuition that the relationship between the subject of a P-passive and the stranded preposition is a *semantic* one, and will present my own analysis based on properties of the syntax-semantics interface in LFG+Glue.

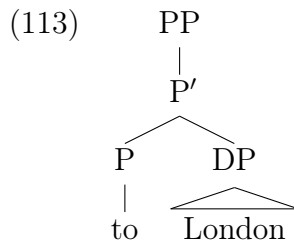
Chapter 4

Prepositions

Before discussing the analysis of the prepositional passive, it is necessary to have an analysis of both prepositions and the passive. In this chapter, therefore, I present a sketch of the theory of prepositional syntax and semantics which I will be working with, and in Chapter 5, I give an analysis of the passive. Of course, either of these topics could merit an entire thesis in its own right, and so what I have to say will necessarily be abbreviated.

4.1 Introduction

LFG follows standard X-bar theory in assuming that prepositions are one of the major parts of speech, which therefore head their own bar- and phrase-level projections. An example of the c-structure for a prepositional phrase is given below:



PPs can be used in a variety of different ways: they can, for example, be complements of nouns, as in (114), complements of verbs, as in (115), or adjuncts, as in (116).

(114) I bought a [NP [N book] [PP of stamps]]

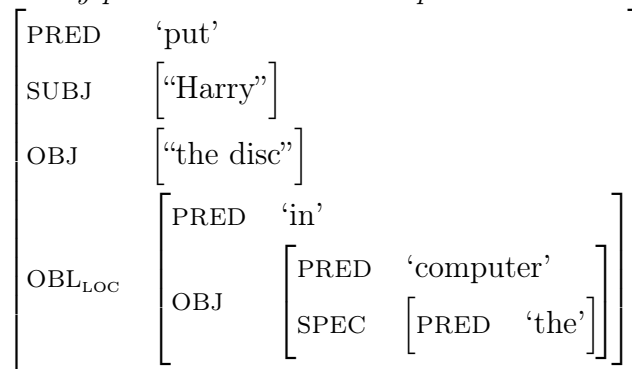
(115) Harry [VP [V put] [DP the disc] [PP in the computer]]

(116) [IP [IP We visited Peter's aunt] [PP in February]]

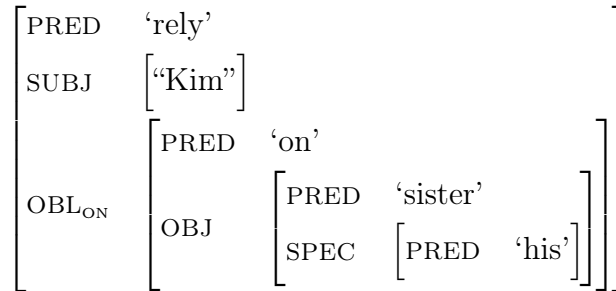
When PPs are arguments, they are represented at f-structure as the value of an OBL_θ attribute, where OBL_θ is indexed by a thematic role, or by the name of a preposition in the case of idiosyncratically marked arguments.

When they are adjuncts, they are members of an ADJ set:

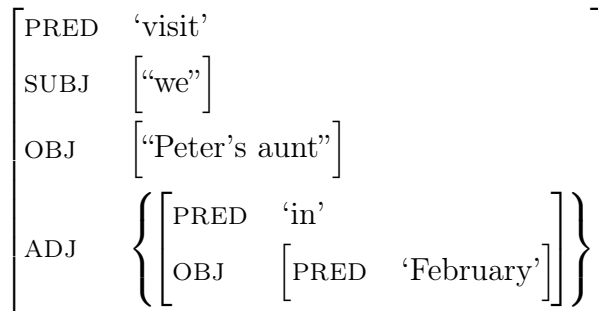
(117) a. *Harry put the disc in the computer.*



b. *Kim relies on his sister.*



(118) *We visited Peter's aunt in February.*



Among the many uses of prepositions, in this chapter I focus on four, and show how a single lexical entry per preposition, with a single shared meaning, can capture these different functions.

4.2 Four uses of prepositions

The four main uses of prepositions which I will be considering here are as follows: they can head adjuncts, core arguments, or derived arguments, or they can be used to idiosyncratically mark the arguments of idiosyncratic prepositional verbs (IPVs).¹ This corresponds to their use in (119), (120), (121), and (122) respectively:

¹They can also function predicatively, or as complements of nouns, but I will not be considering these uses here—I believe they can successfully be explained as elaborations of the basic, core argument function of PPs, but reasons of space prevent me from discussing this here.

- (119) Anakin left **on Friday**.
 (120) Jacen put the package **on the desk**.
 (121) Jaina spoke eloquently **on the subject**.
 (122) Luke relied **on his wife**.

Not all prepositions can fulfil all of these roles (I am unaware of an adjunct use for *of*, for example), but there are some, such as *on*, which can.

In this section, I will begin the presentation of a unified analysis of prepositions whereby a single lexical entry can accommodate all of the uses exemplified in (119–122), while retaining the same core meaning. The final result will be a lexical entry which features a four-way disjunction between bundles of functional information corresponding to each of these uses, abbreviated in templates, as in (123). External factors will force the preposition to select the correct template for each scenario.

- (123) {**@ADJUNCT** | **@COREARG** |
@DERIVEDARG | **@IDIOSYNCRATIC**}

In what follows, I will spell out the relevant information required for each template.

4.2.1 Adjuncts

The adjunct use of prepositions is relatively straightforward to describe. Firstly, we must include the mapping information that the object of the preposition corresponds to its argument:

- (124) *on* P $(\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1)$

This will ensure that the object is correctly passed to the prepositional semantics (see below). The adjunct use of prepositions also requires a specific

meaning constructor to handle the modifying behaviour of adjuncts. We will define this below when we deal with the semantics of prepositional phrases generally. For now, we will abbreviate it as the PP-MODIFIER template. With this in mind, we have the following adjunct template:

$$(125) \quad \text{ADJUNCT} = \\
\begin{array}{l}
(\text{ADJ} \in \uparrow) \\
(\uparrow \text{OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG}_1) \\
@PP\text{-MODIFIER}
\end{array}$$

The first line here is an existential constraining equation. It states that \uparrow must appear as the value of $\text{ADJ} \in$, i.e. must be a member of the set which is the value of an ADJ attribute.² It does this by making use of *inside-out functional uncertainty* (Halvorsen & Kaplan 1988; Dalrymple 1993; see also Asudeh 2012: 64–65 for some discussion, and Dalrymple 2001: 143–146 for discussion and definitions). In general, the expression $(\text{GF} \uparrow)$ refers to an f-structure whose value for the GF attribute is the f-structure \uparrow . In (125), we have the expression $(\text{ADJ} \in \uparrow)$: this refers to the f-structure which contains an ADJ attribute having \uparrow as one of the members of its value. Existential equations state that the structures/attributes that they name must exist; the equation in the first line of (125) thus states that there must exist some f-structure from which the present f-structure is reachable via the path $\text{ADJ} \in$. In effect, this says that the present f-structure must be a member of an ADJ set. This in turn ensures that the preposition appears on the appropriate c-structure node, as we will see below.

²Here, the set membership symbol ‘ \in ’ is being used as an attribute, not in its usual mathematical sense. This gives us a convenient way to refer to the members of sets in functional descriptions. See Dalrymple (2001: 154–155) for more on this notation.

4.2.2 Core arguments

Core arguments are those which are fundamental to the verb’s meaning. Often, this corresponds to being obligatorily present in the syntax; this is the case in (120), for example, where none of the three arguments can be omitted without the result being ungrammatical:

- (126) a. * Put the package on the desk.
 [With the intended, non-imperative, meaning.]
 b. * Jacen put on the desk.
 [With the non-sartorial meaning ...]
 c. * Jacen put the package.

However, this correlation is not absolute: although *eat* can appear without an object, it is an inherently two-place predicate, involving an eater and something eaten, which means that it has two core arguments (see Asudeh & Giorgolo 2012 for an analysis of how the syntactic optionality can be explained in this case).

Core arguments are selected by the verb, and are subject to default mapping principles based on some version of LMT. In the theory assumed here (Findlay 2014), core arguments are also named ARG₁–ARG₄, where ARG₄ is the name usually given to OBLique arguments (Findlay 2014, following the analysis of Kibort 2007, 2008, 2013a,b). Thus, the semantic structure for (120) is as follows:

- (127)
$$\begin{bmatrix} \text{REL} & \text{put} \\ \text{EVENT} & [\] \\ \text{ARG}_1 & [\] \\ \text{ARG}_2 & [\] \\ \text{ARG}_4 & [\] \end{bmatrix}$$

The only important mapping information which a core argument PP contributes is that its object corresponds to an argument of the preposition, just as for adjunct PPs.

Additionally, however, prepositions used in core arguments must, like all prepositions used in arguments (as opposed to adjuncts), contribute information about the specific kind of OBL they head. In general, phrase structure rules (PSRs) which introduce an OBL do not specify its index. An example is given in (128):

$$(128) \quad V' \quad \rightarrow \quad \begin{array}{c} \uparrow = \downarrow \\ V \end{array} \quad \begin{array}{c} (\uparrow \text{ OBJ}) = \downarrow \\ \text{DP} \end{array} \quad \begin{array}{c} (\uparrow \text{ OBL}) = \downarrow \\ \text{PP} \end{array}$$

This is a possible PSR for ditransitive verbs, introducing their two core arguments. The annotation on the PP node simply makes reference to $(\uparrow \text{ OBL})$, without specifying a particular kind of oblique. Formally, this bare OBL should be understood as a disjunction over all available OBL functions, however we choose to classify them:

$$(129) \quad \text{OBL} \equiv \{ \text{OBL}_{\text{GOAL}} | \text{OBL}_{\text{LOC}} | \dots | \text{OBL}_{\text{TO}} | \text{OBL}_{\text{ON}} | \dots \}$$

Each preposition must therefore provide more information in order to resolve this disjunction. This can be achieved with another existential constraining equation:

$$(130) \quad \textit{on} \text{ P } (\text{OBL}_{\text{LOC}} \uparrow)$$

This says, in effect, “the f-structure that I am in must be the value of an OBL_{LOC} feature”. To generalise, we can encode this in a template, $\text{OBL}(I)$, which takes the name of an oblique index as an argument, as in (131).

$$(131) \quad \text{OBL(I)} = \\ (\text{OBL}_I \uparrow)$$

With this final piece of information, the core argument template can be given as follows:

$$(132) \quad \text{COREARG(I)} = \\ \textcircled{\text{OBL(I)}} \\ (\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1) \\ \uparrow_\sigma =_c ((\text{OBL } \uparrow)_\sigma \text{ARG}_n)$$

This passes the information about what type of OBLique argument the preposition heads up to the main f-structure, using the OBL template just introduced, and gives the mapping information discussed above. It also includes a constraining equation which specifies that the semantic structure corresponding to the OBLique of which this is the head must be a core argument of the main clause. This will be crucial later on in ensuring that the correct template is selected by the preposition in each situation. ARG_n is a shorthand for the disjunction of the four core argument names (analogous to the use of GF as an abbreviation of the grammatical functions at f-structure):

$$(133) \quad \text{ARG}_n \equiv \{\text{ARG}_1 | \text{ARG}_2 | \text{ARG}_3 | \text{ARG}_4\}$$

4.2.3 Derived arguments

Derived arguments are those which are not selected by the main predicate, but which can instead be optionally added to the semantic structure of certain classes of verbs. They are not selected by the verb, and so are not subject to default mapping principles. Instead, they are usually introduced by prepositions (and so therefore surface as OBLs). Needham & Toivonen

(2011) discuss a number of such cases, including experiencers (*It looks to me as if John is unhappy*), instruments (*Cain killed Abel with a rock*) and directionals (*Theodora went to the party*).³ These demonstrate mixed behaviour with respect to various tests for argument/adjunct status. I give two examples here: the *iterativity* test (Needham & Toivonen 2011: 406), and the *VP-preposing* test (p. 408). The iterativity test claims that adjuncts can be iterated, whereas arguments cannot:

- (134) a. Hassan [expertly] displayed his juggling skills [after dinner] [last Wednesday night] [in our dining room].
 b. * Julia gave [the present] [the book] [to her father] [to her sister].

Derived arguments behave like adjuncts with respect to the iterativity test; they are optional and iterable:

- (135) a. Peter spoke.
 b. Peter spoke to Susie.
 c. Peter spoke to Susie about the report.
 d. Peter spoke to Susie about the report for Jonathan.
 etc.

Things look different when we consider the VP-preposing test, however. According to this test, arguments must move with the verb in VP-preposing, but adjuncts need not:

- (136) a. * Kylie wanted to draw a picture and draw she did a picture.
 b. Kylie wanted to leave on Monday and leave she did on Monday.

³Needham & Toivonen (2011) also include passive *by*-phrases under the heading of derived arguments. This is not the way they will be understood here, where they are considered to be just a remapping of the verb's ARG₁.

The PP complements in (135) cannot be left stranded like an adjunct, but must prepose along with the verb, like an argument:

- (137) a. *Peter wanted to speak to Susie and speak he did to Susie.
 b. Peter wanted to speak to Susie and speak to Susie he did.

This mixed behaviour is what leads Needham & Toivonen (2011) to propose the new category of derived argument. In the present theory, such arguments are given mnemonic names at semantic structure to uniquely identify them: *to* introduces a GOAL argument, for example, while *on*, in (121), *Jaina spoke eloquently on the subject*, introduces an ISSUE argument.⁴ The semantic structure of the main clause in (121) is therefore as follows:

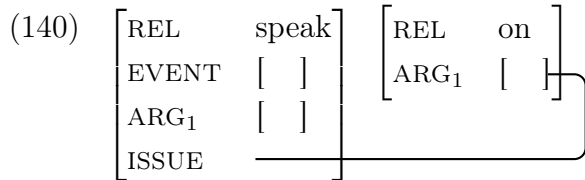
$$(138) \begin{bmatrix} \text{REL} & \text{speak} \\ \text{EVENT} & [\] \\ \text{ARG}_1 & [\] \\ \text{ISSUE} & [\] \end{bmatrix}$$

Note that, unlike core arguments, in the case of derived arguments, the preposition itself is not part of the argument at s-structure: its job is to pass its object to the main verb as a derived argument (although the preposition will still play a role in the semantics). This is achieved lexically, via a defining equation like that in (139):

$$(139) \quad \textit{on} \text{ P } (\uparrow_{\sigma} \text{ARG}_1) = ((\text{OBL } \uparrow)_{\sigma} \text{ISSUE})$$

⁴This is intended as the name for the argument corresponding to the subject matter of a text (spoken or written). It is perhaps a somewhat less clear name than TOPIC or THEME, or even SUBJECT, but these all have pre-established meanings in the linguistics jargon (indeed, it seems as though this semantic field has been particularly richly mined for linguistic nomenclature), and I do not want to provoke undue confusion. Similarly, this is not to be confused with the notion of *at-issue* content invoked in recent work on implicature (Potts 2005, etc.).

Whatever is mapped to the argument of the preposition (usually its object) will be equated with a derived argument, the ISSUE, in the main clause's semantic structure, as in (140):



In general, the prepositional argument will be its object, as for core argument and adjunct PPs. However, there are two instances where this is not what we observe: in the case of IPVs, where the object of the preposition is not an argument of the preposition at all, but rather of the main verb (on which see Chapter 7); and in the P-passive, where the preposition has no object. Although the former does not involve derived arguments, the latter can, as in *This pen has been written with*, or *Peter was spoken to*. We therefore omit the mapping information relating to the preposition's object from the derived argument template, relying on other components of the grammar to give us this information (on which see below).

Finally, derived arguments, like adjunct PPs, require a special meaning constructor to manage their meaning contribution. We abbreviate this as DERIVEDPP-COMBINER, delaying discussion until Section 4.4, where we present the semantics of PPs.

The template for the derived argument use of a preposition is thus as in (4.2.3), where this template takes two arguments: the usual oblique index, and the name of the derived argument.⁵

⁵An easily interpretable, and more parsimonious, version of (4.2.3) would be the following, which only takes a single argument:

- (i) $\text{DERIVEDARG}(I, A) =$
 $\quad @\text{OBL}(I)$
 $\quad (\uparrow_{\sigma} \text{ARG}_1) = ((\text{OBL } \uparrow)_{\sigma} A)$
 $\quad @\text{DERIVEDPP-COMBINER}$

4.2.4 Idiosyncratic PPs

The final use of PPs is as bearing the idiosyncratic prepositionally marked argument of IPVs. In this case, the preposition does not contribute its usual meaning, this being removed by the verb (see Chapter 7), and so nothing maps to the preposition's ARG_1 position. The requisite information for the idiosyncratic prepositional use is given in (141):

- (141) $\text{IDIOSYNCRATIC}(I) =$
 $\quad @\text{OBL}(I)$
 $\quad @\text{EMPTY}((\uparrow_{\sigma} \text{ARG}_1)_{\sigma^{-1}})$

The second line employs a new template, EMPTY , defined as follows:

- (142) $\text{EMPTY}(A) =$
 $\quad A = \emptyset$

This template says that its argument is the empty set. In (141), this amounts to saying that there is no f-structure which is connected to $(\uparrow_{\sigma} \text{ARG}_1)$ by the σ -function from f- to s-structure, i.e. nothing maps to $(\uparrow_{\sigma} \text{ARG}_1)$.

We now turn to the question of how PPs fit into the syntax of English, making use of the templates just introduced.

-
- (1) $\text{DERIVEDARG}(I) =$
 $\quad @\text{OBL}(I)$
 $\quad (\uparrow_{\sigma} \text{ARG}_1) = ((\text{OBL } \uparrow)_{\sigma} I)$
 $\quad @\text{DERIVEDPP-COMBINER}$

However, formally speaking, the index of an oblique and the name of a feature at semantic structure are not the same kind of object, and so it would be inappropriate to conflate them in the template.

4.3 Prepositional syntax

In this section, we examine the c-structure positioning of the various kinds of PP, and give the phrase structure rule (PSR) which introduces them.

In order to determine the correct ordering of PPs, we must consider several contrasts between the different kinds of PP. Firstly, note that there is a difference between both derived arguments and idiosyncratic PPs on the one hand, and core PP arguments on the other, in that the former, but not the latter, permit main clause adverbials to intervene between them and the verb:⁶

- (143) a. The Sheikh spoke **quietly** to his chauffeur. (BNC)
 b. We began to speak **at great length** about our respective dreams. (COCA)
- (144) a. These proposals consisted **primarily** of economic analyses. (COCA)
 b. The other 140 had to rely **in varying degrees** on transferred votes to provide them with a quota. (BNC)
- (145) a. * The Sheikh gave the book **quietly** to him.
 b. ?* Smith put the vase **with great care** on the table.

⁶Judgments are somewhat confounded in the case of core arguments by two facts. Firstly, it is possible to modify the preposition, as in (i):

- (i) He put it right under his feet so that he would not trip on it. (COCA)

This means that adverbial material *can* intervene between the verb and the preposition, but in this case it modifies the preposition, and not the verb/main clause.

Secondly, heavy constituent shift (of the sort most commonly exemplified by heavy NP shift; Ross 1967) can also lead to intervening material (my thanks to Mary Dalrymple, p.c., for bringing this point to my attention); cf. (iia) and (iib):

- (ii) a. ? Jones handed the documents with some trepidation to the woman he had arranged to meet.
 b. * Jones handed the documents with some trepidation to her.

I assume, however, as (iib) illustrates, that, fundamentally, intervening adverbials are not permitted in the case of ditransitives.

Secondly, both core and idiosyncratically marked arguments always precede derived arguments:

- (146) a. Give a kiss [to your Katrina]_{CORE} [for me]_{DER}. (COCA)
 b. * Give a kiss [for me]_{DER} [to your Katrina]_{CORE}.
- (147) a. King Arthur dealt [with the problem]_{IDIO} [with his trusty sword]_{DER}.
 b. * King Arthur dealt [with his trusty sword]_{DER} [with the problem]_{IDIO}.

Thirdly, adverbial material can intervene between idiosyncratic arguments and derived arguments:

- (148) Susan dealt [with spiders] all the time [for her brother], who suffered from terrible arachnophobia.

Fourthly, and finally, adverbial material can also intervene between derived arguments:

- (149) Sally went [to the hospital] every day [for her cousin], who couldn't get there himself.

Informally labelling each of the types of PP with a subscript, as well as labelling adverbial material as XP_{ADJ}, we can describe the ordering of constituents using the following PSR:⁷

- (150) $V' \rightarrow (V) (DP) (PP_{CORE}) XP^*_{ADJ} (PP_{IDIO}) \{XP_{ADJ} | PP_{DER}\}^*$

The brackets represent optionality. They are shown here for clarity, but I will not include them from now on, since, due to Economy of Expression, all phrase structure nodes are always optional. The star is a Kleene star,

⁷Adverbials can also follow the derived arguments, of course (e.g. *He spoke to his brother [for hours]*), but I assume that this can be handled by a more general theory of adjunction at a higher phrasal level, as described in e.g. Toivonen (2003) or Asudeh (2012).

which is used in regular expressions to denote zero or more occurrences of something. It is used here to represent the fact that there can, in principle, be any number of adverbials or derived arguments. Notice the final disjunction between adverbials and derived arguments. The syntax of this regular expression is important: the Kleene star is outside of the disjunction, meaning that this stands for any number of XPs and PPs potentially interwoven in any order (whereas if the star had been inside, on each node, the whole expression would denote any number of XPs *or* any number of PPs, but not both). This allows adverbials to intervene between derived arguments.

The question now facing us is how to formally differentiate these c-structure positions so as to force a preposition to select the correct template in each slot. First of all, we can add the standard equations which specify the f-structural contribution of each node; this is shown in (154).⁸ Note that this is all the information we need for the adverbials, since anything which appears as XP will have to be compatible with being a member of an ADJ set (including PPs, where the head P will be forced to select the ADJUNCT template). Also note that these are the only positions where the preposition could select the ADJUNCT template, since the other PP positions are annotated with the equation $(\uparrow \text{OBL}) = \downarrow$, which contradicts the existential constraining equation in the first line of this template.

Now we turn to each of the oblique PP positions. The first node we annotate is the last PP slot, for derived arguments. This requires two equations. Firstly, we specify that the semantic structure projected from the PP in this position is not a core argument of the main clause. We achieve this us-

⁸ Examples (154) and (155) are given on page 83 for readability.

ing the negative constraint in (151), which employs the ARG_n abbreviation introduced above to stand for any core argument position.

$$(151) \quad \neg(\downarrow_\sigma = (\uparrow_\sigma \text{ARG}_n))$$

This prevents core arguments from incorrectly surfacing in this position, where they could be preceded by an adverbial (by preventing the preposition which heads the PP from selecting the COREARG template). Secondly, we add a mapping equation which links the preposition's object to its ARG_1 position. The result is shown in (152):

$$(152) \quad \begin{array}{l} (\downarrow \text{OBJ})_\sigma = (\downarrow_\sigma \text{ARG}_1) \\ \neg(\downarrow_\sigma = (\uparrow_\sigma \text{ARG}_n)) \\ (\uparrow \text{OBL}) = \downarrow \\ \text{PP} \end{array}$$

The mapping equation rules out the possibility of the preposition heading the PP in this position selecting the IDIOSYNCRATIC template, since this stipulates that nothing maps to its ARG_1 . Thus, we are left with just the DERIVEDARG template, as desired.

Next, we turn to the PP slot reserved for idiosyncratically marked arguments. To this, we simply add the same negative constraint as above, which requires that this PP not project a core argument of the main clause:

$$(153) \quad \begin{array}{l} \neg(\downarrow_\sigma = (\uparrow_\sigma \text{ARG}_n)) \\ (\uparrow \text{OBL}) = \downarrow \\ \text{PP} \end{array}$$

By omitting the mapping equation, we rule out the preposition in this position calling the DERIVEDARG template, because this template provides no mapping information of its own. Selecting it would therefore result in a situation of resource deficit when the prepositional meaning constructor

has no argument to consume. Thus, the only template compatible with this position is IDIOSYNCRATIC, exactly as required.

Finally, the first PP position, for core arguments, does not require any further annotation. As regards core arguments, it is the only position where they can appear, since the other two PP slots are annotated with negative constraints barring them from surfacing there. This means that core arguments will always precede any adverbials or derived arguments, as required. Idiosyncratic arguments are also compatible with this position, but this is not a problem, since they will still correctly precede any derived arguments. This is because derived arguments cannot appear in this first PP position, since it provides no mapping information, and so the same resource accounting problem described for the idiosyncratic PP position recurs here.

Now we have appropriately annotated all of the c-structure positions, we can give the final version of the V' expansion rule, shown in (155).

In comparison to the V' rule, the PP expansion rules pose no special problems of their own, and are as follows:

- (156) PP \rightarrow $\begin{array}{c} \uparrow = \downarrow \\ P' \end{array}$
- (157) P' \rightarrow $\begin{array}{cc} \downarrow \in (\uparrow \text{ ADJ}) & \uparrow = \downarrow \\ XP & P' \end{array}$
- (158) P' \rightarrow $\begin{array}{cc} \uparrow = \downarrow & (\uparrow \text{ OBJ}) = \downarrow \\ P & DP \end{array}$

Summarising and exemplifying the discussion in this section, Figures 4.1 (p. 85) and 4.2 (p. 86) give syntactic analyses for two active sentences involving core and derived arguments (delaying discussion of the P-passive until Chapter 6 and of IPVs until Chapter 7). We now turn to the semantics of

$$(154) \quad V' \rightarrow \begin{array}{ccccccc} \uparrow = \downarrow & (\uparrow \text{ OBJ}) = \downarrow & (\uparrow \text{ OBL}) = \downarrow & \downarrow \in (\uparrow \text{ ADJ}) & (\uparrow \text{ OBL}) = \downarrow & \downarrow \in (\uparrow \text{ ADJ}) & (\uparrow \text{ OBL}) = \downarrow \\ V & \text{DP} & \text{PP} & \text{XP}^* & \text{PP} & \{ \text{XP} \mid \text{PP} \}^* \end{array}$$

(155) **V' rule for English:**

$$V' \rightarrow \begin{array}{ccccccc} \uparrow = \downarrow & (\uparrow \text{ OBJ}) = \downarrow & (\uparrow \text{ OBL}) = \downarrow & \downarrow \in (\uparrow \text{ ADJ}) & \neg(\downarrow_{\sigma} = (\uparrow_{\sigma} \text{ ARG}_n)) & \downarrow \in (\uparrow \text{ ADJ}) & (\downarrow \text{ OBJ})_{\sigma} = (\downarrow_{\sigma} \text{ ARG}_1) \\ V & \text{DP} & \text{PP} & \text{XP}^* & (\uparrow \text{ OBL}) = \downarrow & \{ \text{XP} \mid \text{PP} \}^* & \neg(\downarrow_{\sigma} = (\uparrow_{\sigma} \text{ ARG}_n)) \\ & & & & & & (\uparrow \text{ OBL}) = \downarrow \end{array}$$

PPs.

4.4 The semantics of PPs

Given our Davidsonian event semantics, the meaning of a sentence like (159) is as in (160).

(159) Peter went to London.

(160) $\exists e[go(e, peter) \wedge to(e, london) \wedge past(e)]$

Prepositions, under this theory, are functions from entities (their argument) to functions from events to truth values, i.e. they are of type $\langle e \rightarrow \langle ev \rightarrow t \rangle \rangle$, like intransitive verbs. However, the prepositions do not themselves provide an EVENT resource in their semantic structure, relying instead on the EVENT resource of the clause which they are a part of. Prepositions therefore have the following general meaning constructor (MC):⁹

(161) $\lambda x \lambda e. preposition\text{-}meaning(e, x) : (\uparrow_{\sigma} ARG_1)_e \multimap \uparrow_{\sigma_{\langle ev \rightarrow t \rangle}}$

Notice that the result of not providing their own EVENT resource is that the type of the whole PP resource is $\langle ev \rightarrow t \rangle$, i.e. a dependency on an event.¹⁰

⁹[JYF (Dec '15): It has been pointed out to me that the analysis of PPs I give here potentially breaks the Curry-Howard isomorphism, as we have a non-implicational linear logic term corresponding to a functional type. This would, of course, be a Bad Thing. I believe that the substance of the present analysis can be retained by making simple formal tweaks (having the prepositional MC refer to the main clause's event resource via inside-out functional uncertainty, for example), but for the sake of preserving the original argumentation and flow of the text, I have not attempted to undertake these changes here. It is my intention to publish a tighter version of this analysis in the near future, where I will clarify my position on this matter.]

¹⁰This makes this MC inappropriate for the basic predicative use of PPs, as in *The book is on the table*, since these are two-place relations, and the MC in (161) only has one argument position. In other words, it will give the meaning of *on the table*, but not *be on the table*. This may be mistaken (indeed, Wunderlich 1991 argues that this predicative

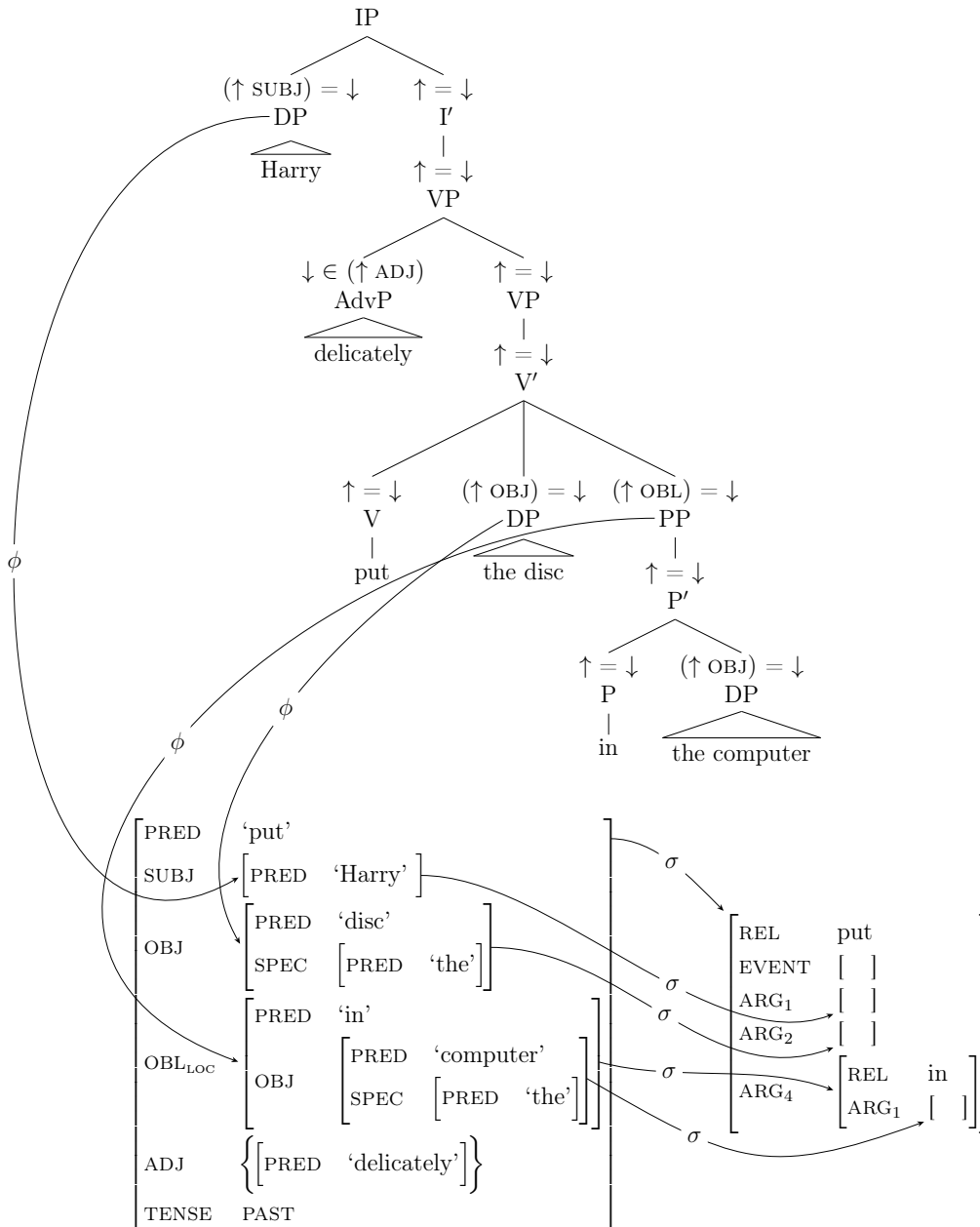


Figure 4.1: Structures and correspondences for *Harry delicately put the disc in the computer*

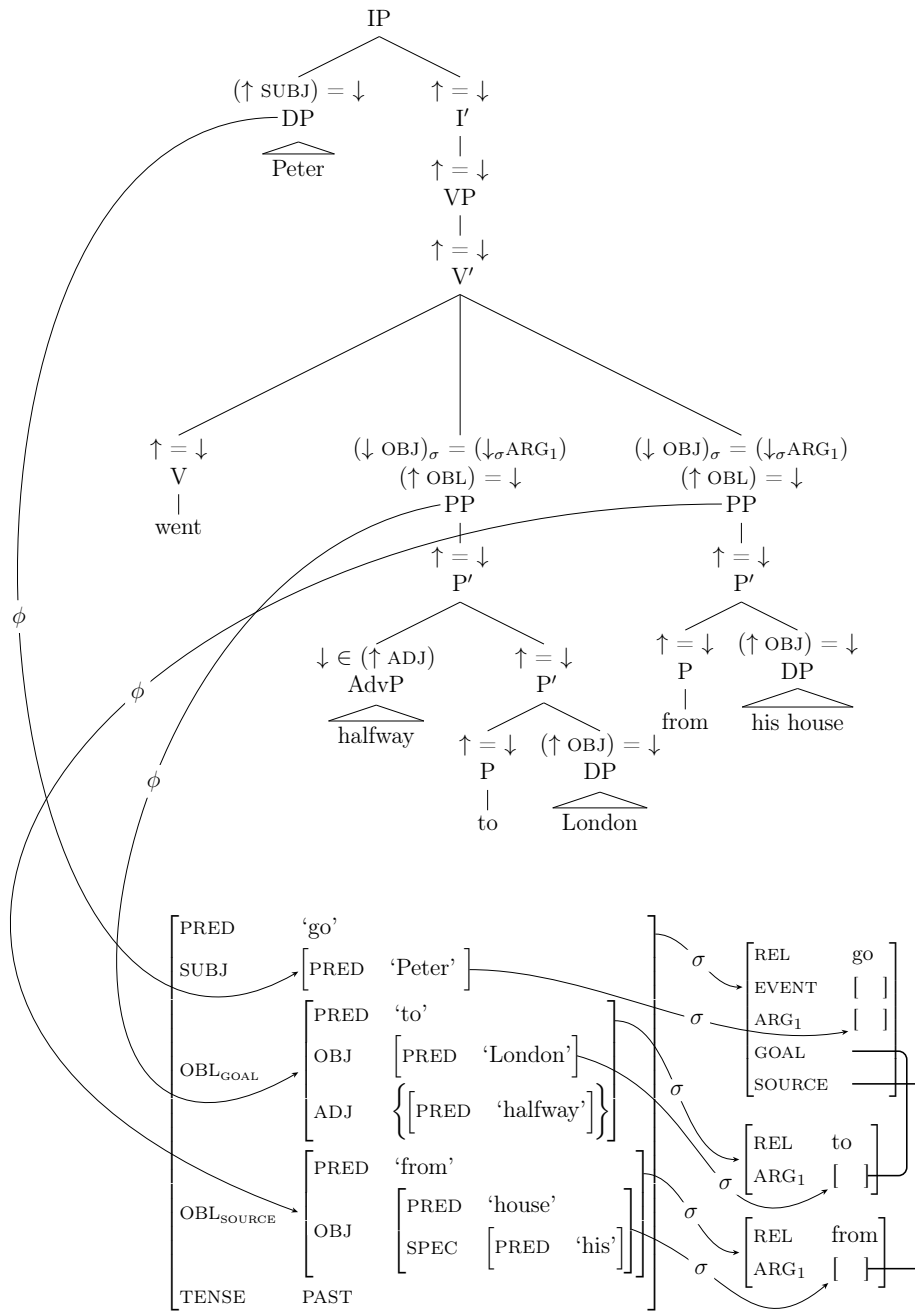


Figure 4.2: Structures and correspondences for *Peter went halfway to London from his house*

In what follows, I will assume that prepositions contribute the same basic MC in all of their uses. Let us now examine how each of the four uses discussed in Section 4.2 plays out in the semantics.

4.4.1 Adjuncts

Recall that the ADJUNCT template is as follows:

$$(162) \quad \text{ADJUNCT}(P) = \\ \quad (\text{ADJ} \in \uparrow) \\ \quad (\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1) \\ \quad @\text{PP-MODIFIER}$$

We now turn to the question of what exactly the PP-MODIFIER template contributes. Just like any adjunct, these kinds of PPs are modifiers. Modifiers in Glue Semantics are schematically of the form given in (163), where \mathcal{M} is the meaning of the modifier, and \mathcal{S} is the the glue contribution of the phrase it modifies (Dalrymple 2001: 262):

$$(163) \quad \mathcal{M} : \mathcal{S} \multimap \mathcal{S}$$

In other words, they produce an identical glue resource to the one which they consume. This is in part what accounts for the iterability of modifiers: the output of one modifier can serve as the input to another. The PP-MODIFIER template takes the meaning of the PP and produces a modifier on the main clause:

use is the intrinsic, basic meaning of prepositions), or it may suggest that some further meaning constructor is needed, either provided by the copula or by the preposition itself. I leave this question open here.

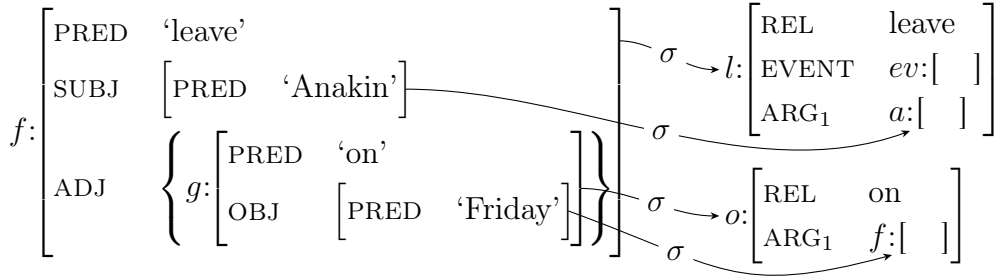


Figure 4.3: Structures and correspondences for *Anakin left on Friday*

$$(164) \quad \text{PP-MODIFIER} = \\
\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : \\
\uparrow_{\sigma} \multimap [((\text{ADJ} \in \uparrow)_{\sigma} \text{EVENT}) \multimap (\text{ADJ} \in \uparrow)_{\sigma}] \multimap \\
((\text{ADJ} \in \uparrow)_{\sigma} \text{EVENT}) \multimap (\text{ADJ} \in \uparrow)_{\sigma}$$

This approach is in a broad sense the same as that employed by Dalrymple (2001: 260–262) in her analysis of intersective adjectives. On the meaning side, the MC in (164) takes two functions, the meaning of the PP and the meaning of the verb (once it has combined with its arguments), predicates them both of an event variable, and conjoins them. On the glue side, the expressions in (164) make use of inside-out functional uncertainty once more to refer to the implicational resource corresponding to the verb after it has combined with its arguments. The MC consumes the prepositional phrase’s resource and then produces a modifier on this verbal dependency.

To see this in use, consider sentence (119), *Anakin left on Friday*. The f - and s -structures are given in Figure 4.3. The MC in (164) is introduced by the preposition, and so \uparrow resolves to g . We can see that the expression $(\text{ADJ} \in g)$ refers to the main f -structure, f , and so the expressions $((\text{ADJ} \in g)_{\sigma} \text{EVENT})$ and $(\text{ADJ} \in g)_{\sigma}$ refer to $(f_{\sigma} \text{EVENT})$ and f_{σ} respectively. The whole glue side of (164) is thus (165):

$$(165) \quad g_{\sigma} \multimap [(f_{\sigma} \text{EVENT}) \multimap f_{\sigma}] \multimap (f_{\sigma} \text{EVENT}) \multimap f_{\sigma}$$

We can name these resources mnemonically, using the labels in Figure 4.3:

$$(166) \quad o \multimap [ev \multimap l] \multimap ev \multimap l$$

The instantiated meaning constructors for the whole sentence (relative to Figure 4.3) are given below, while the resulting Glue proof is shown in Figure 4.4 (p. 90).

$$(167) \quad \mathbf{[Anakin]}$$

$$anakin : a$$

$$\mathbf{[left]}$$

$$\lambda x \lambda e. leave(e, x) : a \multimap ev \multimap l$$

$$\mathbf{[PAST]}$$

$$\lambda P. \exists e [P(e) \wedge past(e)] : [ev \multimap l] \multimap l$$

$$\mathbf{[on]}$$

$$\lambda x \lambda e. on(e, x) : f \multimap o$$

$$\mathbf{[PP-MODIFIER]}$$

$$\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : o \multimap [ev \multimap l] \multimap ev \multimap l$$

$$\mathbf{[Friday]}$$

$$friday : f$$

In the proof, the PP-MODIFIER meaning constructor produces the modifier in (168) by consuming the meaning of the PP:

$$(168) \quad \lambda Q \lambda e. Q(e) \wedge on(e, friday) : [ev \multimap l] \multimap ev \multimap l$$

This then modifies the MC $\lambda e. leave(e, anakin) : ev \multimap l$, which corresponds to the verbal meaning once it has combined with its argument.

$$\begin{array}{c}
\begin{array}{c}
\text{[Anakin]} \quad \text{[left]} \\
\frac{anakin : \quad \lambda x \lambda e. leave(e, x) : \quad a}{a \quad a \multimap ev \multimap l}
\end{array}
\quad
\begin{array}{c}
\text{[on]} \\
\frac{\lambda x \lambda e. on(e, x) : \quad \text{[Friday]} \quad f \multimap o \quad \text{friday} : f}{\lambda e. on(e, friday) : \quad o}
\end{array}
\quad
\begin{array}{c}
\text{[PP-MODIFIER]} \\
\frac{\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : \quad o \multimap [ev \multimap l] \multimap ev \multimap l}{\lambda Q \lambda e. Q(e) \wedge on(e, friday) : \quad [ev \multimap l] \multimap ev \multimap l}
\end{array}
\\
\begin{array}{c}
\text{[PAST]} \\
\frac{\lambda P. \exists e [P(e) \wedge past(e)] : \quad [ev \multimap l] \multimap l \quad \lambda e. leave(e, anakin) \wedge on(e, friday) : \quad ev \multimap l}{\exists e [leave(e, anakin) \wedge on(e, friday) \wedge past(e)] : l}
\end{array}
\end{array}$$

Figure 4.4: Proof for *Anakin left on Friday*

4.4.2 Core arguments

The COREARG template does not mention any meaning constructor itself. This is because I am assuming that core arguments are handled by the relevant verbal meaning constructor, since they are introduced by the verb itself. The MC for a verb like *put* is as follows:¹¹

$$(169) \quad \lambda x \lambda y \lambda P \lambda e. put(e, x, y, P) : \\ (\uparrow_{\sigma} \text{ARG}_1)_e \multimap (\uparrow_{\sigma} \text{ARG}_2)_e \multimap \\ (\uparrow_{\sigma} \text{ARG}_4)_{\langle ev \rightarrow t \rangle} \multimap (\uparrow_{\sigma} \text{EVENT})_{ev} \multimap \uparrow_{\sigma t}$$

Note the types: the PP argument is of type $\langle ev \rightarrow t \rangle$, which makes the type of the whole verb $\langle e \rightarrow \langle e \rightarrow \langle \langle ev \rightarrow t \rangle \rightarrow \langle ev \rightarrow t \rangle \rangle \rangle$. The fourth argument position in the *put* predicate is filled by a function from events to truth values; the meaning of an expression like $\lambda e. on(e, \iota x[table(x)])$ is *on the table*.¹² For the sake of readability, we can substitute the expression in (170) for the η -equivalent expression in (171):

$$(170) \quad \lambda e. on(e, \iota x[table(x)])$$

$$(171) \quad on(\iota x[table(x)])$$

The meaning of *Derek put the book on the table* in the present theory is therefore represented as in (172):

$$(172) \quad \exists e[put(e, derek, \iota x[book(x)], on(\iota y[table(y)]))]$$

The f- and s-structures for *Derek put the book on the table* are given in Figure 4.5 (p. 92); this gives us the instantiated meaning constructors in

¹¹Recall that ARG₄ is the name usually given to arguments which by default will surface as an OBLIQUE in the theory assumed here.

¹²Cf. fn. 10 (p. 87).

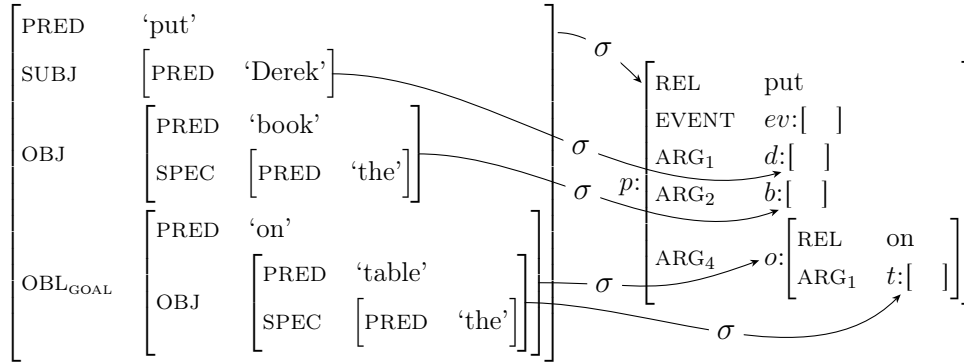


Figure 4.5: Structures and correspondences for *Derek put the book on the table*

(173), and the Glue proof in Figure 4.6 (p. 93).¹³

(173) **[Derek]**
derek : *d*

[put]
 $\lambda x \lambda y \lambda P \lambda e . \text{put}(e, x, y, P) : d \multimap b \multimap o \multimap ev \multimap p$

[PAST]
 $\lambda P . \exists e [P(e) \wedge \text{past}(e)] : [ev \multimap p] \multimap p$

[the book]
 $\iota x [\text{book}(x)] : b$

[on]
 $\lambda x \lambda e . \text{on}(e, x) : t \multimap o$

[the table]
 $\iota y [\text{table}(y)] : t$

¹³I am abstracting away from the semantics of definite descriptions and simply give an unanalysed meaning for the DPs *the book* and *the table* using the iota-operator, a formalism first introduced by Whitehead & Russell (1910: *14) (although notice that these authors use a turned iota, ι , instead). The expression $\iota x [\text{book}(x)]$ is to be read as “the unique x such that x is a book”.

$$\begin{array}{c}
\begin{array}{c}
\text{[Derek]} \quad \text{[put]} \\
derek : \quad \lambda x \lambda y \lambda P \lambda e. put(e, x, y, P) : \\
d \quad \quad \quad d \multimap b \multimap o \multimap ev \multimap p
\end{array} \\
\hline
\begin{array}{c}
\lambda y \lambda P \lambda e. put(e, derek, y, P) : \\
b \multimap o \multimap ev \multimap p
\end{array} \\
\hline
\begin{array}{c}
\text{[the book]} \\
ix[book(x)] : \\
b
\end{array} \\
\hline
\begin{array}{c}
\lambda P \lambda e. put(e, derek, ix[book(x)], P) : \\
o \multimap ev \multimap p
\end{array} \\
\hline
\begin{array}{c}
\text{[on]} \quad \quad \quad \text{[the table]} \\
\lambda x \lambda e. on(e, x) : \quad iy[table(y)] : \\
t \multimap o \quad \quad \quad t
\end{array} \\
\hline
\begin{array}{c}
\lambda e. on(e, iy[table(y)]) : \\
o
\end{array} \\
\hline
\begin{array}{c}
on(iy[table(y)]) : \\
o
\end{array} \Rightarrow_{\eta}
\end{array} \\
\hline
\begin{array}{c}
\text{[PAST]} \\
\lambda P. \exists e [P(e) \wedge past(e)] : \\
[ev \multimap p] \multimap p
\end{array} \\
\hline
\begin{array}{c}
\lambda e. put(e, derek, ix[book(x)], on(iy[table(y)])) : \\
ev \multimap p
\end{array} \\
\hline
\exists e [put(e, derek, ix[book(x)], on(iy[table(y)])) \wedge past(e)] : p
\end{array}$$

Figure 4.6: Proof for *Derek put the book on the table*

4.4.3 Derived arguments

Derived arguments occupy an intermediate position between core arguments and adjuncts. In the semantics, they behave like modifiers: there is a parallelism between the representations of *Anakin left on Friday*, given in (174a), and *Peter went to London*, given in (174b), which is markedly different from the representation of an expression involving a core argument PP, like *Viviane gave Excalibur to Arthur* in (174c):

- (174) a. $\exists e[\textit{leave}(e, \textit{anakin}) \wedge \textit{on}(e, \textit{friday}) \wedge \textit{past}(e)]$
 b. $\exists e[\textit{go}(e, \textit{peter}) \wedge \textit{to}(e, \textit{london}) \wedge \textit{past}(e)]$
 c. $\exists e[\textit{give}(e, \textit{viviane}, \textit{excalibur}, \textit{to}(\textit{arthur})) \wedge \textit{past}(e)]$

In the grammatical representation of these sentences, however, the argument status of *London* sets it apart from the adjunct *Friday*. The s-structure corresponding to *London* occupies a position in the main clausal semantic structure, as well as a position in the preposition's, separate, s-structure, as in (175a). This is in contrast to both adjuncts, (175b), and core arguments, (175c): in the former, the semantic structure of the PP plays no role in the main s-structure, while in the latter, the PP's semantic structure is entirely contained within the main s-structure, being the value of a core argument attribute.

- (175) a. $\left[\begin{array}{l} \text{REL} \quad \textit{go} \\ \text{EVENT} \quad [\quad] \\ \text{ARG}_1 \quad [\quad] \\ \text{GOAL} \quad [\quad] \end{array} \right] \left[\begin{array}{l} \text{REL} \quad \textit{to} \\ \text{ARG}_1 \quad [\quad] \end{array} \right]$
-

$$\text{b. } \begin{bmatrix} \text{REL} & \text{leave} \\ \text{EVENT} & [\] \\ \text{ARG}_1 & [\] \end{bmatrix} \quad \begin{bmatrix} \text{REL} & \text{on} \\ \text{ARG}_1 & [\] \end{bmatrix}$$

$$\text{c. } \begin{bmatrix} \text{REL} & \text{give} \\ \text{EVENT} & [\] \\ \text{ARG}_1 & [\] \\ \text{ARG}_2 & [\] \\ \text{ARG}_4 & \begin{bmatrix} \text{REL} & \text{to} \\ \text{ARG}_1 & [\] \end{bmatrix} \end{bmatrix}$$

This mixed behaviour of derived arguments accords with their mixed behaviour relative to various argument-/adjuncthood tests (see discussion above in Section 4.2.3 as well as Needham & Toivonen 2011).

In order to account for the semantic contribution of derived arguments, the DERIVEDARG template calls DERIVEDPP-COMBINER. This does exactly the same job as the PP-MODIFIER template called by the ADJUNCT template, since, as we noted above, derived arguments and adjuncts have the same semantic representation. However, the DERIVEDPP-COMBINER template changes the path referred to by the inside-out functional uncertainty in the glue expressions to correctly reflect the fact that these PPs appear as OBLs rather than as values of ADJ:

$$(176) \quad \text{DERIVEDPP-COMBINER} = \\ \lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : \\ \uparrow_{\sigma} \multimap [((\text{OBL } \uparrow)_{\sigma} \text{ EVENT}) \multimap (\text{OBL } \uparrow)_{\sigma}] \multimap \\ ((\text{OBL } \uparrow)_{\sigma} \text{ EVENT}) \multimap (\text{OBL } \uparrow)_{\sigma}$$

The meaning assembly now proceeds as discussed above for adjuncts. I will present the analysis of *Peter went to London* as an example. The f- and s-structures are given in Figure 4.7, the instantiated meaning constructors

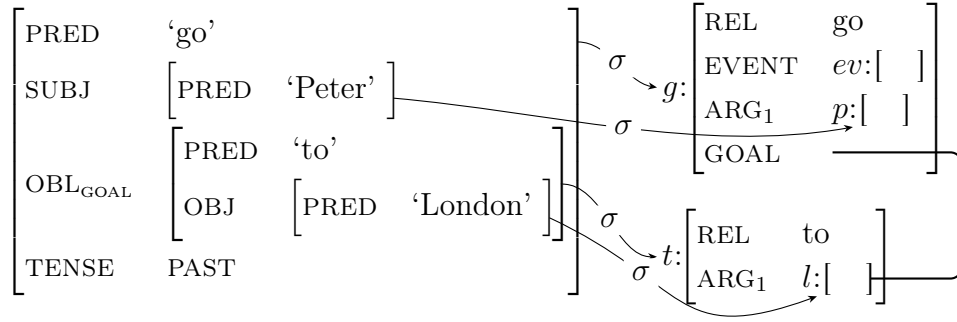


Figure 4.7: Structures and correspondences for *Peter went to London*

in (177), and the Glue proof in Figure 4.8 (p. 97).

(177) **[Peter]**
peter : *p*

[went]
 $\lambda x \lambda e. go(e, x) : p \multimap ev \multimap g$

[PAST]
 $\lambda P. \exists e [P(e) \wedge past(e)] : [ev \multimap g] \multimap g$

[to]
 $\lambda x \lambda e. to(e, x) : l \multimap t$

[DERIVEDPP-COMBINER]
 $\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : t \multimap [ev \multimap g] \multimap ev \multimap g$

[London]
london : *l*

4.4.4 Idiosyncratic PPs

The semantics of idiosyncratic PPs is handled by the IPVs which select them, since the prepositional object is a core argument of the IPV. We will see in Chapter 7 how this is achieved.

$$\begin{array}{c}
\begin{array}{c}
\text{[Peter]} \quad \text{[went]} \\
peter : \quad \lambda x \lambda e. go(e, x) : \\
p \quad \quad p \multimap ev \multimap g
\end{array}
\quad
\begin{array}{c}
\text{[to]} \quad \quad \text{[London]} \\
\lambda x \lambda e. to(e, x) : \quad london : \\
l \multimap t \quad \quad l
\end{array}
\quad
\begin{array}{c}
\text{[DERIVEDPP-COMBINER]} \\
\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : \\
t \multimap [ev \multimap g] \multimap ev \multimap g
\end{array}
\\
\hline
\begin{array}{c}
\lambda e. go(e, peter) : \\
ev \multimap g
\end{array}
\quad
\begin{array}{c}
\lambda Q \lambda e. Q(e) \wedge to(e, london) : \\
[ev \multimap g] \multimap ev \multimap g
\end{array}
\\
\hline
\begin{array}{c}
\text{[PAST]} \\
\lambda P. \exists e [P(e) \wedge past(e)] : \\
[ev \multimap g] \multimap g
\end{array}
\quad
\begin{array}{c}
\lambda e. go(e, peter) \wedge to(e, london) : \\
ev \multimap g
\end{array}
\\
\hline
\exists e [go(e, peter) \wedge to(e, london) \wedge past(e)] : g
\end{array}$$

Figure 4.8: Proof for *Peter went to London*

4.5 Conclusion

Before we move on to a discussion of the passive, let us offer a brief recapitulation of what has been presented in this chapter:

- There are four main uses of prepositions which I have analysed:
 - as the head of an adjunct,
 - as the head of a core argument,
 - to introduce a derived argument,
 - to idiosyncratically mark an argument.
- A single lexical entry per preposition can accommodate this variation, using a disjunction between several templates which provide the relevant syntactic and/or semantic information. This allows a single meaning to be given to each preposition.
- The additional information provided by the templates is as follows:

$$\begin{aligned}
 (178) \quad \text{ADJUNCT} &= \\
 &(\text{ADJ} \in \uparrow) \\
 &(\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1) \\
 &\text{@PP-MODIFIER}
 \end{aligned}$$

$$\begin{aligned}
 (179) \quad \text{COREARG(I)} &= \\
 &\text{@OBL(I)} \\
 &(\uparrow \text{OBJ})_\sigma = (\uparrow_\sigma \text{ARG}_1) \\
 &\uparrow_\sigma =_c ((\text{OBL } \uparrow)_\sigma \text{ARG}_n)
 \end{aligned}$$

$$\begin{aligned}
 (180) \quad \text{DERIVEDARG(I, A)} &= \\
 &\text{@OBL(I)} \\
 &(\uparrow_\sigma \text{ARG}_1) = ((\text{OBL } \uparrow)_\sigma \text{A}) \\
 &\text{@DERIVEDPP-COMBINER}
 \end{aligned}$$

$$\begin{aligned}
 (181) \quad \text{IDIOSYNCRATIC(I)} &= \\
 &\text{@OBL(I)} \\
 &\neg(\uparrow_\sigma \text{ARG}_1)_{\sigma^{-1}}
 \end{aligned}$$

- An example lexical entry, for LOCATION-introducing *on*, is given below:

$$(182) \quad on \quad P \quad (\uparrow \text{PRED}) = \text{'on'}$$

$$\quad \quad \quad \{ @\text{ADJUNCT} \mid$$

$$\quad \quad \quad \quad @\text{COREARG}(\text{LOC}) \mid$$

$$\quad \quad \quad \quad @\text{DERIVEDARG}(\text{LOC}, \text{LOCATION}) \mid$$

$$\quad \quad \quad \quad @\text{IDIOSYNCRATIC}(\text{ON}) \}$$

$$\lambda x \lambda e. on(e, x) : (\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}$$

Note that this will mark its OBL with a thematic role index in its core and derived argument uses, while marking it with a prepositional name in the idiosyncratic use.

- Which template is selected will be determined by a combination of (a) the phrase-structure position where the PP is introduced and (b) the argument structure of the main verb (whether it has an OBLIQUE core argument, for example).
- Syntactically, annotations on the relevant PP nodes introduced by the V' expansion rule in English ensure that the correct type of preposition is used in the correct position, so that core arguments are not separated from the verb by adverbials, idiosyncratic and core arguments precede derived arguments, and adverbials can appear interspersed among idiosyncratic and derived arguments.
- Semantically, prepositions have a relatively simple intrinsic meaning. They combine with their argument to produce the meaning of the whole PP, which is a function from events to truth values. This unsaturated function is the meaning which is consumed by verbs which take

core PP arguments. Derived arguments and adjuncts bring along their own MCs which allow their meanings to be combined with the main verb's—both in a similar way, since derived arguments behave semantically like modifiers. The semantics of idiosyncratic PPs is handled by the IPVs themselves.

The analysis presented in this chapter will provide the foundations for the discussion of the prepositional passive from Chapter 6 onwards. Before we can turn to that, however, we need to know how we are to handle the passive voice. This is the focus of the following chapter.

Chapter 5

The Passive

5.1 What is the passive?

Voice is a syntactic feature, and so in LFG it is represented as an f-structure attribute, VOICE, with at least the possible values ACTIVE and PASSIVE. The value of the VOICE attribute is contributed by verbal lexical entries (and ultimately, presumably, by the morphology). However, the passive voice also brings with it a number of other features: it changes mapping behaviour, and it allows the optional suppression of the verb's highest argument. We can represent this in a template (based in part on that of Asudeh & Giorgolo 2012: 79):

$$(183) \quad \text{PASSIVE} = \\ \quad (\uparrow \text{VOICE}) = \text{PASSIVE} \\ \quad @\text{PASSIVEMAPPING} \\ \\ \quad (\lambda P.\exists x[P(x)] : [(\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}] \multimap \uparrow_{\sigma})$$

The first line gives the requisite f-structural information regarding voice. The second we will return to shortly. The final line gives an optional meaning

constructor which existentially closes the highest argument of the verb, allowing for it to be syntactically unrealised. It is optional because it will only be used in the case of the short passive, and left unused in the case of the *by*-passive, as we will see below.

What mapping information is encoded by the passive is not entirely clear. Asudeh & Giorgolo (2012) assume that it maps the subject to the ARG₂ position:

$$(184) \quad (\uparrow \text{SUBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG}_2)$$

However, as we have seen, derived arguments can also be promoted to passive subject, and so this is too restrictive. Kibort (2001, 2013a), on the other hand, sees passive morphology as restricting the mapping possibilities of the highest argument so that it can only be realised as an OBL, if it is syntactically realised at all. The fact that the ARG₂, if there is one, then surfaces as the passive subject follows automatically from default mapping information, as per the standard LMT treatment of Patient-like arguments (Bresnan & Kanerva 1989). In broad terms, this is the approach assumed here, although since the formal workings of Lexical Mapping Theory are not the focus of this thesis, I will omit the details here.¹ I therefore leave the contents of PASSIVEMAPPING unanalysed, but assume that its function is to restrict the mapping possibilities of the verb's ARG₁, and that, in the absence of any other factors, the ARG₂ of a transitive verb will surface as the passive subject. In Chapter 6, we will show how the prepositional argument can also surface as a subject in the P-passive.

¹Findlay (2014, especially pp. 34–36) presents an analysis of the passive which combines the approaches of Asudeh & Giorgolo (2012) and Kibort (2001).

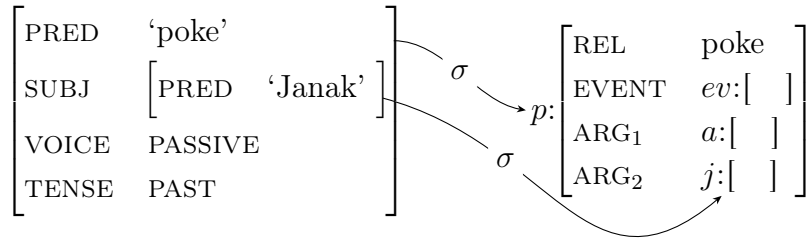


Figure 5.1: Structures and correspondences for *Janak was poked*

5.2 The passive in action

In this section, we give an example of the passive with a simple transitive verb to demonstrate the use of the optional **[PASSIVE]** meaning constructor.

(185) gives the lexical entry for passive *poked*:

(185) *poked* V (\uparrow PRED) = 'poke'
 @PASSIVE

$$\lambda y \lambda x \lambda e . \text{poke}(e, x, y) :$$

$$(\uparrow_{\sigma} \text{ARG}_2) \multimap (\uparrow_{\sigma} \text{ARG}_1) \multimap (\uparrow_{\sigma} \text{EVENT}) \multimap \uparrow_{\sigma}$$

Figure 5.1 shows the relevant structures and correspondences for the sentence *Janak was poked*, the instantiated meaning constructors are given in (186), and Figure 5.2 (p. 105) shows the Glue proof (I assume that the auxiliary *was* simply provides tense information, and so its meaning contribution is the same as that contributed by the PAST template).

(186) **[Janak]**
janak : *j*

[was]
 $\lambda P. \exists e [P(e) \wedge \text{past}(e)] : [ev \multimap p] \multimap p$

[poked]
 $\lambda y \lambda x \lambda e. \text{poke}(e, x, y) : j \multimap a \multimap ev \multimap p$

[PASSIVE]
 $\lambda P. \exists x [P(x)] : [a \multimap p] \multimap p$

Notice that if the optional **[PASSIVE]** MC were not selected in this instance (the short passive), there would be no successful proof for the sentence. We would have a problem of resource deficit, since no lexical item is contributing the ARG₁ resource, and so the verbal dependency could not be satisfied.² The optional MC removes this dependency and existentially closes the function on this argument in the meaning language, exactly as we require. On the other hand, if the ARG₁ is contributed lexically, via a *by*-phrase, then the optional MC *cannot* be selected, or else we would have the opposite problem of resource surplus, since the ARG₁ resource would not be used up. This is how the resource sensitivity of Glue Semantics ensures that the optional MC is selected if and only if it is needed (on which see Asudeh & Giorgolo 2012: 75) .

To give a full analysis of the *by*-passive requires one more piece of the puzzle: the lexical contribution of passive *by*. I propose that this *by* is semantically empty, and that its only purpose is to map its object to the ARG₁ position of the main clause's semantic structure. Thus, the lexical entry for

²I assume that the mapping theory will ensure that the ARG₁ attribute is present at semantic structure even when nothing projects it from f-structure (on which see Findlay 2014: 28, fn. 9).

$$\begin{array}{c}
\begin{array}{c}
\text{[poked]} \\
\lambda e \lambda y \lambda x. \text{poke}(e, x, y) : \\
ev \multimap j \multimap a \multimap p \quad [e : ev]^1
\end{array} \\
\hline
\begin{array}{c}
\text{[Janak]} \\
\lambda y \lambda x. \text{poke}(e, x, y) : \quad \text{janak} : \\
j \multimap a \multimap p \quad j
\end{array} \\
\hline
\begin{array}{c}
\text{[PASSIVE]} \\
\lambda P. \exists x [P(x)] : \\
[a \multimap p] \multimap p
\end{array} \\
\hline
\begin{array}{c}
\lambda x. \text{poke}(e, x, \text{janak}) : \\
a \multimap p
\end{array} \\
\hline
\begin{array}{c}
\exists x [\text{poke}(e, x, \text{janak})] : p \\
\hline
\lambda e. \exists x [\text{poke}(e, x, \text{janak})] : \\
ev \multimap p \quad \multimap_{\mathcal{I},1}
\end{array} \\
\hline
\begin{array}{c}
\text{[was]} \\
\lambda P. \exists e [P(e) \wedge \text{past}(e)] : \\
[ev \multimap p] \multimap p
\end{array} \\
\hline
\exists e \exists x [\text{poke}(e, x, \text{janak}) \wedge \text{past}(e)] : p
\end{array}$$

Figure 5.2: Proof for *Janak was poked*

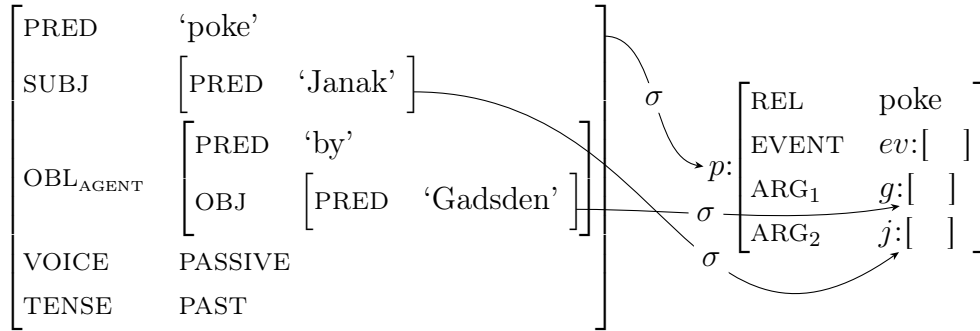


Figure 5.3: Structures and correspondences for *Janak was poked by Gadsden*

by is as follows (modified from Asudeh & Giorgolo’s (2012: 76) ex. (31)):

$$\begin{aligned}
 (187) \quad by \quad P \quad & (\uparrow \text{PRED}) = \text{'by'} \\
 & (\text{OBL}_{\text{AGENT}} \uparrow) \\
 & ((\text{OBL} \uparrow) \text{VOICE}) =_c \text{PASSIVE} \\
 & (\uparrow \text{OBJ})_{\sigma} = ((\text{OBL} \uparrow)_{\sigma} \text{ARG}_1)
 \end{aligned}$$

With the object of *by* mapped to the ARG₁ position, the proof progresses just as in the active, since the optional passive MC is not used. Relevant structures and correspondences for *Janak was poked by Gadsden* are given in Figure 5.3. Instantiated meaning constructors are given in (188), and the Glue proof is shown in Figure 5.4 (p. 107).

$$\begin{aligned}
 (188) \quad & \mathbf{[Janak]} \\
 & \text{janak} : j \\
 & \\
 & \mathbf{[was]} \\
 & \lambda P. \exists e [P(e) \wedge \text{past}(e)] : [ev \multimap p] \multimap p \\
 & \\
 & \mathbf{[poked]} \\
 & \lambda y \lambda x \lambda e. \text{poke}(e, x, y) : j \multimap g \multimap ev \multimap p \\
 & \\
 & \mathbf{[Gadsden]} \\
 & \text{gadsden} : g
 \end{aligned}$$

5.3 Affectedness

One important semantic constraint on the passive is what has been called the *affectedness condition* (Bolinger 1977; Davison 1980; Goh 2003; Kim 2009). This states that the subject of a passive must in some way be sufficiently affected by the action in order to be a permissible passive subject. Bolinger (1977: 67) formulates it as follows: “the subject in a passive construction is conceived to be a true patient, i.e. to be genuinely affected by the action of the verb”. Riddle & Sheintuch (1983) have criticised this, and instead propose what we might call a *prominence condition*: “the crucial condition on the occurrence of any NP as a passive subject is that its referent play the most prominent role in the eyes of the speaker within the situation described by the passive clause” (p. 559). As Lødrup (1991: 120–121) points out, it is not necessarily clear that either of these generalisations is quite adequate, but something like them is needed to explain contrasts such as the following:

- (189) a. The books weighed twenty kilos.
b. * Twenty kilos was/were weighed by the books.

The suggestion is that there is no sense in which a unit of measurement is affected by being the weight of some books, and so this is not an acceptable passive. The affectedness condition (or whatever we wish to call it) also plays an important role in the P-passive, accounting for contrasts like the following:

- (190) a. This bed has been slept in.
b. * This bed has been slept under.

- (191) a. This house has been lived in by my brother (for several years).
 b. * New York has been lived in by my brother (for several years).

A bed is more affected by being slept in than under (the sheets are ruffled in the first case but not the latter, for example); and a house is more affected by being lived in by a single person than New York is (the net effect of a single person on New York is negligible, but on the house, presumably it is significant: the curtains are opened and closed, the garden is kept tidy, the paintwork is upkeep, etc.). Again, this conception of ‘affectedness’ is a little fuzzy around the edges, but the intuition, I believe, is clear.

Further work is needed to clarify exactly what constraint(s) is (are) in play here, but for our present purposes it suffices to assume that such a constraint can indeed be formulated. I use the semantic predicate *affected* to represent whatever status is required of the subject of a passive. Formally, then, we can capture this constraint by adding the following modifier MC to our our PASSIVE template:

- (192) $\lambda P \lambda x \lambda e. P(x)(e) \wedge affected(e, x) :$
 $[(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma] \multimap$
 $(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$

On the glue side, this consumes a verbal dependency on the subject and returns an identical resource; on the meaning side, it modifies the meaning of the verb so that it also applies the *affected* predicate to its subject, relative to the event expressed by the verb.

The full PASSIVE template is therefore as follows:

$$\begin{aligned}
(193) \quad \text{PASSIVE} = & \\
& (\uparrow \text{VOICE}) = \text{PASSIVE} \\
& @\text{PASSIVEMAPPING} \\
& \lambda P \lambda x \lambda e. P(x)(e) \wedge \textit{affected}(e, x) : \\
& [(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma] \multimap \\
& \quad (\uparrow \text{SUBJ})_\sigma \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma \\
& (\lambda P. \exists x [P(x)] : [(\uparrow_\sigma \text{ARG}_1) \multimap \uparrow_\sigma] \multimap \uparrow_\sigma)
\end{aligned}$$

Figure 5.5 (p. 111) shows the Glue proof for *Janak was poked* revised to incorporate the new **[AFFECTEDNESS]** MC.

In what follows, I will not explicitly use the affectedness MC in Glue proofs. Its only role is to rule out the kinds of examples we have seen in this chapter. The passives I will be considering from now on are acceptable or not for other reasons, and so to include the affectedness MC would only unnecessarily bloat the proofs.

We now have all the framework we need to develop an analysis of the P-passive, both the semantic prepositional passive (SPP) and the idiosyncratic prepositional passive (IPP), to which we turn in the following chapters.

$$\begin{array}{c}
\begin{array}{c}
\text{[AFFECTEDNESS]} \\
\lambda P \lambda z \lambda e. P(z)(e) \wedge \text{affected}(e, z) : \\
[j \multimap ev \multimap p] \multimap j \multimap ev \multimap p
\end{array}
\qquad
\begin{array}{c}
\text{[poked]} \\
\lambda x \lambda y \lambda e. \text{poke}(e, x, y) : \\
a \multimap j \multimap ev \multimap p \qquad [u : a]^1
\end{array}
\end{array}$$

$$\begin{array}{c}
\lambda z \lambda e. \text{poke}(e, u, z) \wedge \text{affected}(e, z) : \\
j \multimap ev \multimap p
\end{array}
\qquad
\begin{array}{c}
\lambda y \lambda e. \text{poke}(e, u, y) : \\
j \multimap ev \multimap p
\end{array}$$

$$\begin{array}{c}
\lambda e. \text{poke}(e, u, \text{janak}) \wedge \text{affected}(e, \text{janak}) : \\
ev \multimap p
\end{array}
\qquad
\begin{array}{c}
\text{[Janak]} \\
\text{janak} : \\
j
\end{array}$$

$$\begin{array}{c}
\text{[PASSIVE]} \\
\lambda P. \exists x [P(x)] : \\
[a \multimap p] \multimap p
\end{array}
\qquad
\begin{array}{c}
\text{poke}(e, u, \text{janak}) \wedge \text{affected}(e, \text{janak}) : p \\
\lambda u. \text{poke}(e, u, \text{janak}) \wedge \text{affected}(e, \text{janak}) : a \multimap p
\end{array}$$

$$\begin{array}{c}
\text{[was]} \\
\lambda P. \exists e [P(e) \wedge \text{past}(e)] : \\
[ev \multimap p] \multimap p
\end{array}
\qquad
\begin{array}{c}
\exists x [\text{poke}(e, x, \text{janak}) \wedge \text{affected}(e, \text{janak})] : p \\
\lambda e. \exists x [\text{poke}(e, x, \text{janak}) \wedge \text{affected}(e, \text{janak})] : \\
ev \multimap p
\end{array}$$

$$\exists e \exists x [\text{poke}(e, x, \text{janak}) \wedge \text{affected}(e, \text{janak}) \wedge \text{past}(e)] : p$$

Figure 5.5: Proof for *Janak was poked*

Chapter 6

The Prepositional Passive I: Adjacency and the Semantic Prepositional Passive

We now come to the central question of this thesis: what is the correct analysis of the prepositional passive? In general terms, I seek to explain the P-passive by making as few new assumptions as possible. In particular, I wish to avoid positing homophonous variants of regular prepositions, such as ‘intransitive’ or non-projecting versions, if they are not independently justified. In the analysis that follows, the prepositions involved in the P-passive will be just the same as those involved in the active versions of the sentences in question, projecting the same OBL GF and bearing the same meaning constructor(s).

Part of the motivation for this approach is the observation that the P-passive is in fact a very productive phenomenon (a point also emphasised by Davison 1980 and Riddle & Sheintuch 1983), especially in cases where the prepositional complement of the verb in the active would be classed as a derived argument:

- (194) a. This shovel has been shovelled with for many years.
b. This bed has been slept in by so many people.
c. This bowl has been eaten out of every day.
d. This box has been jumped on far too much.

This seems to hold for a variety of prepositions, and an almost endless selection of verbs. Further evidence for its generality is the fact that it seems to be possible with relatively recent neologisms:

- (195) a. We can't bring you everything that is being blogged about.
(COCA)
b. Sean was tweeted at by Molly Mesnick.
(<http://hollywoodlife.com/2013/03/12/catherine-giudici-sean-lowes-secret-engagement/>)
c. This will definitely be facebooked on!
(<http://thenaturalnutritionist.com.au/coconut-oil-the-scoop/>)

With this in mind, it would seem unparsimonious to suggest that whatever is responsible for the (semantic) P-passive is found in the lexical entries of any particular verbs or prepositions. I therefore intend to treat the semantic prepositional passive as the general case, rather than as an exception. Given this approach, it makes sense to see it as generated by regular and familiar processes as far as possible.

In the following two chapters, I present the analysis of two different types of prepositional passive. This chapter begins by introducing the general problem of syntactic adjacency, before presenting the analysis of the semantic prepositional passive (SPP). The following chapter discusses idiosyncratic prepositional verbs (IPVs) in general, including their role in the idiosyncratic prepositional passive (IPP). Lastly, in Chapter 8, I discuss the

case of transitive prepositional verbs, which offer a challenge to the analysis presented in this and the following chapter.

6.1 Adjacency

The most significant syntactic restriction on the P-passive (both the SPP and IPP) appears to be adjacency. As discussed by Bresnan (1982), Alsina (2009), and others, it would seem that no material can intervene between the verb and preposition in the passive, even when it can in the active.

Thus, we have the contrasts below:

Intervening DP:

- (196) a. Russell wrote his memoirs with that pen.
b. * That pen has been written Russell's memoirs with.
- (197) a. They rely 100 per cent on rainwater. (COCA)
b. * Rainwater is relied 100 per cent on.

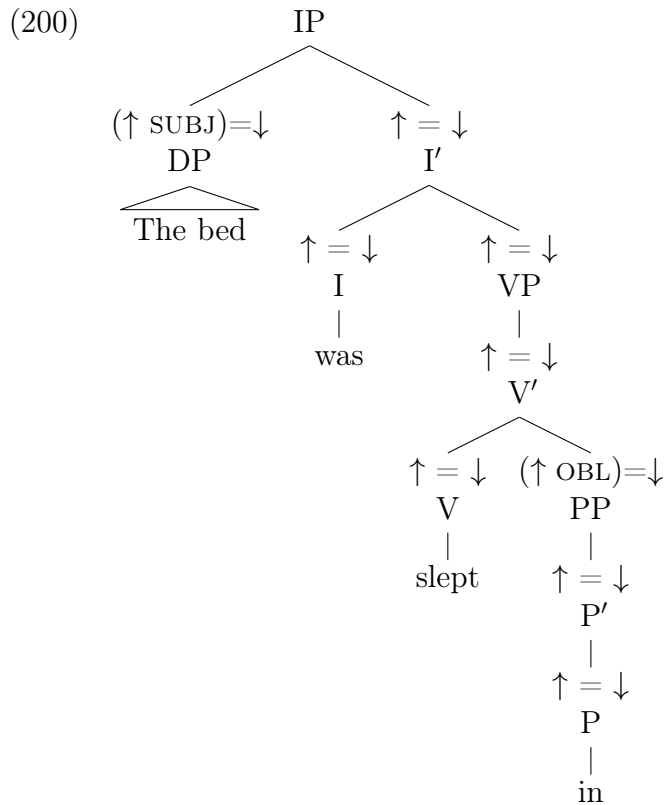
Intervening adverb:

- (198) a. John slept soundly in the bed.
b. * This bed has been slept soundly in (by John).
- (199) a. They had to deal immediately with predator threats.
(Isbell 2009: 72)
b. * Predator threats had to be dealt immediately with (by them).

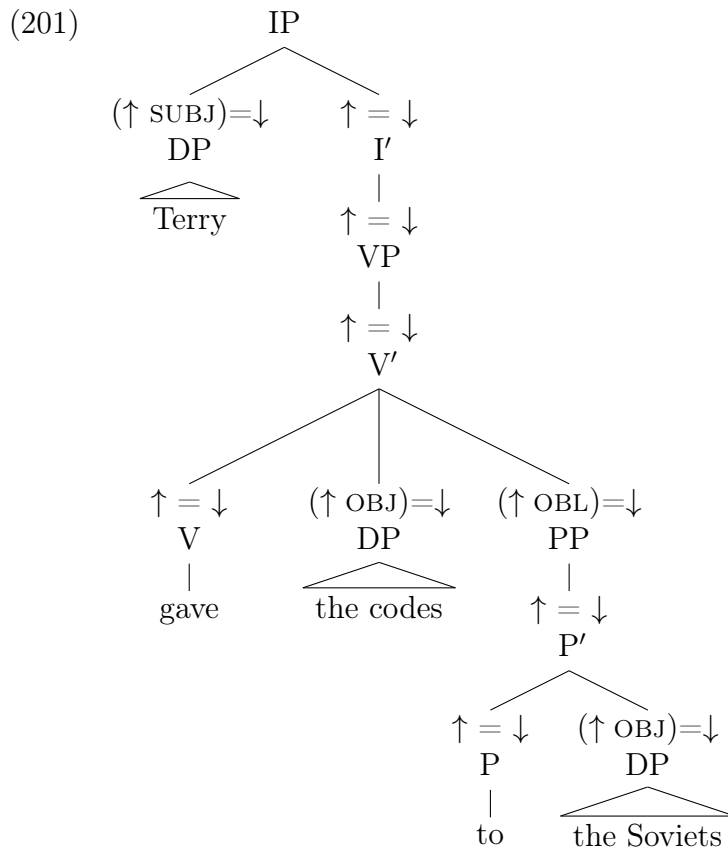
Bresnan's solution to this puzzle is to posit morphological reanalysis in the case of the passive—if the V and P actually make up a single morphological word, it follows that material cannot intrude between them. However, this account is unsatisfactory for a number of other reasons, as we saw in Chapter 3. Alsina, on other hand, interprets the contrasts in (196–199) as evidence for c-structural adjacency (2009: 56). Although I will not follow

the specifics of Alsina's account, c-structure will play an important role in my analysis, albeit augmented with functional information as well.

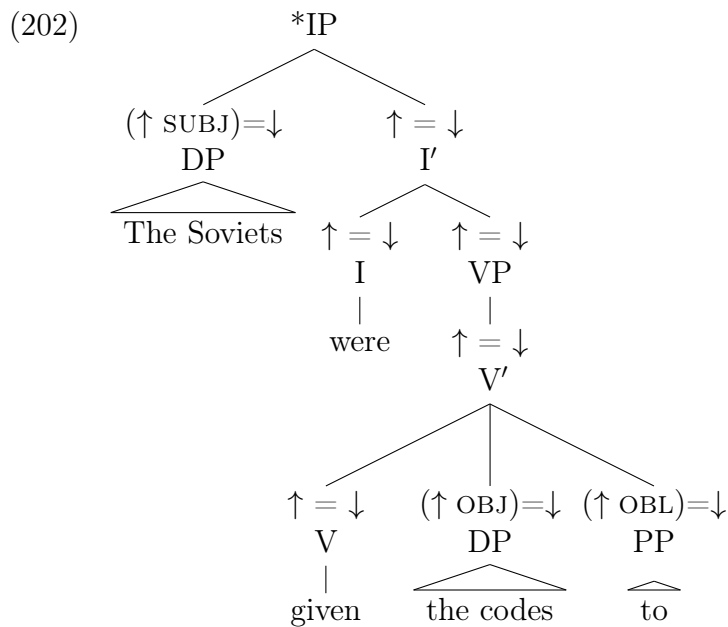
The adjacency information suggests the following c-structure for the P-passive, exemplified with the sentence *The bed was slept in*:



The question then arises: how do we prevent material from appearing between the verb and the PP, as in the active? Certainly, they must be sisters, but this requirement is not strong enough. Recall from Chapter 4.3 that the standard LFG analysis of ditransitives like *put* or *give* is as in (201):



All things being equal, this would seem to license the c-structure in (202).



Evidently, mere sisterhood is insufficient; there is a stronger adjacency requirement in force. One possibility might be that literal string adjacency is required; that is, adjacency in the phonological string (as described by Asudeh 2009). However, this would rule out *any* intervening material between the verb and preposition, which is too strong: certain material *can* intervene, namely particles and non-thematic objects:¹

- (203) a. The partially eaten food was made **up** for by our conversation.
(COCA)
b. As the first local settler he was looked **up** to by most. (COCA)
- (204) a. Get nukes and you will be paid **attention** to. (COCA)
b. This positive facilitating function should not be lost **sight** of.
(BNC)

In (203), the particle *up* intervenes between the verb and preposition, while in (204), the verb and preposition are separated by an idiomatic, and therefore non-thematic, object, *attention* or *sight*. The key unifying factor that these nominals and particles both share is their non-thematicity. It is only semantically inert material which can intervene between the verb and the preposition in the P-passive. In LFG, the syntactic reflex of thematicity is possession of a PRED value; semantically empty f-structures contain no PRED.

We can describe this generalisation by making use of the concept of *functional precedence* (f-precedence; Sadler 1999; Falk 2006), a relation between f-structures:

- (205) **F-precedence:** (Kaplan & Zaenen 1995 [1989]; Bresnan 2001)
 f_1 f-precedes f_2 ($f_1 <_f f_2$) if and only if there are c_1 and c_2 such

¹The non-thematic restriction holds for English but not necessarily for Norwegian. See Lødrup (1991) and footnote 5 in Chapter 3 (p. 61) for some discussion.

that c_1 is the rightmost node in $\phi^{-1}(f_1)$, c_2 is the rightmost node in $\phi^{-1}(f_2)$, and c_1 precedes c_2 .

In other words, $f_1 <_f f_2$ iff the rightmost c-structure node which projects the f-structure f_1 precedes the rightmost c-structure node which projects the f-structure f_2 .

For present purposes, I will make use of the following slightly modified definition:

(206) **Terminal f-precedence:**

f_1 terminally f-precedes f_2 ($f_1 \ll_f f_2$) if and only if there are c_1 and c_2 such that c_1 is the rightmost terminal node in $\phi^{-1}(f_1)$, c_2 is the rightmost terminal node in $\phi^{-1}(f_2)$, and c_1 strictly precedes c_2 .

This adds two more restrictions: c_1 and c_2 must be terminal nodes, and c_1 must strictly precede c_2 (i.e. the precedence relation is not reflexive).²

Terminal f-precedence is an ordering on the f-structures of terminal nodes. This makes it essentially the functional reflex of string precedence, since terminal nodes correspond to members of the phonological string (via the π -function—see Asudeh 2009; I am assuming there are no empty categories such as traces).

The relevant adjacency relation in the P-passive can now be stated as

²Both additions I make here can be easily stated in formal terms. The terminal node requirement can be enforced using the native c-structure mother relation, \mathcal{M} :

$$(i) \quad \mathcal{M}^{-1}(c_1) = \emptyset \wedge \mathcal{M}^{-1}(c_2) = \emptyset$$

This says that the inverse of the mother relation applied to c_1 and c_2 is empty. In other words, these nodes have no daughters, i.e. they are terminal nodes.

The strict precedence requirement simply ensures that the precedence relation is not construed as reflexive, and so can be enforced by (ii):

$$(ii) \quad c_1 \neq c_2$$

follows: there must be no PRED-ful (i.e. thematic) f-structure which terminally f-precedes the prepositional f-structure, f_P , and which is terminally f-preceded by the verbal f-structure, f_V . In other words, no thematic material must intervene between the verb and the preposition. We can write this formally as follows:

$$(207) \quad \neg(f_V \ll_f \{ (f_V \text{ GF } \text{ }) \mid (f_V \text{ ADJ } \text{ } \in \text{ }) \} \ll_f f_P) \\ \quad \quad \quad (\rightarrow \text{ PRED}) \quad \quad \quad (\rightarrow \text{ PRED})$$

This makes use of two *off-path constraints* (Dalrymple 2001: 148–151), $(\rightarrow \text{ PRED})$. These are annotations on an f-structure path which constrain the properties that f-structures on that path can have. The symbol \rightarrow refers to the value of the attribute which bears the annotation; in this case, the f-structure value of GF or ADJ \in . The expression $(\rightarrow \text{ PRED})$ specifies that this value contains a PRED attribute. Thus, the whole expression in (207) says that it is not the case that the verbal f-structure terminally f-precedes either a GF or a member of an ADJ set which (a) has a PRED value and which (b) itself terminally f-precedes the prepositional f-structure.³ In other words, nothing thematic can intervene between the verb and the preposition.

This constraint will be appealed to in different ways in the SPP and IPP, with different expressions standing for f_V and f_P , depending on where (207) is introduced, as we will see below.

³Since the verbal f-structure corresponds to the main clause, the GF or ADJ \in will be contained within f_V , which is why they are written $(f_V \text{ GF})$ and $(f_V \text{ ADJ } \in)$.

6.2 The semantic prepositional passive

In the semantic prepositional passive (SPP), the preposition brings with it its normal semantic contribution. That is, the meaning of *The bed was slept in* is that the bed was slept *in*, and not *on* or *under*, for example. The problem we must address is that the preposition has no object in the passive, and its object is usually what the prepositional MC is applied to in order to give the meaning of the PP; in the passive, however, it is the subject that it should be applied to. The problem of the P-passive is how to make this connection.

One way to do this is syntactically. This is the approach taken in the structure-sharing accounts of Alsina (2009) and Lødrup (1991), for example, where it is claimed that the preposition *does* have an object in the passive, but that it is structure-shared with the clausal subject. I am sympathetic to their intuition that there is still a connection between the subject of the P-passive and the stranded preposition, but I do not believe they are right in considering it a syntactic one (as we saw in Chapter 3.3). My intuition regarding the P-passive is rather that the connection between the preposition and the subject is best expressed in terms of the mappings which represent the interface between syntax and semantics. The subject is still interpreted as a semantic argument of the preposition, but it is no longer syntactically related. Since they did not consider the semantics of the prepositional passive, Alsina (2009) and Lødrup (1991) did not have this option available to them, but I believe it offers a neater and more appropriate account of the data. So how can we operationalise this intuition?

As we saw above, the SPP is a very productive phenomenon. As such, the analysis given here is that the information which permits the SPP is introduced by a c-structure rule, rather than by any particular lexical item. The c-structure position which will bear the relevant information is the core argument PP sister of V, since (a) this is the closest PP position, helping to account for the adjacency facts, and (b) there can only be one such PP, meaning that we correctly rule out having multiple stranded prepositions in the P-passive.

This phrase-structure position is annotated with a call of the template LINK, which contains a bundle of functional descriptions. Part of the role of LINK is to map the subject of the clause to the ARG₁ position of the preposition, thus establishing the semantic link required to interpret the P-passive correctly. The other part is to impose the adjacency constraint. Since this template will not be used in the active, we make it optional. The PP node is thus annotated as follows:

$$(208) \quad \begin{array}{l} (\textcircled{\text{LINK}}) \\ (\uparrow \text{OBL}) = \downarrow \\ \text{PP} \end{array}$$

The contents of LINK are given in (209):

$$(209) \quad \text{LINK} = \begin{array}{l} (\uparrow \text{VOICE}) =_c \text{PASSIVE} \\ (\uparrow \text{SUBJ})_\sigma = (\downarrow_\sigma \text{ARG}_1) \\ \neg(\uparrow \ll_f \{ (\uparrow \begin{array}{c} \text{GF} \\ (\rightarrow \text{PRED}) \end{array}) \mid (\uparrow \text{ADJ} \begin{array}{c} \in \\ (\rightarrow \text{PRED}) \end{array}) \} \ll_f \downarrow) \end{array}$$

The first line of (209) simply stipulates that this template is only available in the passive voice. The second line provides the mapping equation to connect the SUBJECT of the main clause to the ARG₁ position of the preposition, thus

establishing the semantic link needed for the SPP. The third line enforces the adjacency constraint, with the appropriate metavariables substituted for f_V and f_P .⁴

Let us give an example of how this works. I assume that a verb like *sleep* is compatible with a derived LOCATION argument. The structures and correspondences for *The bed was slept in* are then given in Figure 6.1 (p. 123). Since the only prepositional template compatible with this position and the selectional properties of the verb is the DERIVEDARG template, the preposition requires mapping information, and so the optional call of LINK is selected. This maps the subject of the main clause, f , to the prepositional argument, b . In addition, since there is nothing which intervenes between the verb and the preposition, the third line of LINK is also satisfied.

Intervening thematic material will correctly violate this constraint. Consider the example of **The Soviets were given the codes to*. The c- and f-structures for this sentence are given in Figure 6.2 (p. 124). In this case, there is a PRED-ful f-structure which is terminally f-preceded by the verbal

⁴In the current analysis, this last line is actually unnecessarily verbose. Given the V' rule we described in Chapter 4, if LINK is called by the core argument PP position, adverbial material is already prevented from intervening between the verb and preposition, since there is no XP slot between them (hence why no adverbial material can intervene between the verb and the core PP argument of ditransitives). In fact, the only thing that can intervene is the DP node which introduces the direct object, and so we can rewrite LINK as in (i), which stipulates that the main clause must not have a thematic object:

- (i) LINK' =
 (↑ VOICE) =_c PASSIVE
 (↑ SUBJ)_σ = (↓_σ ARG₁)
 ¬(↑ OBJ PRED)

The reason I have given the slightly more complex analysis in the text is that, although it is less parsimonious, it has the advantage of describing the facts more generally, and not relying so heavily on a particular account of the relevant c-structural information.

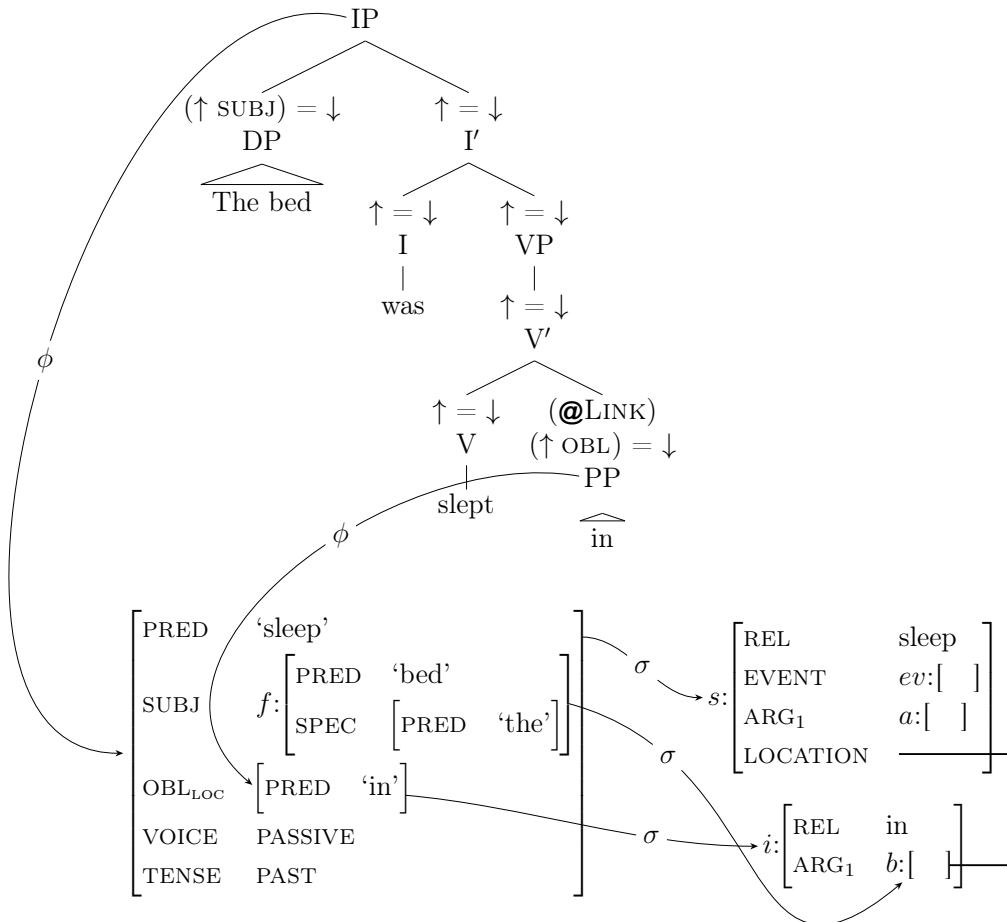


Figure 6.1: Structures and correspondences for *The bed was slept in*

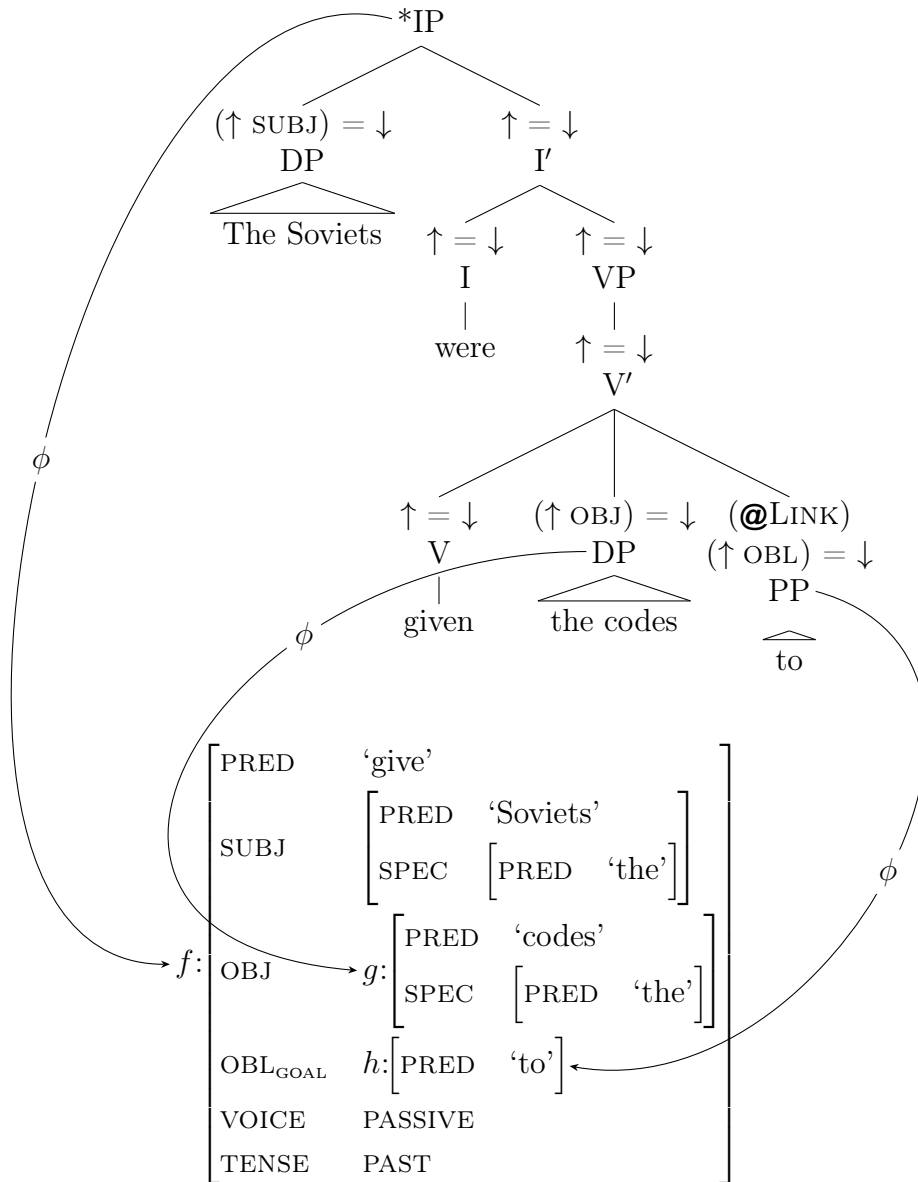


Figure 6.2: C- and f-structures for **The Soviets were given the codes to*

f-structure, f , and which terminally f-precedes the prepositional f-structure, h , namely the OBJ f-structure, g , corresponding to the DP *the codes*. That is, we have $f \ll_f g \ll_f h$, where g contains a PRED attribute, and so the adjacency constraint in LINK is violated. This means that calling this template is impossible, and so the subject of the main clause cannot be mapped to the semantic argument position of the preposition. This, in turn, means that there is no proof for the sentence, since the prepositional MC is left wanting for an ARG₁ resource.

Returning to *The bed was slept in*, we observed above that the only one of the four prepositional templates which is compatible with this position is DERIVEDARG. This means that only derived arguments can participate in the SPP. The template contributes both the required MC for the derived argument meaning, and also the mapping information regarding the derived argument attribute at s-structure; in the present example, that the preposition's ARG₁ is the main s-structure's LOCATION argument.

With the mapping achieved via the LINK template, and the derived argument MC introduced by the preposition, the proof continues much as for the active. Partial lexical entries for *slept* and *in* are given below,⁵ followed by the instantiated meaning constructors for *The bed was slept in*. The Glue proof is shown in Figure 6.3 (p. 127).

⁵ Here and in what follows, I omit the irrelevant information from the preposition's lexical entry, satisfied that the syntax of the clause and the argument structure of the verb will ensure that the correct template is selected.

- (210) *slept* V (\uparrow PRED) = ‘sleep’
 @PASSIVE
 $\lambda x \lambda e. \text{sleep}(e, x) :$
 $(\uparrow_{\sigma} \text{ARG}_1) \multimap (\uparrow_{\sigma} \text{EVENT}) \multimap \uparrow_{\sigma}$
- (211) *in* P (\uparrow PRED) = ‘in’
 $\{\dots | \text{@DERIVEDARG}(\text{LOC}, \text{LOCATION}) | \dots\}$
 $\lambda x \lambda e. \text{in}(e, x) : (\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}$
- (212) **[the bed]**
 $\iota x [\text{bed}(x)] : b$

[was]
 $\lambda P. \exists e [P(e) \wedge \text{past}(e)] : [ev \multimap s] \multimap s$

[slept]
 $\lambda x \lambda e. \text{sleep}(e, x) : a \multimap ev \multimap s$

[PASSIVE]
 $\lambda P. \exists y [P(y)] : [a \multimap s] \multimap s$

[in]
 $\lambda y \lambda e. \text{in}(e, y) : b \multimap i$

[DERIVEDPP-COMBINER]
 $\lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : i \multimap [ev \multimap s] \multimap ev \multimap s$

As we can see from Figure 6.3, we arrive correctly at the desired meaning for the SPP, namely that someone slept in the bed.

6.2.1 Lexical exceptions

Although the P-passive is very productive, there are certain verbs which cannot appear in the passive with a derived subject, the most prominent of which is the verb *go*:

- (213) a. We went to Banbury.

$$\begin{array}{c}
\vdots \\
\text{[in]} \quad \text{[the bed]} \\
\lambda x \lambda e. in(e, x) : \quad ix[bed(x)] : \\
b \multimap i \quad \quad \quad b \\
\hline
\text{[slept]} \quad \quad \quad \text{[DERIVED PP-COMBINER]} \\
\lambda x \lambda e. sleep(e, x) : \quad \quad \quad \lambda e. in(e, ix[bed(x)]) : \quad \quad \quad \lambda P \lambda Q \lambda e. Q(e) \wedge P(e) : \\
a \multimap ev \multimap s \quad [y : a]^1 \quad \quad \quad i \quad \quad \quad i \multimap [ev \multimap s] \multimap ev \multimap s \\
\hline
\lambda e. sleep(e, y) : \quad \quad \quad \lambda Q \lambda e. Q(e) \wedge in(e, ix[bed(x)]) : \\
ev \multimap s \quad \quad \quad [ev \multimap s] \multimap ev \multimap s \\
\hline
\text{[was]} \\
\lambda P. \exists e [P(e) \wedge past(e)] : \quad \quad \quad \lambda e. sleep(e, y) \wedge in(e, ix[bed(x)]) : \\
[ev \multimap s] \multimap s \quad \quad \quad ev \multimap s \\
\hline
\exists e [sleep(e, y) \wedge in(e, ix[bed(x)]) \wedge past(e)] : \\
s \\
\hline
\lambda y. \exists e [sleep(e, y) \wedge in(e, ix[bed(x)]) \wedge past(e)] : \quad \quad \quad \text{[PASSIVE]} \\
a \multimap s \quad \quad \quad \lambda P. \exists z [P(z)] : \\
\quad \quad \quad [a \multimap s] \multimap s \\
\hline
\exists z \exists e [sleep(e, z) \wedge in(e, ix[bed(x)]) \wedge past(e)] : s
\end{array}$$

Figure 6.3: Proof for *The bed was slept in*

- b. * Banbury was gone to (by us).

It might be suggested that the bar on the passive here is simply down to the affectedness condition, and indeed this intuition is initially supported by comparison with semantically similar verbs:

- (214) a. We travelled to Banbury.
b. * Banbury was travelled to (by us).

However, when we look at other kinds of derived argument, such as that introduced by *in*, the parallelism breaks down:

- (215) a. * This car has been gone in.
b. This car has been travelled in.

It seems that *go* simply *never* appears in the passive, and that this is a fact about the verb which should therefore be lexically encoded.

There are a number of ways this could be achieved formally, depending on one's theory of the lexicon. It could be just be that verbs like *go* are esoterically marked to indicate that they do not participate in the passive alternation. A more interesting theory of the lexicon is implied by Asudeh & Giorgolo (2012), where what we might call a constructive approach is explored. Under this theory, words have core lexical contributions which are then augmented by e.g. voice, tense, mood information introduced by the morphology before they enter into the syntax. For example, the core lexical entry of a verb like *sleep* might be nothing more than (216):

- (216) *sleep* V (↑ PRED) = 'sleep'
 $\lambda e.sleep(e) : (\uparrow_{\sigma} \text{EVENT}) \multimap \uparrow_{\sigma}$

In other words, the verb specifies its PRED value and its basic meaning, but no more. Further information is then added regarding transitivity, tense, etc., this being constrained by various factors (the nature of the *sleep* predicate means that it would not make sense for this verb to have a second, Patient argument, for example).

Given this approach, one way to mark verbs as unpassivisable is to include voice information in this ‘core’ lexical entry, as in (217):

$$(217) \quad go \quad V \quad (\uparrow \text{PRED}) = \text{'go'}$$

$$\quad \quad \quad (\uparrow \text{VOICE}) = \text{ACTIVE}$$

$$\quad \quad \quad \lambda e.go(e) : (\uparrow_{\sigma} \text{EVENT}) \multimap \uparrow_{\sigma}$$

Since LFG assumes monotonicity (on which see Chapter 3, p. ??), information can only be added to this core, never removed, and so any attempt to add passive morphology will result in a violation of Consistency, since the attribute VOICE will be assigned two different values.

However we choose to achieve it, the passive is ruled out in these verbs in the lexicon.

Chapter 7

The Prepositional Passive II: Idiosyncratic Prepositional Verbs and the Idiosyncratic Prepositional Passive

The idiosyncratic prepositional passive (IPP) differs from the SPP in that the stranded prepositions do not contribute their usual meaning to the meaning of the sentence. For example, while a bed can be slept *in/on/under/beside*, or someone talked *to/about/through*, a person can only be relied *on*, and not *off*, *about*, or *with*. In fact, as indicated by the lack of contrasts, the preposition does not seem to contribute any meaning at all: there is nothing inherently locational about relying *on* someone, nor is there anything comitative or instrumental about dealing *with* something. As noted in Chapter 1, the verbs involved in the IPP constitute a class of their own, called idiosyncratic prepositional verbs (IPVs). These verbs stipulate that one of their arguments must be prepositionally marked, and the choice of preposition is an arbitrary matter of lexical idiosyncrasy. This has several implications for the syntax and semantics of these verbs; in this chapter, I

present an analysis of these IPVs, in both the active and the passive.

7.1 Syntax

We can capture the syntactic fact that a particular preposition is always present with these verbs by adding an existential constraining equation to the verb's lexical entry, as in (218):

$$(218) \quad \textit{rely} \quad V \quad (\uparrow \text{PRED}) = \text{'rely'}$$

$$\quad \quad \quad (\uparrow \text{OBL}_{\text{ON}})$$

This specifies that the verbal f-structure must contain an OBL_{ON} attribute. *Reley* must therefore be accompanied at all times by the preposition *on*, which contributes the requisite information. Note that since the equation in (218) uses a prepositional index rather than a thematic role, it will ensure that the preposition calls the IDIOSYNCRATIC template, since the other templates will index their OBL attributes with a thematic role instead:

$$(219) \quad \textit{on} \quad P \quad (\uparrow \text{PRED}) = \text{'on'}$$

$$\quad \quad \quad \{ @\text{ADJUNCT} \mid$$

$$\quad \quad \quad \quad @\text{COREARG}(\text{LOC}) \mid$$

$$\quad \quad \quad \quad @\text{DERIVEDARG}(\text{LOC}, \text{LOCATION}) \mid$$

$$\quad \quad \quad \quad @\text{IDIOSYNCRATIC}(\text{ON}) \}$$

$$\lambda x \lambda e. \textit{on}(e, x) : (\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}$$

7.2 Mapping

Another important trait of IPVs is that they cannot be used intransitively, unlike the verbs involved in the SPP:

- (220) a. Alicia went.
 b. Yoolim spoke.

- (221) a. * Alicia dealt (with).
 b. * Yoolim relied (on).

This is because, unlike those verbs, IPVs are inherently two-place relations. In other words, their basic semantics is as for any transitive verb:

- (222) $\lambda y \lambda x \lambda e. \text{verbal-meaning}(e, x, y) :$
 $(\uparrow_{\sigma} \text{ARG}_2) \text{---} \circ (\uparrow_{\sigma} \text{ARG}_1) \text{---} \circ (\uparrow_{\sigma} \text{EVENT}) \text{---} \circ \uparrow_{\sigma}$

Unlike normal transitive verbs, however, their second argument is the object of a (pre-selected) preposition. That is, they do not bring with them the default mapping information for ARG₂, but instead use the idiosyncratic mapping equation in (223), where OBL is indexed by the appropriate idiosyncratic preposition selection:

- (223) $(\uparrow \text{OBL}_I \text{ OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG}_2)$

This indexing ensures that the object of the idiosyncratically marked PP is selected as the argument of the main verb, and not the object of some other OBL. For example, even though they are headed by the same preposition, the two OBLs in (224) are individuated by their different indices:

- (224) *King Arthur dealt with the problem with his trusty sword.*

PRED	‘deal’				
SUBJ	[“King Arthur”]				
OBL _{WITH}	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">PRED</td> <td style="padding-left: 10px;">‘with’</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">OBJ</td> <td style="padding-left: 10px;">[“the problem”]</td> </tr> </table>	PRED	‘with’	OBJ	[“the problem”]
PRED	‘with’				
OBJ	[“the problem”]				
OBL _{INSTRUMENT}	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">PRED</td> <td style="padding-left: 10px;">‘with’</td> </tr> <tr> <td style="border-right: 1px solid black; padding-right: 10px;">OBJ</td> <td style="padding-left: 10px;">[“his trusty sword”]</td> </tr> </table>	PRED	‘with’	OBJ	[“his trusty sword”]
PRED	‘with’				
OBJ	[“his trusty sword”]				

The version of (223) which accompanies *dealt* will correctly link its ARG₂ with the object of the OBL_{WITH}, and not the OBL_{INSTRUMENT}.

This mapping information is only required in the active, however; in the passive, the default mapping will be sufficient, since the ARG₂ will surface as a SUBJ, which is what we expect from regular transitive verbs in the passive.

7.3 Semantics

We have said that the prepositions which accompany IPVs do not contribute their regular meanings. However, assuming we wish to avoid a proliferation of homophony between semantically contentful versus semantically vacuous prepositions, they will still bring their regular meanings along with them. I propose that IPVs are equipped with a *manager resource* (Asudeh 2004, 2005, 2012) which will remove this unwanted prepositional meaning constructor. Manager resources are schematically of the form given in (225):

$$(225) \quad \lambda Y \lambda X. X : A \multimap B \multimap B$$

On the glue side, this consumes a resource A and returns a dependency $B \multimap B$, which consumes a resource B and returns an identical resource. On the meaning side, it takes two arguments, Y and X , discards the meaning of the former, and returns the identity function on the latter. Ultimately, this allows us to move from a position of having two meaning constructors, $X : B$ and $Y : A$, to only having one, $X : B$, simply discarding the other. This is demonstrated in Figure 7.1 (p. 134).

The manager resource for IPVs in the active will consume the meaning of the idiosyncratically selected preposition and return an identity function

$$\frac{\frac{\lambda Y \lambda X. X : A \multimap B \multimap B \quad Y : A}{\lambda X. X : B \multimap B} \quad X : B}{X : B}$$

Figure 7.1: A manager resource removes a meaning constructor

on its object. We can add such a meaning constructor to our lexical entry for active *rely* as follows:

$$(226) \quad \textit{rely} \quad \text{V} \quad (\uparrow \text{PRED}) = \text{'rely'}$$

$$(\uparrow \text{OBL}_{\text{ON}})$$

$$(\uparrow \text{OBL}_{\text{ON}} \text{ OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG}_2)$$

$$\lambda P \lambda x. x :$$

$$[(\uparrow \text{OBL}_{\text{ON}})_{\sigma} \text{ ARG}_1] \multimap (\uparrow \text{OBL}_{\text{ON}})_{\sigma} \multimap$$

$$(\uparrow \text{OBL}_{\text{ON}} \text{ OBJ})_{\sigma} \multimap (\uparrow \text{OBL}_{\text{ON}} \text{ OBJ})_{\sigma}$$

On the glue side, this MC consumes the implicational resource corresponding to the preposition, and returns a dependency on the resource corresponding to the prepositional object, which returns it unchanged. On the meaning side, this takes the prepositional meaning, discards it, then returns the identity function on the prepositional object.

We are now in a position to present the full analysis of an active voice IPV. To make matters easier, we can abbreviate the functional information used by active voice IPVs into a template, IPV-ACTIVE:

$$(227) \quad \text{IPV-ACTIVE(I)} =$$

$$(\uparrow \text{VOICE}) = \text{ACTIVE}$$

$$(\uparrow \text{OBL}_I)$$

$$(\uparrow \text{OBL}_I \text{ OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ARG}_2)$$

$$\lambda P \lambda x. x :$$

$$[(\uparrow \text{OBL}_I)_{\sigma} \text{ ARG}_1] \multimap (\uparrow \text{OBL}_I)_{\sigma} \multimap$$

$$(\uparrow \text{OBL}_I \text{ OBJ})_{\sigma} \multimap (\uparrow \text{OBL}_I \text{ OBJ})_{\sigma}$$

This takes an idiosyncratic OBL index as an argument, and then provides the requisite syntactic and semantic information for an active voice IPV.

Let us present the analysis of the sentence *Dessert consisted of trifle*. The lexical entry for *consisted* is given below, making use of the new template:

$$(228) \quad \textit{consisted} \quad V \quad (\uparrow \text{ PRED}) = \text{'consist'}$$

$$\quad \quad \quad \textcircled{\text{IPV-ACTIVE(OF)}}$$

$$\quad \quad \quad \textcircled{\text{PAST}}$$

$$\lambda y \lambda x \lambda e. \textit{consist-of}(e, x, y) :$$

$$(\uparrow_{\sigma} \text{ ARG}_2) \multimap (\uparrow_{\sigma} \text{ ARG}_1) \multimap (\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$$

The relevant structures and correspondences for *Dessert consisted of trifle* are shown in Figure 7.2 (p. 136). The instantiated meaning constructors are given in (229), and the Glue proof is shown in Figure 7.3 (p. 137).

$$(229) \quad \textbf{[dessert]}$$

$$\textit{dessert} : d$$

$$\textbf{[consisted]}$$

$$\lambda x \lambda y \lambda e. \textit{consist-of}(e, x, y) : d \multimap t \multimap ev \multimap c$$

$$\textbf{[IPV-ACTIVE]}$$

$$\lambda P \lambda x. x : [a \multimap o] \multimap t \multimap t$$

$$\textbf{[PAST]}$$

$$\lambda P. \exists e [P(e) \wedge \textit{past}(e)] : [ev \multimap c] \multimap c$$

$$\textbf{[of]}$$

$$\lambda x \lambda e. \textit{of}(e, x) : a \multimap o$$

$$\textbf{[trifle]}$$

$$\textit{trifle} : t$$

Now we come to the passive, where things are a little more complicated. Firstly, the manager resource we have introduced will not work in

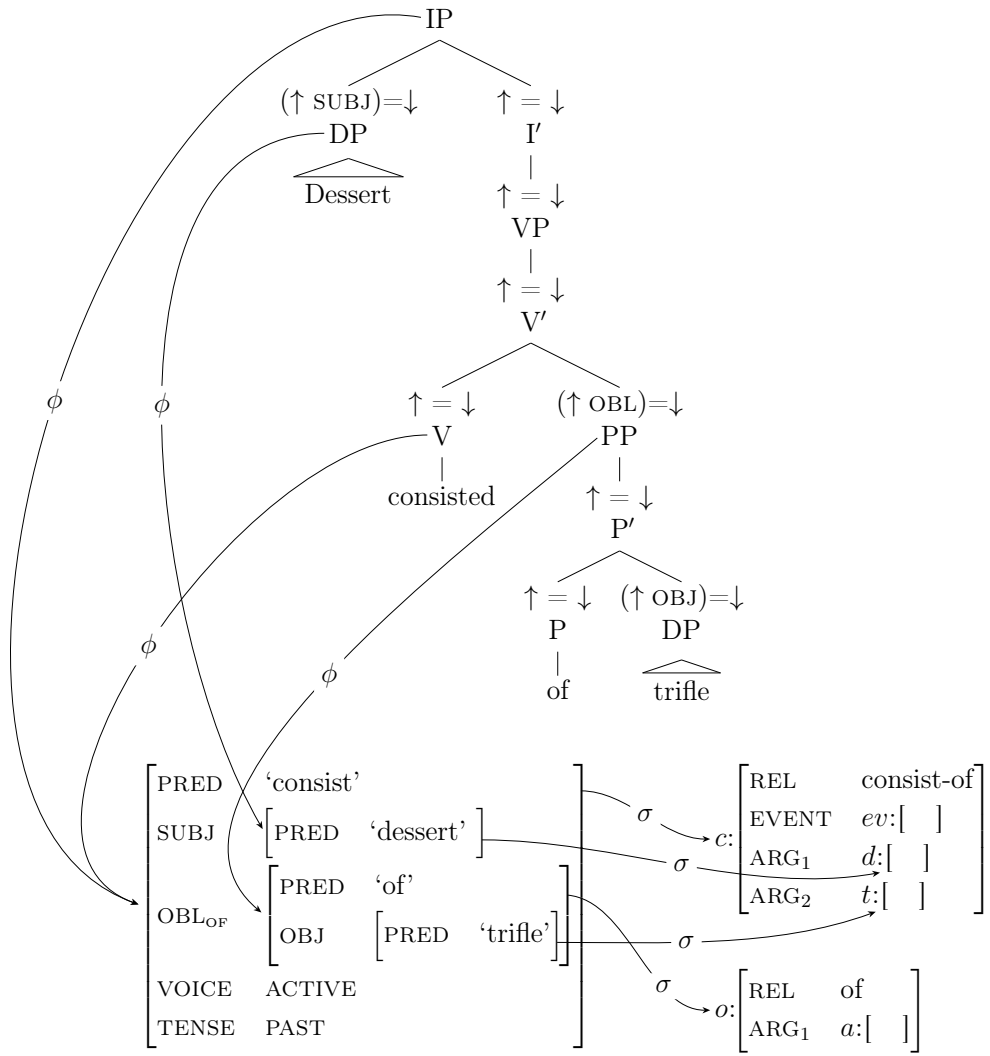


Figure 7.2: Structures and correspondences for *Dessert consisted of trifle*

$$\begin{array}{c}
\begin{array}{cc}
\text{[dessert]} & \text{[consisted]} \\
\text{dessert} : & \lambda x \lambda y \lambda e. \text{consist-of}(e, x, y) : \\
d & d \multimap t \multimap ev \multimap c
\end{array} \\
\hline
\begin{array}{cc}
\lambda y \lambda e. \text{consist-of}(e, \text{dessert}, y) : & \\
t \multimap ev \multimap c &
\end{array} \\
\hline
\begin{array}{cc}
\lambda e. \text{consist-of}(e, \text{dessert}, \text{trifle}) : & \\
ev \multimap c &
\end{array} \\
\hline
\exists e[\text{consist-of}(e, \text{dessert}, \text{trifle}) \wedge \text{past}(e)] : c
\end{array}
\quad
\begin{array}{c}
\begin{array}{cc}
\text{[of]} & \text{[IPV-ACTIVE]} \\
\lambda x \lambda e. \text{of}(e, x) : & \lambda P \lambda x. x : \\
a \multimap o & [a \multimap o] \multimap t \multimap t
\end{array} \\
\hline
\begin{array}{cc}
\text{[trifle]} & \\
\text{trifle} : & \lambda x. x : \\
t & t \multimap t
\end{array} \\
\hline
\begin{array}{c}
\text{[PAST]} \\
\lambda P. \exists e[P(e) \wedge \text{past}(e)] : \\
[ev \multimap c] \multimap c
\end{array}
\end{array}$$

Figure 7.3: Proof for *Dessert consisted of trifle*

the passive, because it refers to $(\uparrow \text{OBL OBJ})_\sigma$, i.e. the semantic structure of the object of the preposition. But in the passive, the preposition *has* no object, and so this structure does not exist. Secondly, the functional descriptions discussed so far fail to impose the required adjacency constraint: recall that no thematic material can intervene between the verb and the stranded preposition in the P-passive.

The first problem can easily be dealt with by changing references to $(\uparrow \text{OBL OBJ})_\sigma$ into references to $(\uparrow_\sigma \text{ARG}_2)$. In the passive, this will allow us to refer to the correct resource even when it is realised syntactically as another GF, *viz.* the SUBJ. (See Section 7.5 below for a reason not to simply amend the active voice MC in the same way.)

However, this does not solve the adjacency issue: the constraints on IPVs we have given so far allow for there to be intervening material between the verb and the preposition. Of course, this is exactly what we want in the active, since, as we noted in Chapter 4, other material can intervene between the verb and the idiosyncratically marked PP:

- (230) a. Charles' army now consisted **in part** of Christianised Saxons and Abotrite Slavs. (BNC)
 b. All three candidates stand **firmly** for a fully democratic and accountable leadership. (BNC)
- (231) a. The rest rely **completely** on the food brought in by the RAF. (BNC)
 b. I'll deal **first of all** with the Children Act. (BNC)

But in the passive, this is not the case:

- (232) a. * The food was relied **completely** on (by the rest).
 b. * The Children Act was dealt **first of all** with (by me).

Rather, just as we noted above, there is a requirement of a particular kind of adjacency. The appropriate adjacency constraint for IPVs is as follows, where OBL_I refers to the idiosyncratically marked oblique:

$$(233) \quad \neg(\uparrow \ll_f \{(\uparrow \begin{array}{c} \text{GF} \\ (\rightarrow \text{PRED}) \end{array}) \mid (\uparrow \text{ADJ} \begin{array}{c} \in \\ (\rightarrow \text{PRED}) \end{array})\} \ll_f (\uparrow OBL_I))$$

Since this MC is introduced by the verb (not by the PP node like LINK), f_P is realised as $(\uparrow OBL_I)$ (rather than \downarrow). As required, this constrains the idiosyncratic OBL so that it is the nearest PRED-ful f-structure which the verb terminally f-precedes, thus preventing any intervening adverbials or thematic objects.

We can now give the contents of the corresponding IPV-PASSIVE template as follows:

$$(234) \quad \text{IPV-PASSIVE(I)} = \\ \text{@PASSIVE} \\ (\text{OBL}_I \uparrow) \\ \neg(\uparrow \ll_f \{(\uparrow \begin{array}{c} \text{GF} \\ (\rightarrow \text{PRED}) \end{array}) \mid (\uparrow \text{ADJ} \begin{array}{c} \in \\ (\rightarrow \text{PRED}) \end{array})\} \ll_f (\uparrow OBL_I)) \\ \lambda P \lambda x.x : \\ [((\uparrow OBL_I)_\sigma \text{ ARG}_1) \multimap (\uparrow OBL_I)_\sigma] \multimap \\ (\uparrow_\sigma \text{ ARG}_2) \multimap (\uparrow_\sigma \text{ ARG}_2)$$

With this in place, I present an analysis of the sentence *Grendel was dealt with*. The lexical entries for *with* and passive *dealt* are given below:

$$(235) \quad \text{dealt} \quad \text{V} \quad (\uparrow \text{PRED}) = \text{'deal'} \\ \text{@IPV-PASSIVE(WITH)} \\ \lambda y \lambda x \lambda e. \text{deal-with}(e, x, y) : \\ (\uparrow_\sigma \text{ ARG}_2) \multimap (\uparrow_\sigma \text{ ARG}_1) \multimap (\uparrow_\sigma \text{ EVENT}) \multimap \uparrow_\sigma$$

- (236) *with* P (\uparrow PRED) = ‘with’
 $\{\dots \mid \textcircled{A}\text{IDIOSYNCRATIC(WITH)}\}$
- $$\lambda x \lambda e. \textit{with}(e, x) :$$
- $$(\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}$$

The relevant structures and correspondences are given in Figure 7.4 (p. 141), the instantiated meaning constructors are given in (237), and the Glue proof is shown in Figure 7.5 (p. 142).

- (237) **[Grendel]**
grendel : *g*
- [was]**
 $\lambda P. \exists e [P(e) \wedge \textit{past}(e)] : [ev \multimap d] \multimap d$
- [dealt]**
 $\lambda x \lambda y \lambda e. \textit{deal-with}(e, x, y) : a \multimap g \multimap ev \multimap d$
- [IPV-PASSIVE]**
 $\lambda P \lambda x. x : [pa \multimap w] \multimap g \multimap g$
- [PASSIVE]**
 $\lambda P. \exists x [P(x)] : [a \multimap d] \multimap d$
- [with]**
 $\lambda x \lambda e. \textit{with}(e, x) : pa \multimap w$

7.4 Particle IPVs

Kim (2009) classifies P-verbs into three types: intransitive, particle, and transitive, as exemplified below (Kim 2009: 3):

- (238) a. Intransitive P-verb:
 They often **speak of** King’s Canterbury.
- b. Particle P-verb:
 They **looked up to** the professor.

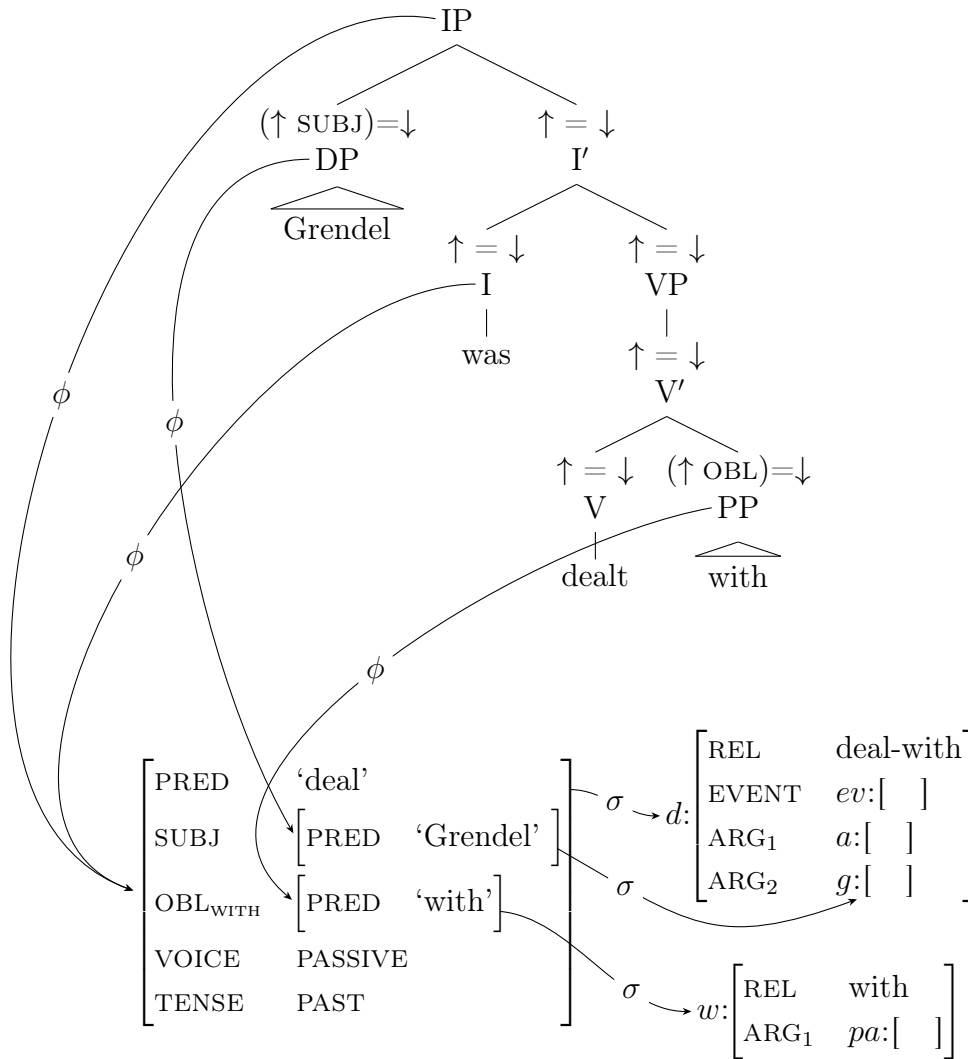


Figure 7.4: Structures and correspondences for *Grendel was dealt with*

c. Transitive P-verb:

The students **paid attention to** the teacher.

The verbs we have been considering so far all fall into the first category. In this section, I present my analysis of particle P-verbs, all of which are IPVs, showing that they fall under the analysis just described for IPVs in general.

The first thing to note is that particle P-verbs have, as well as the usual IPV preposition selection, an extra syntactic constraint, namely the form of the particle they appear with. Particles are semantically empty, and thus do not contribute their own PRED feature; instead, they are f-structure co-heads of the main clausal f-structure, contributing the value of a PARTFORM feature, as in the following lexical entry for the particle *up*:

(239) *up* Part (\uparrow PARTFORM) = UP

Particle IPVs lexically specify that they must appear with a particular particle through a constraining equation like that in the third line of (240):¹

(240) *look* V (\uparrow PRED) = 'look'
 @IPV-ACTIVE(TO)
 (\uparrow PARTFORM) =_c UP

This stipulates that the value of \uparrow 's PARTFORM attribute must be UP, but does not contribute this information itself. Thus, the verb must appear with the particle *up*, which contributes the requisite information, as in (239).

With this extra piece of information, we can modify the IPV templates accordingly; this new template takes a PARTFORM value and an OBL index

¹Note that the treatment of IPVs presented in this chapter will result in a lot of homophony: that is, there is a *look*₁ which is the normal (ambi)transitive *look*, as well as another, *look*₂, which is the one given in (240). The same can be said of *keep*, *pay*, and others. It may be possible to collapse the two into a single, complex entry, but I do not broach this question here.

as arguments:

$$(241) \quad \text{PARTICLEIPV-ACTIVE}(P, I) = \\ (\uparrow \text{PARTFORM}) =_c P \\ @\text{IPV-ACTIVE}(I)$$

$$(242) \quad \text{PARTICLEIPV-PASSIVE}(P, I) = \\ (\uparrow \text{PARTFORM}) =_c P \\ @\text{IPV-PASSIVE}(I)$$

The rest of our analysis carries over without problem. Let us look at two examples to demonstrate this.

For the active sentence *Hansel kept up with Gretel*, we have the following new lexical entries:

$$(243) \quad \textit{kept} \quad V \quad (\uparrow \text{PRED}) = \text{'keep'}$$

$$\quad \quad \quad @\text{PARTICLEIPV-ACTIVE}(\text{UP}, \text{WITH})$$

$$\quad \quad \quad @\text{PAST}$$

$$\lambda y \lambda x \lambda e. \textit{keep-up-with}(e, x, y) :$$

$$(\uparrow_\sigma \text{ARG}_2) \multimap (\uparrow_\sigma \text{ARG}_1) \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$$

$$(244) \quad \textit{up} \quad \text{Part} \quad (\uparrow \text{PARTFORM}) = \text{UP}$$

The relevant structures are given in Figure 7.6 (p. 145).² The Glue proof is essentially the same as that given for *Dessert consisted of trifle* (Figure 7.3, p. 137), since the particle makes no semantic contribution. The instantiated meaning constructors for *Hansel kept up with Gretel* are given in (245), and the Glue proof is shown in Figure 7.7 (p. 147).

²The particle is assigned its own part of speech, Part, which will have to be incorporated into the English V' expansion rule. It appears to be possible to insert adverbial material between the particle and the preposition:

- (i) No one can keep up totally with the outpouring of titles. (COCA)

This suggests that it must appear somewhere before the first XP.

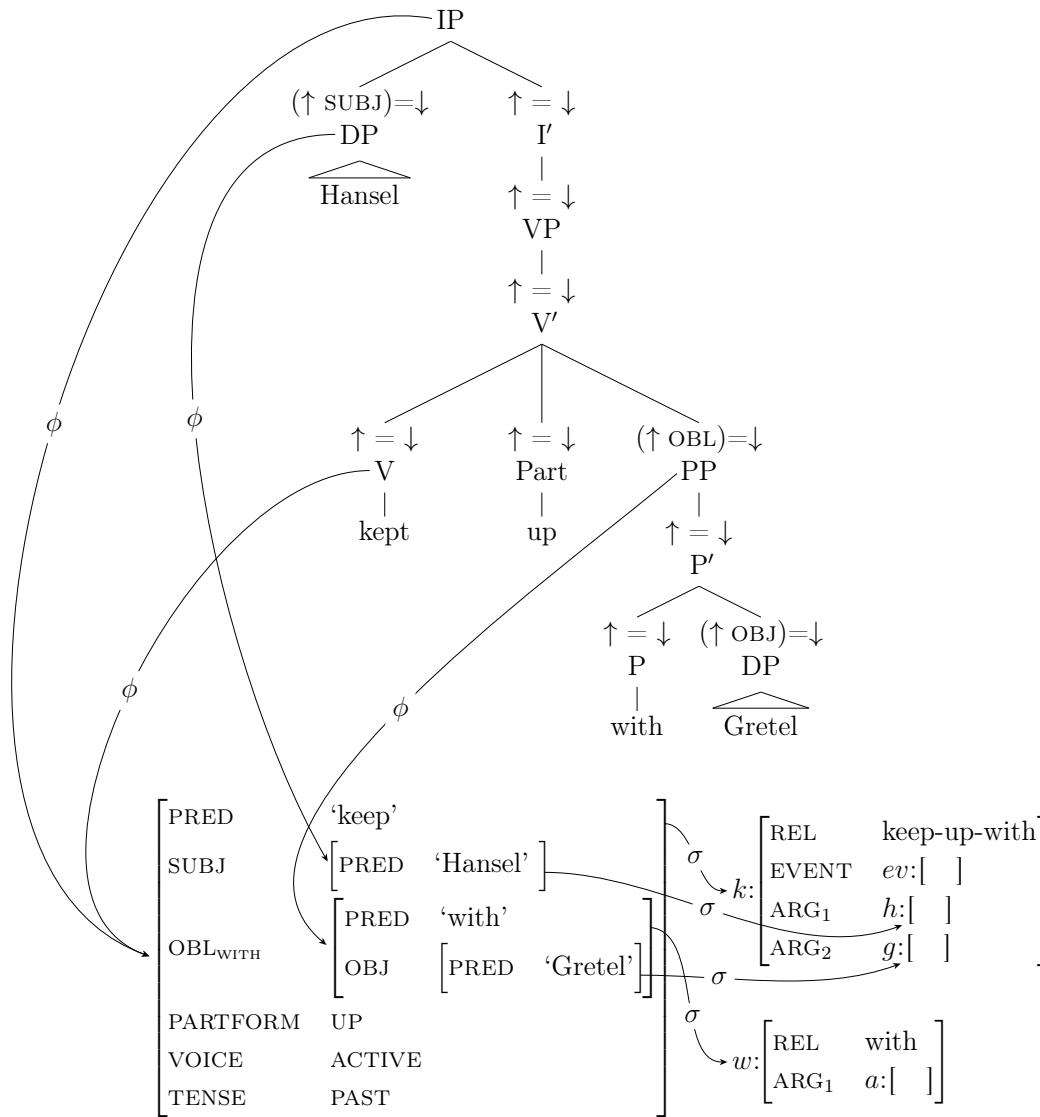


Figure 7.6: Structures and correspondences for *Hansel kept up with Gretel*

(245) **[Hansel]**
hansel : *h*

[kept]
 $\lambda x \lambda y \lambda e. \textit{keep-up-with}(e, x, y) : h \multimap g \multimap ev \multimap k$

[PAST]
 $\lambda P. \exists e [P(e) \wedge \textit{past}(e)] : [ev \multimap k] \multimap k$

[IPV-ACTIVE]
 $\lambda P \lambda x. x : [a \multimap w] \multimap g \multimap g$

[with]
 $\lambda x \lambda e. \textit{with}(e, x) : a \multimap w$

[Gretel]
gretel : *g*

The analysis of the passive follows equally straightforwardly. The particle does not violate the adjacency constraint because it is an f-structure co-head with the main verb, which means that the rightmost terminal node in \uparrow is the particle itself. Thus, the adjacency restriction now hold between the *particle* and the preposition: provided that nothing intervenes between these, the verbal f-structure does not terminally f-precede anything other than the prepositional f-structure, and so the adjacency constraint is satisfied.

Let us consider an example: *Obama was looked up to*. The lexical entries for *looked* and *to* are given in (246) and (247) (the entry for *up* is the same as above):

(246) *looked* V (\uparrow PRED) = ‘look’
 @PARTICLEIPV-PASSIVE(UP,TO)
 $\lambda y \lambda x \lambda e. \textit{look-up-to}(e, x, y) :$
 $(\uparrow_{\sigma} \text{ ARG}_2) \multimap (\uparrow_{\sigma} \text{ ARG}_1) \multimap (\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$

$$\begin{array}{c}
\begin{array}{cc}
\text{[Hansel]} & \text{[kept]} \\
hansel : & \lambda x \lambda y \lambda e. keep-up-with(e, x, y) : \\
h & h \multimap g \multimap ev \multimap k
\end{array} \\
\hline
\lambda y \lambda e. keep-up-with(e, hansel, y) : \\
g \multimap ev \multimap k \\
\hline
\lambda e. keep-up-with(e, hansel, gretel) : \\
ev \multimap k \\
\hline
\exists e[keep-up-with(e, hansel, gretel) \wedge past(e)] : k
\end{array}
\qquad
\begin{array}{c}
\begin{array}{cc}
\text{[Gretel]} & \text{[with]} & \text{[IPV-ACTIVE]} \\
gretel : & \lambda x \lambda e. with(e, x) : & \lambda P \lambda x. x : \\
g & a \multimap w & [a \multimap w] \multimap g \multimap g \\
& & \lambda x. x : \\
& & g \multimap g
\end{array} \\
\hline
gretel : \\
g \\
\hline
\text{[PAST]} \\
\lambda P. \exists e[P(e) \wedge past(e)] : \\
[ev \multimap k] \multimap k \\
\hline
\exists e[keep-up-with(e, hansel, gretel) \wedge past(e)] : k
\end{array}
\end{array}$$

Figure 7.7: Proof for *Hansel kept up with Gretel*

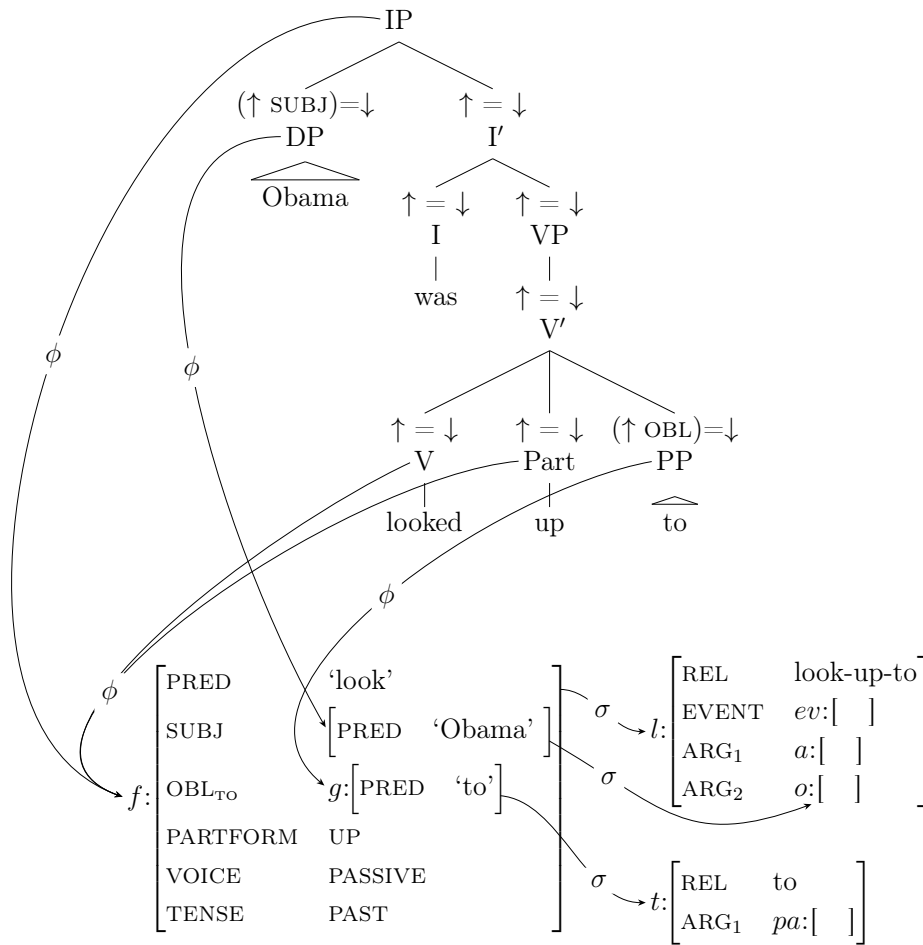


Figure 7.8: Structures and correspondences for *Obama was looked up to*

$$(247) \quad to \quad P \quad (\uparrow \text{PRED}) = \text{'to'}$$

$$\{ \dots \mid @\text{IDIOSYNCRATIC}(\text{TO}) \}$$

$$\lambda x \lambda e . to(e, x) :$$

$$(\uparrow_{\sigma} \text{ARG}_1) \multimap \uparrow_{\sigma}$$

The relevant structures and correspondences are given in Figure 7.8. As we can see, the particle and the verb both contribute to the main f-structure, f . This means that the rightmost terminal node in $\phi^{-1}(f)$ is up , which does not precede anything which itself precedes to , the rightmost node in $\phi^{-1}(g)$. Therefore, as discussed, the adjacency constraint is still satisfied.

Instantiated meaning constructors are given in (248) and the Glue proof is shown in Figure 7.9 (p. 150).

- (248) **[Obama]**
 $obama : o$
- [was]**
 $\lambda P.\exists e[P(e) \wedge past(e)] : [ev \multimap l] \multimap l$
- [looked]**
 $\lambda x\lambda y\lambda e.look-up-to(e, x, y) : a \multimap o \multimap ev \multimap l$
- [IPV-PASSIVE]**
 $\lambda P\lambda x.x : [pa \multimap t] \multimap o \multimap o$
- [PASSIVE]**
 $\lambda P.\exists x[P(x)] : [a \multimap l] \multimap l$
- [to]**
 $\lambda x\lambda e.to(e, x) : pa \multimap t$

7.5 Lexical exceptions

Just as for the SPP, there are verbs, such as *consist (of)*, which are lexically specified as being unpassivisable. The same considerations as discussed in Chapter 6.2.1 apply here: for example, these verbs may simply specify their ACTIVE voice value in their core lexical entry. However, the IPV manager resource offers another possibility. Presumably, this MC should be included in the verb's core lexical entry. In this case, we can decompose the IPV-ACTIVE and IPV-PASSIVE templates we have been using a little, and supply some of the information separately, as in (249–250):

$$\begin{array}{c}
\begin{array}{c}
\text{[look]} \\
\lambda x \lambda y \lambda e. \text{look-up-to}(e, x, y) : \\
a \multimap o \multimap ev \multimap l \quad [u : a]^1
\end{array} \\
\hline
\begin{array}{c}
\lambda y \lambda e. \text{look-up-to}(e, u, y) : \\
o \multimap ev \multimap l
\end{array} \\
\hline
\begin{array}{c}
\lambda e. \text{look-up-to}(e, u, obama) : \\
ev \multimap l
\end{array} \\
\hline
\begin{array}{c}
\text{[PASSIVE]} \\
\lambda P. \exists x [P(x)] : \\
[a \multimap l] \multimap l
\end{array} \\
\hline
\begin{array}{c}
\exists x \exists e [\text{look-up-to}(e, x, obama) \wedge \text{past}(e)] : l
\end{array}
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
\text{[Obama]} \\
obama : \\
o
\end{array} \\
\hline
obama : \\
o
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
\text{[to]} \\
\lambda x \lambda e. \text{to}(e, x) : \\
pa \multimap t
\end{array} \\
\hline
pa \multimap t
\end{array}
\quad
\begin{array}{c}
\begin{array}{c}
\text{[IPV-PASSIVE]} \\
\lambda P \lambda x. x : \\
[pa \multimap t] \multimap o \multimap o
\end{array} \\
\hline
\lambda x. x : \\
o \multimap o
\end{array} \\
\hline
\begin{array}{c}
\text{[was]} \\
\lambda P. \exists e [P(e) \wedge \text{past}(e)] : \\
[ev \multimap l] \multimap l
\end{array} \\
\hline
\begin{array}{c}
\exists e [\text{look-up-to}(e, u, obama) \wedge \text{past}(e)] : l \\
\hline
\lambda u. \exists e [\text{look-up-to}(e, u, obama) \wedge \text{past}(e)] : \\
a \multimap l
\end{array} \multimap_{I,1}
\end{array}
\end{array}$$

Figure 7.9: Proof for *Obama was looked up to*

$$(249) \quad \textit{consist} \quad V \quad (\uparrow \text{PRED}) = \text{'consist'}$$

$$(\uparrow \text{OBL}_{\text{OF}})$$

$$\lambda P \lambda x.x :$$

$$[((\uparrow \text{OBL}_{\text{OF}})_{\sigma} \text{ ARG}_1) \multimap (\uparrow \text{OBL}_{\text{OF}})_{\sigma}] \multimap$$

$$(\uparrow \text{OBL}_{\text{OF}} \text{ OBJ})_{\sigma} \multimap (\uparrow \text{OBL}_{\text{OF}} \text{ OBJ})_{\sigma}$$

$$\lambda e.\textit{consist-of}(e) :$$

$$(\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$$

$$(250) \quad \textit{rely} \quad V \quad (\uparrow \text{PRED}) = \text{'rely'}$$

$$(\uparrow \text{OBL}_{\text{ON}})$$

$$\lambda P \lambda x.x :$$

$$[((\uparrow \text{OBL}_{\text{ON}})_{\sigma} \text{ ARG}_1) \multimap (\uparrow \text{OBL}_{\text{ON}})_{\sigma}] \multimap$$

$$(\uparrow_{\sigma} \text{ ARG}_2) \multimap (\uparrow_{\sigma} \text{ ARG}_2)$$

$$\lambda e.\textit{rely-on}(e) :$$

$$(\uparrow_{\sigma} \text{ EVENT}) \multimap \uparrow_{\sigma}$$

Crucially, we supply the passivisable IPVs with the manager from IPV-PASSIVE, and the non-passivisable ones with that from IPV-ACTIVE. This gives us an immediate explanation for why *rely on* can passivise but *consist of* cannot, taking advantage of the asymmetric applicability of these two manager resources. The passive manager will function appropriately in both the active and the passive, since in the active, we have the equation $(\uparrow \text{OBL}_{\text{ON}} \text{ OBJ})_{\sigma} = (\uparrow_{\sigma} \text{ ARG}_2)$, and so the meaning constructor is equivalent to the active version. (The passive will still have to supply the adjacency constraint, of course.) By contrast, the active manager will only function correctly in the active, since in the passive, the resource referred to by $(\uparrow \text{OBL} \text{ OBJ})_{\sigma}$ does not exist. Thus, supplying different managers to the verbs' core lexical entries gives us another way to constrain certain verbs to prevent them from participating in the passive alternation.

This concludes our analysis of IPVs, in both the active and passive. We turn in the next chapter to the final of Kim's P-verb categories: transitive P-verbs.

Chapter 8

The Prepositional Passive III: Transitive P-Verbs

The third class of P-verbs identified by Kim (2009) are what he calls transitive P-verbs, i.e. those verbs which appear to take a nominal direct object in addition to their prepositional argument. Kim (2009: 4) further subdivides these into four classes, depending on their behaviour in the passive:

- (251) No passive at all:
 - a. *Patience was lost with the secretary.
 - b. *The secretary was lost patience with.
- (252) Only object nominal passivisable:
 - a. Doubt was cast on his motives.
 - b. *His motives were cast doubt on.
- (253) P-passive only:
 - a. *Sight was lost of our goal.
 - b. Our goal was lost sight of.
- (254) Either the object nominal or the prepositional object is passivisable:
 - a. Use was made of the extra time.
 - b. The extra time was made use of.

As Kim observes, one thing which sets the passivisable transitive P-verbs apart from the non-passivisable ones is their idiomaticity. Apparently par-

allel constructions which remain compositional cannot be passivised, as we have noted elsewhere (examples from Kim 2009: 4):

- (255) a. Mary reminded him of her older sister.
 b. The police blamed the accident on the weather.
 (256) a. *Her/Mary's older sister was reminded him of (by Mary).
 b. *The weather was blamed the accident on (by the police).

The claim, then, is that the passivisable transitive P-verbs are idiom chunks, and that their direct objects are therefore non-thematic. This would allow us to explain the behaviour of those verbs exemplified by (251) and (253) in a manner analogous to the particle IPVs: the preposition and nominal are idiosyncratically selected, with the nominal contributing no semantic information (and therefore no PRED), just a NOMFORM value. An example lexical entry for idiomatic *sight* is given in (257):

- (257) *sight* N (↑ NOMFORM) = SIGHT

We can now simply propose the modified templates below in order to describe the behaviour of these kinds of transitive P-verbs:

- (258) TRANSITIVEIPV-ACTIVE(N, I) =
 (↑ OBJ NOMFORM) =_c N
 @IPV-ACTIVE(I)
 (259) TRANSITIVEIPV-PASSIVE(N, I) =
 (↑ OBJ NOMFORM) =_c N
 @IPV-PASSIVE(I)

Verbs like *lose* (*patience with*) are lexically marked as not having a P-passive, in one of the ways described above. Verbs like *lose* (*sight of*), on the other hand, will call either of (258) or (259), having no restriction on their grammatical voice. However, the direct object is still non-thematic,

which means that it is not an eligible passive subject; only the active prepositional object can be promoted via passivisation.

The active of these verbs offers no special problems, so I will not present an analysis here. I will, however, give the analysis for the P-passive *The boat was lost sight of* in order to demonstrate how the non-thematic object does not violate the adjacency requirement, re-presented in (260):

$$(260) \quad \neg(\uparrow \ll_f \{(\uparrow \begin{array}{c} \text{GF} \\ (\rightarrow \text{PRED}) \end{array}) \mid (\uparrow \text{ADJ} \begin{array}{c} \in \\ (\rightarrow \text{PRED}) \end{array})\} \ll_f (\uparrow \text{OBL}_I))$$

The lexical entries for *lost*, *of*, and non-thematic *sight* are given below:

$$(261) \quad \textit{lost} \quad \text{V} \quad (\uparrow \text{PRED}) = \text{'lose'}$$

$$\quad \quad \quad \textcircled{\text{TRANSITIVEIPV-PASSIVE}}(\text{SIGHT}, \text{OF})$$

$$\lambda y \lambda x \lambda e. \textit{lose-sight-of}(e, x, y) :$$

$$(\uparrow_\sigma \text{ARG}_2) \multimap (\uparrow_\sigma \text{ARG}_1) \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$$

$$(262) \quad \textit{of} \quad \text{P} \quad (\uparrow \text{PRED}) = \text{'of'}$$

$$\quad \quad \quad \{ \dots \mid \textcircled{\text{IDIOSYNCRATIC}}(\text{OF}) \}$$

$$\lambda x \lambda e. \textit{of}(e, x) :$$

$$(\uparrow_\sigma \text{ARG}_1) \multimap \uparrow_\sigma$$

$$(263) \quad \textit{sight} \quad \text{N} \quad (\uparrow \text{NOMFORM}) = \text{SIGHT}$$

The relevant structures and correspondences are given in Figure 8.1 (p. 156). Now, unlike in the case of particle verbs, the intervening material this time projects its own f-structure: the value of OBJ, named *g*. And it is true that the main f-structure, *f*, terminally f-precedes *g*, which itself terminally f-precedes the prepositional f-structure, *h*; so far, therefore, we might expect this to be a violation of the adjacency constraint in (260). However, the constraint stipulates that nothing must intervene *which has a PRED value*, and, crucially, *g* does not. Therefore the constraint is still satisfied, and the

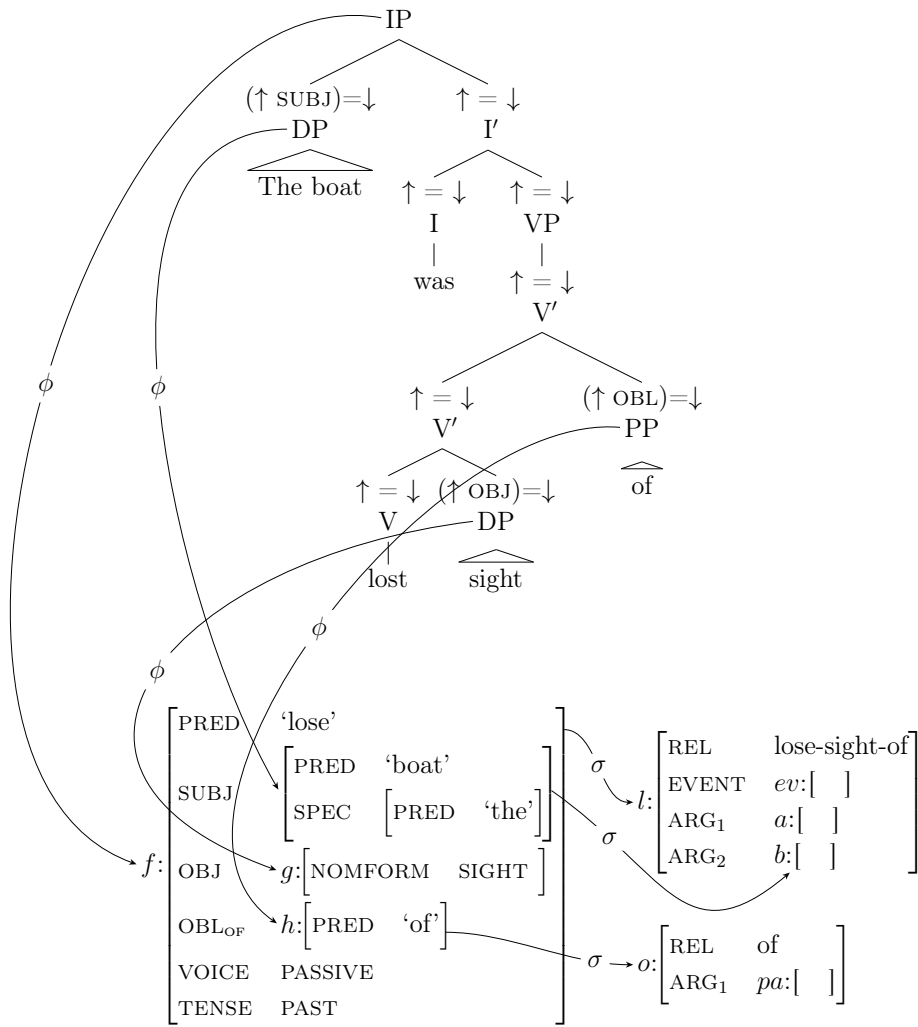


Figure 8.1: Structures and correspondences for *The boat was lost sight of*

proof can proceed as before. The Glue proof that results is given in Figure 8.2 (p. 158), using the instantiated meaning constructors below:

(264) **[the boat]**
 $\iota z[\text{boat}(z)] : b$

[was]
 $\lambda P.\exists e[P(e) \wedge \text{past}(e)] : [ev \multimap l] \multimap l$

[lost]
 $\lambda x\lambda y\lambda e.\text{lose-sight-of}(e, x, y) : a \multimap b \multimap ev \multimap l$

[IPV-PASSIVE]
 $\lambda P\lambda x.x : [pa \multimap o] \multimap b \multimap b$

[PASSIVE]
 $\lambda P.\exists x[P(x)] : [a \multimap l] \multimap l$

[of]
 $\lambda x\lambda e.\text{of}(e, x) : pa \multimap o$

This neatly accounts for the behaviour exemplified by (251) and (253); however, the classes of verb exemplified by (252) and (254) pose a problem for the current analysis. Here, the nominal can be realised as the passive SUBJ, which means that it appears to be a true argument of the verb. This is further evidenced by the fact that, as a subject, it can be modified:

(265) **Particular attention** is paid to regularising the use of free and bound variables. (BNC)

(266) **Further doubt** is cast on the Keynesian approach to macroeconomic policy by what is known as the Lucas critique. (BNC)

It seems, therefore, that the nominal cannot be non-thematic in these cases. This means our previous analysis will not carry over. A straightforward solution for those cases like (252), where *only* the nominal is passivisable,

$$\begin{array}{c}
\begin{array}{c}
\text{[lost]} \\
\lambda x \lambda y \lambda e. \textit{lose-sight-of}(e, x, y) : \\
a \multimap b \multimap ev \multimap l \quad [u : a]^1
\end{array} \\
\hline
\begin{array}{c}
\lambda y \lambda e. \textit{lose-sight-of}(e, u, y) : \\
b \multimap ev \multimap l
\end{array} \\
\hline
\begin{array}{c}
\lambda e. \textit{lose-sight-of}(e, u, \iota z[\textit{boat}(z)]) : \\
ev \multimap l
\end{array} \\
\hline
\begin{array}{c}
\text{[PASSIVE]} \\
\lambda P. \exists x [P(x)] : \\
[a \multimap l] \multimap l
\end{array} \\
\hline
\begin{array}{c}
\vdots \\
\text{[the boat]} \\
\iota z[\textit{boat}(z)] : \\
b
\end{array} \\
\hline
\begin{array}{c}
\text{[of]} \\
\lambda x \lambda e. \textit{of}(e, x) : \\
pa \multimap o
\end{array} \\
\hline
\begin{array}{c}
\text{[IPV-PASSIVE]} \\
\lambda P \lambda x. x : \\
[pa \multimap o] \multimap b \multimap b
\end{array} \\
\hline
\begin{array}{c}
\lambda x. x : \\
b \multimap b
\end{array} \\
\hline
\begin{array}{c}
\text{[was]} \\
\lambda P. \exists e [P(e) \wedge \textit{past}(e)] : \\
[ev \multimap l] \multimap l
\end{array} \\
\hline
\begin{array}{c}
\exists e [\textit{lose-sight-of}(e, u, \iota z[\textit{boat}(z)]) \wedge \textit{past}(e)] : l \\
\hline
\lambda u. \exists e [\textit{lose-sight-of}(e, u, \iota z[\textit{boat}(z)]) \wedge \textit{past}(e)] : \\
a \multimap l \quad \multimap_{\mathcal{I},1} \\
\hline
\exists x \exists e [\textit{lose-sight-of}(e, x, \iota z[\textit{boat}(z)]) \wedge \textit{past}(e)] : l
\end{array}
\end{array}$$

Figure 8.2: Proof for *The boat was lost sight of*

is to simply treat them as ditransitives like *put*, since this is the syntactic pattern they follow:

- (267) a. The (ugly) painting was put under the table.
 b. *The table was put the (ugly) painting under.
- (268) a. (Considerable) doubt was cast on the story.
 b. *The story was cast (considerable) doubt on.

As these examples show, the direct object nominal can be promoted to subject in the passive, and can also be modified in this position. However, the object of the preposition cannot be promoted to passive subject—in other words, these verbs have no P-passive.

One apparent contrast between the two types of verb, however, is that with verbs like *cast* (*doubt on*), the preposition appears semantically inert, since there are no meaningful contrasts, unlike with verbs like *put*:

- (269) a. Kerry put the documents on the desk.
 b. Kerry put the documents under the desk.
 c. Kerry put the documents in(to) the desk.
 ...
- (270) a. Some scholars, however, still cast doubt on the notion of a historical Trojan War. (COCA)
 b. *Some scholars, however, still cast doubt under the notion of a historical Trojan War.
 c. *Some scholars, however, still cast doubt in(to) the notion of a historical Trojan War.
 ...

But this is misleading. When we look at how it is used with other nominals, it is clear that *cast* can occur with different prepositions (with greater or lesser degrees of idiomaticity):

- (271) a. Its leaves [...] cast a shadow **over** the tree roots. (COCA)

- b. That conflict with Armenia cast a shadow **over** Eurovision.
(COCA)
- (272) Two weeks later, he went to the polls and cast his vote **for** Lincoln.
(COCA)
- (273) I cast mine eyes **towards** the head of the river.¹

This is in contrast to verbs like *rely (on)* and *deal (with)*, which cannot take any other preposition. What is more, the string *cast doubt* can in fact be used with other prepositions too, with largely the same idiomatic meaning it has in *cast doubt on*:

- (274) Two of the reasons cast doubt **upon** the significance of figures in the budget. (BNC)
- (275) The accused hostage taker seems to have cast doubt **in** the minds of jurors. (COCA)
- (276) They cast doubt **as to** whether or not the situation was clear cut. (COCA)
- (277) The Observer [...] also cast doubt **over** the quality of the WHS management. (BNC)
- (278) When Connie opened her mouth, she cast doubt **about** the credibility of the whole operation. (COCA)
- (279) Fiona could not allow her to cast doubt **within** Abby. (COCA)

This lends further support to the idea that *cast doubt on* is really just a regular ditransitive construction, where *on* is in fact semantically contentful, as evidenced by the fact that semantically related prepositions (*upon, over, etc.*) can be substituted while preserving the same overall meaning. The impression of an idiomatic meaning comes merely from the fact that the verb is being used metaphorically, in much the same way as in e.g. *throw caution to the wind*; and from the fact that there *are* certain P-verbs which have become grammaticalised idioms.

¹Book of Mormon, The First Book of Nephi, 8:17.

What we have with the transitive P-verbs is, I propose, an ongoing process of grammaticalisation, whereby the expressions are slowly bleached of their compositional meanings. For expressions like *lose patience with* or *lose sight of*, the grammaticalisation has reached completion, and the whole expression is a fixed idiom, with a non-thematic form of the idiomatic object selected by the verb. This is reflected in the fact that the objects of these verbs cannot be promoted to passive subjects. Independently of this, the IPV passivisability parameter is in play, accounting for the contrast between those idiomatic transitive P-verbs which have a P-passive and those which don't (*lose sight of* vs. *lose patience with*).

At the other end of the spectrum, we have expressions like *cast doubt on*, which still have the force of compositionally derived metaphors. That is, the *cast* in *cast doubt on* is the same *cast* as in regular compositional expressions such as this famous example from the Bible:

(280) He that is without sin among you, let him first cast a stone at her.²

Of course, one cannot literally cast doubt anywhere, since it is non-corporeal, and so the construction signals a metaphorical interpretation, along familiar Gricean lines (Grice 1975, etc.).

Given these two extremes, we naturally expect there to be intermediate cases as well, and this is exactly what we observe in the class represented by (254), where both the idiomatically driven P-passive and the compositionally driven standard passive are available.

²King James Bible, John 8:7.

The syntax and semantics of the idiomatic transitive P-verbs are described above; owing to their idiomaticity, they are best described as IPVs. The non-idiomatic cases have very different syntactic and semantic properties, however, being just one particular use of ditransitive verbs. They place no restrictions on their preposition or their object (beyond general semantic well-formedness). Certain combinations, though, have clear metaphorical meanings.

The in-between cases, such as *make use of*, are more complex. As a first approximation of their behaviour, we might simply say that they are ambiguous between the idiomatic and non-idiomatic analysis, thus accounting for their multiple passivisation possibilities. If they are interpreted idiomatically, they call one or other of the TRANSITIVEIPV templates. If they are interpreted non-idiomatically, they behave like ordinary ditransitive verbs, where only the direct object is passivisable.

This would leave us with a fairly neat analysis of the transitive P-verbs, assuming some background theory of the grammaticalisation of metaphors (on which see e.g. Traugott 2002; Brinton & Traugott 2005; Eckardt 2006; Vande Wiele 2014). However, all is not so rosy. Under the current hypothesis, the P-passive of these expressions should represent an idiomatic analysis, whereby the object is non-thematic. If this is the case, then it should not be possible to modify the object in the passive. Unfortunately, this is not what we observe:

- (281) a. What is [...] essential is [...] that the grant that I mentioned earlier is made **full use** of. (BNC)
b. There are still a few days left, and I hope they'll be made **good use** of. (COCA)

- c. The Roman wall [...] has been made **most aesthetic use** of. (BNC)
- (282) a. If domestic violence were paid **more attention** to earlier by the Justice Department, something as tragic as this could have been avoided. (COCA)
- b. Because these things tend to happen a lot [...], they tend not to be paid **as much attention** to. (COCA)
- c. It will be paid **no attention** to if the candidates just go to the most populous states. (COCA)

In fact, these expressions constitute an interestingly mixed class which Nunberg et al. (1994) describe as *idiomatically combining expressions*. These are idiomatic expressions where the conventional meaning can be distributed compositionally over the parts of the idiom, the prototypical example being *spill the beans*, where *spill* = *divulge* and *beans* = *information*. (This is in contrast to *idiomatic phrases*, such as *kick the bucket*, where the meaning cannot be so distributed.) But if the idiomatic meaning of these expressions is triggered by certain combinations of words which themselves are not idiomatic, then the present analysis is obviously invalidated: the nominals *attention* or *use* will presumably bring with them their usual PRED feature.

At present, I have no good explanation as to why this is possible. There must be a general bar on intervening thematic material between the verb and stranded preposition in the P-passive, to account for the impossibility of both adverbial material and the direct objects of ditransitives appearing there. What is more, in the cases which I have described as fully grammaticalised, such as *lose sight of*, we do not observe any modification of the nominal in the P-passive: neither the COCA, the BNC, nor web searches provide examples of passive *lost sight of* with modified *sight*, for example.

This would seem to further support the idea that any intervening material must be non-thematic. The mixed cases provide a direct challenge to this hypothesis, however, and one to which I do not have an immediate solution. It is to be hoped that further investigation into the interaction of the syntax and semantics of idiomatically combining expressions may provide some answers.

Chapter 9

Conclusion

This thesis has presented the analysis of two kinds of prepositional passive in English, the semantic prepositional passive (SPP) and the idiosyncratic prepositional passive (IPP). In so doing, it has also been necessary to develop a theory of the syntax and semantics of prepositions more generally. An ontologically parsimonious theory was presented, whereby a single lexical entry can do multiple duty, serving each of the various roles played by prepositions in the English grammar, while preserving a single, shared basic meaning. My analysis has also made use of the core/derived argument distinction proposed by Needham & Toivonen (2011), thus perhaps further indicating its importance.

Both the SPP and the IPP are licensed and constrained by properties of the syntax-semantics interface. The former case, where the preposition retains its semantic properties, is highly productive, and this is accounted for by the fact that the relevant mapping information, contained in the template LINK, is introduced by a phrase-structure rule of English, rather

than by any particular lexical item. LINK imposes an adjacency restriction on the verb and the preposition by making use of the terminal f-precedence relation to prevent any thematic material from intervening between them. Certain verbs, like *go*, prohibit the P-passive, and this is construed as a general bar on the passive in their individual lexical entries.

The IPP, on the other hand, is a lexically controlled phenomenon, only available to certain verbs which subcategorise for particular prepositions, particles, and non-thematic objects. Since these verbs, called IPVs, require the presence of a certain preposition, but make no reference to its meaning, they introduce a manager resource to remove the prepositional meaning from the Glue proof. Passivisation of IPVs is lexically determined: those verbs which allow it contribute not only a manager resource which removes the prepositional meaning, but also a bundle of functional information which imposes the same adjacency requirement as in the SPP, where no thematic material can intervene between the verb and preposition in the P-passive. This does, however, allow particles and non-thematic objects to intervene.

Although typology has not been the focus of this thesis, the formally distinct analysis presented for the SPP and the IPP does make typological predictions: specifically, it suggests that we might expect to find languages with one but not the other. To my knowledge, this is not the case, but the pool of data is so small, since so few languages permit any kind of P-passive, that I do not think this fact is necessarily probative. It would be informative to extend the present enterprise to less well studied examples of the P-passive, such as in Vata, Gbadi, and possibly Papiamentu (as reported in Abels 2003).

Transitive P-verbs offer an interesting case study for future research. Those which allow the P-passive are here treated as IPVs which select an idiomatic, non-thematic object. Those which do not are treated as regular ditransitive verbs which are being used metaphorically. The intermediate cases are ambiguous between the two, and are representative of a class which Nunberg et al. (1994) have called idiomatically combining expressions. Taken together, the transitive P-verbs are seen as falling along a scale of grammaticalisation, from non-idiomatic, but metaphorical, uses on the one hand, to fully idiomatic, grammaticalised forms on the other. At present, the only real evidence for such an analysis is the syntactic facts regarding patterns of passivisation. A productive direction for future work would be to examine historical patterns, to see whether this change can be observed occurring in real time, and/or to consider the role of processing in understanding idiomatic vs. non-idiomatic meanings, applying this to the hypothesised distinctions drawn here.

References

- Abels, Klaus. 2003. Successive cyclicity, anti-locality and adposition stranding. Doctoral dissertation, University of Connecticut.
- Alexiadou, Artemis. 2005. A note on non-canonical passives: the case of the *get*-passive. In Hans Broekhuis, Norbert Corver, Riny Huybregts, Ursula Kleinhenz & Jan Koster (eds.), *Organizing grammar: linguistic studies in honor of Henk Van Riemsdijk* (Studies in Generative Grammar 86), 13–21. Berlin: Mouton de Gruyter.
- Alsina, Alex. 2009. The prepositional passive as structure-sharing. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG09 Conference*, 44–64. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/14/papers/lfg09alsina.pdf>.
- Andrews, Avery D. 2008. The role of PRED in LFG+Glue. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG08 Conference*, 46–67. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/13/papers/lfg08andrews.pdf>.
- Asudeh, Ash. 2004. Resumption as resource management. Doctoral dissertation, Stanford University.
- Asudeh, Ash. 2005. Control and semantic resource sensitivity. *Journal of Linguistics* 41(3). 465–511.
- Asudeh, Ash. 2009. Adjacency and locality: a constraint-based analysis of complementizer-adjacent extraction. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG09 Conference*, 106–126. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/14/papers/lfg09asudeh.pdf>.

- Asudeh, Ash. 2012. *The logic of pronominal resumption*. Oxford, UK: Oxford University Press.
- Asudeh, Ash. 2013. Flexible composition and the argument/adjunct distinction in LFG+Glue. Paper presented at the LLI Lab, Institute of Cognitive Science, Carleton University.
- Asudeh, Ash, Mary Dalrymple & Ida Toivonen. 2013. Constructions with lexical integrity. *Journal of Language Modelling* 1(1). 1–54. <http://jlm.ipipan.waw.pl/index.php/JLM/article/view/56/49>.
- Asudeh, Ash & Gianluca Giorgolo. 2012. Flexible composition for optional and derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG12 Conference*, 64–84. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/17/papers/lfg12asudehgiorgolo.pdf>.
- Asudeh, Ash & Ida Toivonen. 2009. Lexical-functional grammar. In Bernd Heine & Heiko Narrog (eds.), *The Oxford handbook of linguistic analysis*, 425–458. Oxford: Oxford University Press. <http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199544004.001.0001/oxfordhb-9780199544004-e-017>.
- Baker, Mark. 1988. *Incorporation*. Chicago, IL: University of Chicago Press.
- Baltin, Mark. 1978. Constraints on construal. Doctoral dissertation, MIT.
- Baltin, Mark & Paul M. Postal. 1996. More on reanalysis hypotheses. *Linguistic Inquiry* 27(1). 127–145.
- Bolinger, Dwight. 1977. Transitivity and spatiality: the passive of prepositional verbs. In A. Makkai, V. B. Makkai & L. Heilmann (eds.), *Linguistics at the crossroads*, Lake Bluff, IL: Jupiter Press.
- Bresnan, Joan. 1972. Theory of complementation in English syntax. Doctoral dissertation, MIT.
- Bresnan, Joan. 1973. Syntax of the comparative clause construction in English. *Linguistic Inquiry* 4(3). 275–343.
- Bresnan, Joan. 1977a. Evidence for a theory of unbounded transformations. *Linguistic Analysis* 2. 353–393.

- Bresnan, Joan. 1977b. Variables in the theory of transformations. In Peter Culicover, Thomas Wasow & Adrian Akmajian (eds.), *Formal syntax*, 157–196. New York, NY: Academic Press.
- Bresnan, Joan. 1982. The passive in lexical theory. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 3–86. Cambridge, MA: MIT Press.
- Bresnan, Joan. 1990. Levels of representation in locative inversion: A comparison of English and Chichewa. Manuscript, Stanford University and Xerox Palo Alto Research Center.
- Bresnan, Joan. 2001. *Lexical-functional syntax*. Oxford, UK: Blackwell.
- Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler. forthcoming. *Lexical-functional syntax* (2nd edn.). Oxford, UK: Wiley-Blackwell.
- Bresnan, Joan & Jonni M. Kanerva. 1989. Locative inversion in Chichewa: A case study of factorization in grammar. *Linguistic Inquiry* 20(1). 1–50.
- Brinton, Laurel & Elizabeth Traugott. 2005. *Lexicalization in language change*. Cambridge, UK: Cambridge University Press.
- Butt, Miriam, Mary Dalrymple & Anette Frank. 1997. An architecture for linking theory in LFG. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG97 Conference*, Stanford, CA: CSLI Publications. <http://web.stanford.edu/group/cslipublications/cslipublications/LFG/LFG2-1997/lfg97butt-dalrymple-frank.pdf>.
- Chomsky, Noam. 1955. Logical syntax and semantics: their linguistic relevance. *Language* 31(1). 36–45.
- Chomsky, Noam. 1957. *Syntactic structures*. London, UK: Mouton.
- Chomsky, Noam. 1965. *Aspects of the theory of syntax*. Cambridge, MA: MIT Press.
- Chomsky, Noam. 1975. *Reflections on language*. New York, NY: Pantheon.
- Chomsky, Noam. 1981. *Lectures on government and binding*. Dordrecht, NL: Foris.
- Chomsky, Noam. 1986a. *Barriers*. Cambridge, MA: MIT Press.

- Chomsky, Noam. 1986b. *Knowledge of language: Its nature, origin, and use*. New York, NY: Praeger.
- Crouch, Dick, Mary Dalrymple, Ron Kaplan, Tracy King, John Maxwell & Paula Newman. 2012. *XLE documentation*. Palo Alto Research Center (PARC), Palo Alto, CA. <http://www2.parc.com/isl/groups/nlitt/xle/doc/xle.html>.
- Crouch, Dick & Josef van Genabith. 2000. Linear logic for linguists: ESSLLI-2000 course notes. Unpublished ms. available at <http://www.ling.ohio-state.edu/~pollard/681/crouch.pdf>.
- Dalrymple, Mary. 1993. *The syntax of anaphoric binding* (CSLI Lecture Notes 36). Stanford, CA: CSLI Publications.
- Dalrymple, Mary (ed.). 1999. *Semantics and syntax in Lexical Functional Grammar: the resource logic approach*. Cambridge, MA: MIT Press.
- Dalrymple, Mary. 2001. *Lexical Functional Grammar* (Syntax and Semantics 34). Stanford, CA: Academic Press.
- Dalrymple, Mary, Ronald M. Kaplan & Tracy Holloway King. 2004. Linguistic generalizations over descriptions. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG04 Conference*, 199–208. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/9/lfg04dkk.pdf>.
- Dalrymple, Mary, Ronald M. Kaplan & Tracy Holloway King. 2013. Economy of expression. Paper presented at the LFG13 Conference, University of Debrecen.
- Dalrymple, Mary, Ronald M. Kaplan, John T. Maxwell, III, & Annie Zaenen. 1995a. Formal architecture. In Mary Dalrymple, Ronald M. Kaplan, John T. Maxwell, III, & Annie Zaenen (eds.), *Formal issues in Lexical-Functional Grammar*, 1–5. Stanford University: CSLI Publications.
- Dalrymple, Mary, John Lamping, Fernando Pereira & Vijay Saraswat. 1995b. Linear logic for meaning assembly. In Suresh Manandhar, G. P. Lopes & W. Nutt (eds.), *Proceedings of Computational Logic for Natural Language Processing*, Edinburgh, UK.
- Dalrymple, Mary, John Lamping, Fernando Pereira & Vijay Saraswat. 1999. Overview and introduction. In Mary Dalrymple (ed.), *Semantics and syntax in Lexical Functional Grammar: The resource logic approach*, Cambridge, MA: MIT Press.

- Dalrymple, Mary, John Lowe & Louise Mycock. forthcoming. *Lexical Functional Grammar* (2nd edn.). Oxford, UK: Oxford University Press.
- Davidson, Donald. 1967. The logical form of action sentences. In Nicholas Rescher (ed.), *The logic of decision and action*, 81–120. Pittsburgh, PA: University of Pittsburgh Press.
- Davies, Mark. 2004–. *BYU-BNC*. (Based on the British National Corpus from Oxford University Press). <http://corpus.byu.edu/bnc>.
- Davies, Mark. 2008–. *The Corpus of Contemporary American English: 450 million words, 1990–present*. <http://corpus.byu.edu/coca>.
- Davison, Alice. 1980. Peculiar passives. *Language* 56(1). 42–66.
- Eckardt, Regine. 2006. *Meaning change in grammaticalization: an enquiry into semantic reanalysis*. Oxford, UK: Oxford University Press.
- Falk, Yehuda N. 2001. *Lexical-Functional Grammar: An introduction to parallel constraint-based syntax*. Stanford, CA: CSLI Publications.
- Falk, Yehuda N. 2006. On the representation of case and agreement. Unpublished ms. based on presentation at LFG 2006 conference.
- Fiengo, Robert W. 1974. Semantic conditions on surface structure. Doctoral dissertation, MIT.
- Findlay, Jamie Y. 2014. Mapping Theory without Argument Structure. Unpublished ms., University of Oxford.
- Girard, Jean-Yves. 1987. Linear logic. *Theoretical Computer Science* 50(1). 1–102.
- Goh, Gwang-Yoon. 2003. A lexicalist analysis of the prepositional passive in English. *Journal of Studies in Languages* 19(2).
- Grice, H. Paul. 1975. Logic and conversation. In P. Cole & J. L. Morgan (eds.), *Speech acts*, vol. 3 in the Syntax and Semantics Series, 41–58. London: Academic Press.
- Halvorsen, Per-Kristian & Ronald M. Kaplan. 1988. Projections and semantic descriptions in Lexical-Functional Grammar. In *Proceedings of the International Conference on Fifth Generation Computer Systems*, 1116–1122. Institute for New Generation Systems.

- Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar* (Blackwell Textbooks in Linguistics 13). Oxford, UK: Blackwell.
- Hornstein, Norbert & Amy Weinberg. 1981. Case theory and preposition stranding. *Linguistic Inquiry* 12(1). 55–91.
- Huddleston, Robert & Geoffrey K. Pullum. 2002. *The Cambridge grammar of the English language*. Cambridge, UK: Cambridge University Press.
- Isbell, Lynne A. 2009. *The fruit, the tree, and the serpent: why we see so well*. Cambridge, MA: Harvard University Press.
- Jackendoff, Ray. 1977. *X' syntax: a study of phrase structure*. Cambridge, MA: MIT Press.
- Kaplan, Ronald M. & Joan Bresnan. 1982. Lexical-Functional Grammar: A formal system for grammatical representation. In Joan Bresnan (ed.), *The mental representation of grammatical relations*, 173–281. Cambridge, MA: MIT Press.
- Kaplan, Ronald M. & Annie Zaenen. 1995 [1989]. Long-distance dependencies, constituent structure, and functional uncertainty. In Mary Dalrymple, Ronald M. Kaplan, John T. Maxwell, III, & Annie Zaenen (eds.), *Formal issues in Lexical-Functional Grammar*, 137–165. Stanford, CA: CSLI Publications. Originally appeared in *Alternative conceptions of phrase structure*, ed. Mark Baltin and Antony Kroch (Chicago: Chicago University Press, 1989), 17–42.
- Kibort, Anna. 2001. The Polish passive and impersonal in Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG01 Conference*, 163–183. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/6/lfg01kibort.pdf>.
- Kibort, Anna. 2007. Extending the applicability of Lexical Mapping Theory. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG07 Conference*, 250–270. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/12/papers/lfg07kibort.pdf>.
- Kibort, Anna. 2008. On the syntax of ditransitive constructions. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG08 Conference*, 312–332. Stanford, CA: CSLI

- Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/13/papers/lfg08kibort.pdf>.
- Kibort, Anna. 2013a. Argument Structure and Lexical Mapping Theory. Lecture series given in Hilary Term at the Faculty of Linguistics, Philology & Phonetics, University of Oxford.
- Kibort, Anna. 2013b. Objects and Lexical Mapping Theory. Paper presented at the LFG13 Conference, University of Debrecen.
- Kim, Jong-Bok. 2009. Three types of English pseudo-passives: A lexicalist perspective. *Korean Journal of Linguistics* 34(1). 1–24.
- King, Tracy Holloway. 1995. Configuring topic and focus in Russian. Doctoral dissertation, Stanford University. *Dissertations in linguistics* series, CSLI Publications, Stanford University. Revised and corrected version of 1993 Stanford University dissertation.
- Kroeger, Paul. 1993. Phrase structure and grammatical relations in Tagalog. Doctoral dissertation, Stanford University. *Dissertations in linguistics* series, CSLI Publications, Stanford University. Revised and corrected version of 1991 Stanford University dissertation.
- Kuhn, Jonas. 2001. Resource sensitivity in the syntax-semantics interface and the German split NP construction. In W. Detmar Meurers & Tibor Kiss (eds.), *Constraint-based approaches to Germanic syntax*, Stanford, CA: CSLI Publications.
- Lapointe, Steve. 1980. A theory of grammatical agreement. Doctoral dissertation, University of Massachusetts at Amherst.
- Lipps, Jonathan. 2011. A lexical-functional analysis of Swahili relative clauses. MPhil thesis, University of Oxford.
- Lødrup, Helge. 1991. The Norwegian pseudopassive in lexical theory. *Working Papers in Scandinavian Syntax* 47. 118–129.
- Maling, Joan & Annie Zaenen. 1985. Preposition-stranding and passive. *Nordic Journal of Linguistics* 8(2). 197–209.
- McCawley, James D. 1968. Concerning the base component of a transformational grammar. *Foundations of Language* 4(3). 243–269.
- Napoli, Donna Jo. 1993. *Syntax*. Oxford, UK: Oxford University Press.

- Needham, Stephanie & Ida Toivonen. 2011. Derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG11 Conference*, 401–421. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/16/papers/lfg11needhamtoivonen.pdf>.
- Nunberg, Geoffrey, Ivan A. Sag & Thomas Wasow. 1994. Idioms. *Language* 70(3). 491–538.
- Parsons, Terence. 1990. *Events in the semantics of English*. Cambridge, MA: MIT Press.
- Pietroski, Paul M. 2002. Function and concatenation. In Gerhard Preyer & Georg Peter (eds.), *Logical form and language*, 91–117. Oxford, UK: Clarendon Press.
- Postal, Paul M. 1986. *Studies of passive clauses*. Albany, NY: State University of New York Press.
- Potts, Chris. 2005. *The logic of conventional implicatures* (Oxford Studies in Theoretical Linguistics 7). Oxford, UK: Oxford University Press.
- Radford, Andrew. 1981. *Transformational syntax*. Cambridge, UK: Cambridge University Press.
- Restall, Greg. 2000. *An introduction to substructural logics*. London, UK: Routledge.
- Riddle, Elizabeth & Gloria Sheintuch. 1983. A functional analysis of pseudo-passives. *Linguistics and Philosophy* 6(4). 527–563.
- van Riemsdijk, Henk C. 1978. *A case study in syntactic markedness: the binding nature of prepositional phrases*. Lisse, NL: The Peter de Ridder Press.
- Ross, John R. 1966. A proposed rule of tree-pruning. In *Mathematical linguistics and automatic translation. Report number NSF 17 to the National Science Foundation*, Computer Laboratory, Harvard University, Cambridge, MA.
- Ross, John R. 1967. Constraints on variables in syntax. Doctoral dissertation, MIT. Published as Ross, John R. 1986. *Infinite syntax!* Norwood, NJ: ALEX.

- Sadler, Louisa. 1999. Non-distributive features and coordination in Welsh. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG99 Conference*, Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/4/sadler/lfg99-sadler.html>.
- Snijders, Liselotte. 2012. Issues concerning constraints on discontinuous NPs in Latin. In Miriam Butt & Tracy Holloway King (eds.), *Proceedings of the LFG12 Conference*, 565–581. Stanford, CA: CSLI Publications. <http://www.stanford.edu/group/cslipublications/cslipublications/LFG/17/papers/lfg12snijders.pdf>.
- Svenonius, Peter Arne. 1994. Dependent nexus: Subordinate predication structures in English and the Scandinavian languages. Doctoral dissertation, UCSC.
- Taraldsen, Knut T. 1979. Remarks on some central problems of Norwegian syntax. A review article. *Nordic Journal of Linguistics* 2(1). 23–54. Review of T. Fretheim (ed.) *Sentrale problemer i norsk syntaks*.
- Toivonen, Ida. 2003. *Non-projecting words: A case study of Swedish particles*. Dordrecht, NL: Kluwer Academic Publishers.
- Traugott, Elizabeth. 2002. *Regularity in semantic change*. Cambridge, UK: Cambridge University Press.
- Truswell, Robert. 2008. Preposition stranding, passivisation, and extraction from adjuncts in Germanic. *Linguistic Variation Yearbook* 8. 131–178.
- Vande Wiele, Héloïse. 2014. The loss of poetic effects: from indeterminate to conventionalized meaning. Unpublished ms.
- Whitehead, Alfred North & Bertrand Russell. 1910. *Principia mathematica*, vol. I. Cambridge, UK: Cambridge University Press.
- Wunderlich, Dieter. 1991. How do prepositional phrases fit into compositional syntax and semantics? *Linguistics* 29(4). 591–621.