How *not* to distinguish arguments from adjuncts in LFG

Adam Przepiórkowski
Institute of Computer Science, Polish Academy of Sciences and
Institute of Philosophy, University of Warsaw

Proceedings of the Joint 2016 Conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar

Polish Academy of Sciences, Warsaw, Poland

Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King, Stefan Müller (Editors)

2016

pages 560–580

Keywords: argument–adjunct distinction, dependents, argument structure, adjuncts, modifiers

Przepiórkowski, Adam. 2016. How *not* to distinguish arguments from adjuncts in LFG. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the Joint 2016 Conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar, Polish Academy of Sciences, Warsaw, Poland*, 560–580. DOI: 10.21248/hpsg.2016.29. 

Abstract

The paper briefly reexamines arguments for the argument–adjunct dichotomy, commonly assumed in contemporary linguistics, showing that they do not stand up to scrutiny. It demonstrates that – perhaps surprisingly – LFG currently only assumes this dichotomy in its f-structure feature geometry, and does not rely on it in any crucial way. Building on this observation, the paper presents a way of getting rid of this dichotomy altogether.

1 Introduction

A great number of tests for the argument–adjunct distinction have been proposed over the last almost 60 years (since Tesnière 1959), many quickly discarded. As noted by Tutunjian & Boland 2008, p. 633, "[t]he sheer number of these tests underlines the fact that no single test is entirely satisfactory". While the vast majority of linguists share the sentiment that "[t]he distinction between arguments and adjuncts is crucial in linguistics" (Needham & Toivonen, 2011, p. 402), some have long noted that it is difficult to make it operational, e.g.: "The problem of how to differentiate between complements and adjuncts has not yet been solved satisfactorily" (Vater, 1978, p. 21) or "No single criterion for this distinction has been found yet and it is rather doubtful that it can be found in the future" (Sawicki, 1988, p. 17).

The most common escape strategy, exemplified also by recent LFG work (Needham & Toivonen, 2011; Asudeh & Giorgolo, 2012; Toivonen, 2013; Asudeh et al., 2014), is to make this a three- or more-way distinction, with a separate class (or classes) for difficult or borderline cases. An extreme exemplar of this strategy is Somers 1984, which splits dependents into six classes: *integral complements*, *obligatory complements*, *optional complements*, *middles*, *adjuncts* and *extraperipherals*. This strategy brings us a little closer to the position defended in this paper, i.e., that dependents form a continuum which may be divided in various ways and according to various criteria, but at the prohibitive cost of replacing one vague boundary with two or more even vaguer boundaries.

Before I conclude that – after over half a century of looking for convincing and stable tests for the argument–adjunct dichotomy – the burden of proof is on the proponents of this dichotomy, I examine in Section 2 a few popular tests which are relatively language-independent, theory-independent and stable over time. In Section 3 I show that, perhaps surprisingly, LFG does not really rely on this distinction in any crucial way, but rather assumes it in the f-structure feature geometry. The paper concludes by considering three ways of getting rid of this distinction at f-structure and, hence, in LFG in general.

[†]Many thanks to Agnieszka Patejuk for her comments on various versions of the material presented here, as well as to Mary Dalrymple and two anonymous reviewers of HeadLex16 proceedings for their comments on the previous version of this paper. This research is partially supported by the Polish Ministry of Science and Higher Education within the CLARIN ERIC programme 2016–2018 (http://clarin.eu/).

2 Main tests for the argument–adjunct distinction

The common intuition is that the meaning of arguments is more central to the meaning of the predicate; unfortunately, this intuition has never (to the best of my knowledge) been translated into an operational procedure of splitting dependents into arguments and adjuncts. In fact, this intuition already suggests that the notion of argument is gradable ("more central") rather than categorial. Nevertheless, some more operational tests have been proposed, and this section examines some of the most popular such tests.

2.1 Obligatoriness

If there is one more or less operational test that almost all linguists agree about, it is that obligatory dependents are arguments. However, this is not really a binary classifier; it does not say anything about optional dependents, and in some languages almost all dependents are to some extent optional. Even in English, direct objects – i.e., prototypical arguments – may be syntactically omitted, as in the case of the italicised verbs in the following attested examples:

(1) I lost 20 lbs and nobody has *noticed*. Feeling down about it.[1]
(2) He will tell you everything when he has *finished*.[2]
(3) Make his favorite meal or dessert (if he has already *eaten*) and surprise him when he comes home![3]

And even the most prototypical verbs usually assumed to obligatorily combine with a dependent, such as DEVOUR, are happy without it, under the right circumstances:

(4) He doesn't eat, he *devours*.[4]

The fact that syntactic obligatoriness may be understood in a number of ways and may indeed be a graded notion has been recognised – on the basis of a different kind of evidence than that cited above – within valency theory (Herbst & Roe, 1996). Hence, the notion of *obligatoriness* must be made much more precise than is common in discussions of the argument–adjunct dichotomy, if it is to be operational even in this limited unidirectional (syntactic obligatoriness implies argumenthood, not the other way round) way.

Another problem with the application of this test is the existence of so-called *obligatory adjuncts*, as in the following example from Grimshaw & Vikner 1993, p. 143, which is supposed to be ungrammatical unless at least one of the phrases in the brackets (most of which are uncontroversial adjuncts) appears in the sentence:

(5) *This house was built.

[1] https://www.reddit.com/r/loseit/comments/3ntqsi/i_lost_20_lbs_and_nobody_has_noticed_feeling_down/

[2] https://www.englishforums.com/English/WhenHeHasFinished/bwhml/post.htm

[3] http://love.allwomenstalk.com/sure-ways-to-make-him-happy

[4] http://kitfrazier.com/wordpress/yes-hes-a-mean-cat-but-hes-mine-if-youve-got-him-please-send-him-home-atticusphonehome/

(6) This house was built {yesterday / in ten days / in a bad part of town / only with great difficulty / by a French architect}.

Goldberg & Ackerman (2001), together with Jung (1997) and Szymańska & Śpiewak (2000), convincingly reject the event-semantic analysis of such cases proposed by Grimshaw & Vikner (1993), and offer a pragmatic analysis in terms of Grice's maxim of quantity, arguing that – given a proper context – such adjuncts are not really obligatory. Nevertheless, the existence of this phenomenon supports the observation that obligatoriness is a subtle and possibly graded notion and that the perceived mandatory presence of a dependent may in fact result from a variety of factors.

One way of dealing with such problems with the notion of syntactic obligatoriness is to concentrate on the *semantic obligatoriness* instead, as determined by the dialogue test (Panevová, 1974, pp. 17–19), or its "monologue" version (Fillmore, 1986, p. 96):

(7) He's already *noticed* (#but I have no idea *what* he's noticed).

(8) He's already *finished* (#but I have no idea *what* he's finished).

These examples show that the missing direct objects of the forms of NOTICE and FINISH are semantically obligatory in the sense that they may be syntactically omitted only if they are contextually provided. As semantically obligatory, they are arguments, according to Panevová 1974, 1975. However, it is clear that this test alone cannot determine the argument vs. adjunct status of a dependent, as it would classify the direct object of EAT as an adjunct:

(9) He's already *eaten* (but I have no idea *what* he's eaten).

So, again, this is at best a unidirectional criterion: semantic obligatoriness implies argumenthood, not the other way round. Also, as discussed at length in Przepiórkowski 2016, the applicability of this test is not always straightforward and its results are open to interpretation. Hence, I maintain the conclusion that the notion of obligatoriness – whether understood syntactically, or semantically – has never been operationalised to the extent that would make it usable as a test for argumenthood.

2.2 Iterability

A test assumed in theories as different as LFG and HPSG on one hand and Functional Generative Description (FGD; Sgall et al. 1986)[5] on the other is the iterability test: "[A]djuncts may be iterated freely without any effect on syntactic well-formedness" (Williams, 2015, p. 69). The much cited example showing iterability of adjuncts is (10) from Bresnan 1982c, p. 164, contrasted with (11) from Bresnan 1982c, p. 165, which is supposed to show that instruments are arguments ("[Inst]" added in (11) for the sake of parallelism with (10)):

[5] A critique of tests assumed in FGD, including iterability and specificity, may be found in Przepiórkowski 2016, from which this and especially the ensuing subsection draw heavily.

(10) Fred *deftly* [Manner] handed a toy to the baby *by reaching behind his back* [Manner] *over lunch* [Temp] *at noon* [Temp] *in a restaurant* [Loc] *last Sunday* [Temp] *in Back Bay* [Loc] *without interrupting the discussion* [Manner].

(11) *John escaped from prison *with dynamite* [Inst] *with a machine gun* [Inst].

However, this contrast is ill-conceived, as all [Temp] phrases in (10) are different references to *the same* time of the event, all [Loc] phrases – to *the same* location of the event, and all [Manner] phrases arguably describe aspects of a *single* manner; on the other hand, the two [Inst] phrases in (11) cannot describe the same instrument – dynamite and a machine gun are necessarily *different* entities. Examples such as (10) should rather be compared to the following two examples from Zaenen & Crouch 2009, p. 646, which illustrate the (perhaps more limited) possibility to iterate arguments:

(12) I count on you, on your kindness.

(13) He lives in France, in a small village.

Goldberg (2002, pp. 334–335, 341) argues that also instrumental phrases may be iterated as long as they "concentrically" refer to the same entity, and supports this claim with the following – perhaps more controversial – examples:

(14) With a slingshot he broke the window with a rock.

(15) The robot opened the door with a key with its robotic arm.

In all the cases where two *different* entities are involved they should be expressed via coordination:

(16) Fred will perform [today and tomorrow] / *[today tomorrow].

(17) John escaped from prison [with dynamite and with a machine gun] / *[with dynamite with a machine gun].

(18) I count [on you and on his kindness] / *[on you, on his kindness].

(19) The robot opened the door with [an axe and a crowbar] / *[with an axe, with a crowbar].

It is also easy to construct examples of other iterated arguments, for example, an iterated subject, as in the following Polish example, where the three nominative NPs are understood as referring to the same person:

(20) Ważny urzędnik wczoraj przyszedł, dyrektor
important.NOM official.NOM yesterday came director.NOM
departamentu, bardzo wysoko postawiona osoba...
department.GEN very highly placed person
'An important official came yesterday: the director of a/the department, a very high-ranking person.'

It could be argued that (12)–(13), and maybe also (20), should be analysed as some special construction, maybe a type of apposition. Perhaps so. However, whatever the analysis of such examples of iterated arguments, the burden is on the shoulders of the proponents of the dichotomy to show that this analysis does not carry over to examples of iterated adjuncts, i.e., that iterability does distinguish arguments from adjuncts. Since I am not aware of such an argument, I conclude that iterability, as currently understood, fails to distinguish arguments from adjuncts.

2.3 Specificity

Another common test reflects the intuition that promiscuous types of phrases, happy to combine with all or a great number of different predicates, tend to be adjuncts, while arguments are restricted to smaller classes of predicates.

In Functional Generative Description, specificity is understood strongly: all types of adjuncts are assumed to be able to occur with all verbs (Panevová, 1974, p. 11). Taken literally, the test clearly gives undesirable results, as very few adjunct types may really depend on every verb. For example, McConnell-Ginet 1982, p. 166, notes that WEIGH fails to combine with many typical adverbials:

(21) *Annie weighs 120 pounds {heavily / beautifully / quickly / elegantly}.

(22) *Annie weighs 120 pounds {for her mother / with a fork / in an hour / toward Detroit}.

Even such prototypical types of adjuncts as temporal or locative are subject to exceptions. As shown in Koenig et al. 2003, p. 80, where an experiment consisting in the manual examination of 3909 English verbs is reported, 0.2% (i.e. 8) of them do not combine with temporal dependents and 1.8% (i.e. as many as 70) do not combine with event locations. Such ratios are bound to be much higher in the case of most other dependent types claimed to be adjuncts, e.g., manner or instrument phrases.

It is also clear that the results of this test depend on the granularity of types of dependents. For example, simplifying a little, Koenig et al. (2003) treat as arguments those dependents which may occur with up to 30% of all verbs, and as adjuncts – those which may occur with at least 90% of all verbs. It seems then that agents should count as typical adjuncts. Koenig et al. (2003) avoid this conclusion by splitting this dependent type into more fine-grained semantic roles, as proposed in Dowty 1989, 1991, and showing that each of them occurs with less than 30% of the examined verbs. However, Przepiórkowski 2016 shows that the same reasoning could be applied to Polish durative phrases, i.e. prototypical adjuncts, with the result of classifying them as arguments.

The problem that many intended adjuncts do not really combine with all verbs is duly noted in FGD, but it is played down: "it appears as a rule that such a combination is not grammatically excluded but is unusual due to cognitive or ontological reasons" (Panevová, 1974, fn. 6). Unfortunately, this view makes the test largely unusable in practice, as there is no operational procedure of distinguishing "grammatical unacceptability" from "cognitive or ontological unacceptability". Moreover, it is not clear that such a distinction is justified at all; as shown in Levin 1993, grammatical behaviour of verbs (their diathesis patterns) strongly correlates with their meaning (which may be hard to distinguish from "cognitive or ontological" aspects).

In summary, very few classes of dependent types, if indeed any, "can depend on every verb", and attempts to distinguish reasons for not satisfying this criterion have never, to the best of my knowledge, been translated into an operational test, so the specificity criterion simply does not do the job it was supposed to do.

2.4 Verbal pro-forms

A once popular test concerns the behaviour of *do so* and similar *verbal pro-forms* (Lakoff & Ross, 1976), which apparently may be substituted for a repeated VP (i.e., a verbal projection which contains all complements – that is, non-subject arguments – and perhaps some adjuncts). Multiple arguments against this syntactic status of *do so* – and against using it as a test of argumenthood – may be found in Przepiórkowski 1999a, ch. 7, and in Culicover & Jackendoff 2005, ch. 8, but since the *do so* vampire is occasionally resurrected – recently in a handbook article (Ackema, 2015) – I present the supposed test and arguments against it here.

Consider the following examples (Ackema, 2015, p. 260).

(23) John ate a banana yesterday, and Geraldine did so today.

(24) John ate a banana yesterday, and Geraldine did so, too.

(25) *John ate a banana, and Geraldine did so an apple.

The first example is grammatical, with *did so* referring to *ate a banana*, i.e., the verb and its sole complement. The second example is ambiguous: here *did so* may be understood as being substituted either for *ate a banana*, or for a larger constituent, containing also the adjunct *yesterday*. By contrast, the final example is ungrammatical supposedly because an attempt is made to substitute *did so* for a constituent which is too small, i.e., for *ate* without its complement *a banana*.

Examples showing that *do so* does not have to refer to an existing syntactic constituent are easy to find. Active–passive mismatches like the following are already noted in Bouton 1969, and many more, both from the linguistic literature and from corpora, are cited in Przepiórkowski 1999a:

(26) Because the issue had been discussed so thoroughly in our committee that afternoon, we were asked not to waste time doing so again that night. (*do so* = discuss the issue)

An antecedent of *do so* may also be nominal, as in the following corpus example from Meijs 1984:

(27) Its cord was useless in effect, so I'd no trouble in its removal; on doing so I was dumbfounded by its unexpected contents. (*doing so* = removing it)

In fact, even the weakest requirement of syntactic parallelism seems to be missing, as the antecedent of *do so* may be constructed "on the fly" from different pieces of syntactic structure (Przepiórkowski, 1999a, pp. 303–304):

(28) . . . featuring people (like Woody Allen himself) who can't sing and can't dance, but do so anyway. (*do so* = sing and dance)

(29) Fortunately, the first person to die in 1990 and the first couple to file for divorce in 1990 were allowed to do so anonymously. (*do so* = die and file for divorce, respectively)

Currently, a more common analysis is that such verbal pro-forms should not be understood as involved in some syntactic reconstruction process that requires parallelism, but rather as lexical items that have no arguments (apart from the subject) but may combine with the usual adjuncts (Culicover & Jackendoff 2005, ch. 8,

Williams 2015, pp. 71–72); the pro-form refers to a VP antecedent, with each possible adjunct acting as "an orphan expression that represents what is *not* the same in the interpretation of the fragment [here: *do so*] and the antecedent" (Culicover & Jackendoff, 2005, p. 289). This last statement is supported by the kind of data apparently first discussed in Miller 1990, 1992; see the perhaps somewhat artificial (30)–(31) from Miller 1992, pp. 96–97, perhaps more natural (32)–(33) from Culicover & Jackendoff 2005, p. 285, and the attested[6] (34):

(30) John kicked Mary and Peter did so to Ann.
(31) John spoke to Mary and Peter did so with Ann.
(32) Robin broke the window (with a hammer) and Mary did the same to the vase.
(33) John turned the hot dog down flat, but he wouldn't have done so with filet mignon.
(34) That's all I've been trying to say: think about what you say next time. Opinion or not, you could hurt someone. Be thankful that you did so to someone who can keep their head and not lash out like you seem to normally do.

In all these examples, the pro-form – *do the same* in (32) and *do so* in the other four sentences – occurs with an apparent prepositional adjunct which, however, corresponds to a prototypical argument in the antecedent (passivisable direct object, in the case of (30) and (32)–(34)).

Given such examples, verbal pro-forms cannot be straightforwardly used to distinguish arguments from adjuncts within dependents of other verbs; at best, one may assume, together with Culicover & Jackendoff 2005 and Williams 2015, that dependents co-occurring with *do so* and similar pro-forms are adjuncts of *do so*, but even this claim is controversial, given that the *with*-dependents in (31) and (33) should probably be classified as themes, and *to*-dependents in the other three examples above – as patients (Culicover & Jackendoff, 2005, p. 285).

3 Argument–adjunct distinction in LFG

Given that the purported argument–adjunct distinction (AAD) is so difficult to pin down, the possibility must be entertained that there is no single fundamental partition of possible dependents of a predicate into two (or three) classes. Would that be a problem for LFG?

3.1 AAD at grammatical levels

Perhaps surprisingly, the only grammatical level where the argument–adjunct distinction surfaces in contemporary LFG is f-structure, and there only as a distinction between the attributes representing (closed and open) adjuncts (ADJ and XADJ) on the one hand and the attributes representing governable functions (SUBJ, OBJ, etc.), on the other.

[6] http://mewkwota.deviantart.com/art/Everyone-Stop-Looking-at-Me-413002782

Traditionally, AAD also has a reflex in semantic forms, i.e., values of PRED: only arguments, not adjuncts, are mentioned there, and the principles of Completeness and Coherence (Dalrymple, 2001, pp. 35–39) make sure that only and all arguments listed in such semantic forms are represented as the values of SUBJ, OBJ, etc. However, as noted already in Dalrymple et al. 1993, pp. 13–14, and Kuhn 2001, § 1.3.3, Glue Semantics (Dalrymple, 1999) makes PRED – and also the principles of Completeness and Coherence – largely superfluous. As a result, in some recent work, PRED values do not mention arguments at all; for example, the lexical entry for *ate* in Asudeh & Giorgolo 2012, p. 73, contains the equation $(\uparrow \text{PRED}) = \text{`EAT'}$ rather than $(\uparrow \text{PRED}) = \text{`EAT}\langle\text{SUBJ, OBJ}\rangle\text{'}$.

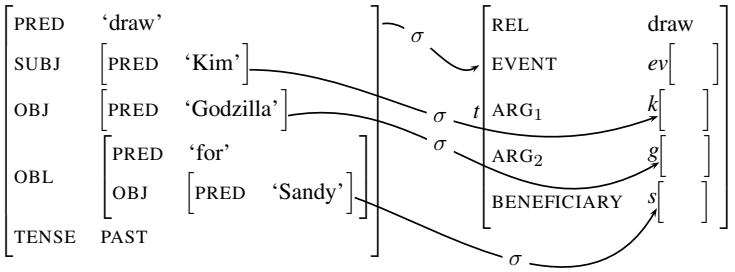
Unlike transformational grammar, LFG has never assumed that AAD must be represented in syntactic trees. For example, Kaplan & Bresnan 1982, p. 217, propose the following syntactic rule for an English VP (abbreviated here), according to which prepositional phrases occupy the same c-structure positions, whether they are arguments ($(\uparrow (\downarrow \text{PCASE})) = \downarrow$) or adjuncts ($\downarrow \in (\uparrow \text{ADJUNCTS})$):

(35) $\text{VP} \longrightarrow \text{V} \quad (\text{NP}) \quad (\text{NP}) \quad \text{PP}^* \quad \ldots$

$(\uparrow \text{OBJ}) = \downarrow \quad (\uparrow \text{OBJ}_\theta) = \downarrow \quad \{(\uparrow (\downarrow \text{PCASE})) = \downarrow \mid \downarrow \in (\uparrow \text{ADJUNCTS})\}$

There is currently no standard LFG approach to semantic structure, and sometimes its very existence is denied (Andrews, 2010), but none of various approaches to s-structure assumes AAD. This is least obvious in the case of recent approaches, e.g., Asudeh et al. 2014, which – following Findlay 2014 – make the semantic structure a locus of the Lexical Mapping Theory and assume s-level attributes $\text{ARG}_1, \ldots, \text{ARG}_4$. However, only a proper subset of arguments fall under the purview of LMT, and remaining arguments correspond to s-structure attributes other than ARG_n, just as in the case of adjuncts. For example, Asudeh et al. 2014, p. 81, propose the following s-structure (and mapping from f-structure) for *Kim drew Godzilla for Sandy*, in which the OBL argument *for Sandy* corresponds to the value of the s-structure attribute BENEFICIARY rather than ARG_n (their Figure 5):

(36)



Finally, the resulting logical forms also do not exhibit AAD, as LFG analyses commonly assume the neo-Davidsonian approach to logical forms (Parsons, 1990). For example, the sentences (37a) and (38a) may receive the respective logical forms in (37b) and (38b) (simplified here), which differ only in the name of the main predicate (*sleep* vs. *reside*), even though the locative phrase is a prototypical adjunct in (37) and a clear (obligatory) argument in (38).

(37) a. Peter sleeps in the garage.
b. $\exists e.[sleep(e) \wedge agent(e, peter) \wedge location(e, the\ garage)]$

(38) a. Peter resides in the garage.
b. $\exists e.[reside(e) \wedge agent(e, peter) \wedge location(e, the\ garage)]$

I conclude that the only level of grammatical representation that assumes the AAD is f-structure, namely, the attributes (X)ADJ vs. SUBJ, OBJ, etc.

3.2 AAD in the grammar

Even if grammatical representations do not exhibit AAD, it is possible that processes leading to their construction are sensitive to this distinction. For example, even if (37a) and (38a) have the same (up to the name of the main predicate) c-structures, s-structures and logical forms, perhaps radically different grammatical mechanisms have to be invoked to construct these analogous representations? It turns out that this is not so, especially given recent LFG developments.

Traditionally, arguments of predicates are only specified in lexical entries of these predicates and adjuncts are only added via general syntactic rules. However, some recent analyses (Asudeh et al., 2008, 2013, 2014; Asudeh & Giorgolo, 2012) blur this distinction. According to such analyses, arguments – also their semantic contributions – are adduced via calls to templates such as @AGENT and @PATIENT for the usual (deep) subjects and objects, @BENEFACTIVE for derived benefactive arguments (Asudeh & Giorgolo, 2012; Asudeh et al., 2014), or @TRANSITIVE-OBLIQUE in the analysis of Swedish Direct Motion Construction (DMC; Asudeh et al. 2008, 2013). What is important is that such calls are made not only within lexical entries, but also within grammatical rules – this is exactly the analysis of the Swedish DMC, which is signalled by a special c-structural configuration (Asudeh et al., 2013, §§ 2.2 and 4.1). Similarly, in the case of the analogous English *way*-constructions, as in *Sarah elbowed her way through the crowd*, the argument headed by *way* is added to the f-structure of the head (*elbowed* in the above example) only by virtue of a relevant template call in the lexical entry of *way*; such an argument is never mentioned in the lexical entry of the head verb (Asudeh et al., 2013, § 4.2). As this analysis is analogous (in relevant aspects) to the standard treatment of adjuncts, I conclude that the same grammatical mechanisms are involved in the introduction of arguments and adjuncts, and that the only place where AAD surfaces in contemporary LFG is f-structure, with its distinction between adjunct attributes (X)ADJ and governable functions SUBJ, OBJ, etc.

4 Argument–adjunct *non*-distinction in LFG

I propose three ways of getting rid of the last vestiges of AAD in LFG. The first is very conservative and consists in replacing (X)ADJ with specific "grammatical functions". The second follows (and exceeds) the approach known from HPSG and consists in replacing all specific attributes for arguments and adjuncts with a single

DEPS list. The third combines the former two and has the additional advantage of encoding the functional hierarchy. I only sketch the main ideas of the first two proposals, but I provide more details and a worked example (39) in the case of the third proposal.

(39) John resided in France for two years, in a village called Les Vans.

In the process, I ignore the internal structure of the nominal phrases in this sentence and their quantificational impact – I make the simplifying assumption that all NPs in (39) semantically contribute constants: j in the case of *John*, f in the case of *France*, ty in the case of *two years* and av in the case of *a village called Les Vans*.

4.1 Conservative proposal

The most conservative way to get rid of AAD altogether is to replace the attributes ADJ and XADJ, which are currently sets of adjuncts of various types, with more specific attributes such as LOC(ation), TEMP(oral), DUR(ative), XPART(icipial) (for open participial adjuncts), etc., as illustrated in (40) below.[7]

(40)
$$\begin{bmatrix}
\textsc{pred} & \text{`RESIDE'} \\
\textsc{tense} & \textsc{past} \\
\textsc{subj} & \begin{bmatrix} \textsc{pred} & \text{`JOHN'} \end{bmatrix} \\
\textsc{loc} & \left\{ \begin{bmatrix} \textsc{pred} & \text{`IN'} \\ \textsc{obj} & \text{“FRANCE”} \end{bmatrix}, \begin{bmatrix} \textsc{pred} & \text{`IN'} \\ \textsc{obj} & \text{“A VILLAGE...”} \end{bmatrix} \right\} \\
\textsc{dur} & \begin{bmatrix} \textsc{pred} & \text{`FOR'} \\ \textsc{obj} & \text{“TWO YEARS”} \end{bmatrix}
\end{bmatrix}$$

This proposal, and the combined analysis of Section 4.3 below, does not necessarily contradict the proposal of Patejuk & Przepiórkowski 2016 that the repertoire of grammatical functions assumed in LFG be strictly limited, perhaps only to SUBJ and OBJ. Rather, I view the set of “extended grammatical functions” SUBJ, OBJ, LOC, DUR, etc., as analogous to “functors” assumed in the FGD approach to valency (Panevová, 1974, 1975): almost all of some 35 FGD functors (Žabokrtský, 2005, pp. 117–118) are defined purely semantically (e.g., LOC(ative), CUAS(e), various temporal functors, etc.), but a couple simply mark grammatical functions. In particular, the perhaps misnamed functor ACT(or) refers to the subject regardless of its semantic relation to the verb, i.e., also in case of non-agentive subjects. Similarly, in the current proposal, SUBJ and OBJ may be regarded as true grammatical functions, and the other “extended grammatical functions” such as LOC and DUR – as indicating syntactic realisations of appropriate semantic roles.

As argued in Section 2.2, there is no clear difference in terms of iterability between such new semantically defined “grammatical functions” and the standard governable functions – it seems that each may be realised as a set of phrases (see Zaenen & Crouch 2009 on OBLs) – but in order to alleviate parenthesis clutter, only

[7] For a related idea, see Nordlinger 1998, pp. 71–72, fn. 26.

those values of extended grammatical functions are represented as sets which have more than one realisation in the sentence. In the running example (39), this only concerns the locative phrases.

Note that this solution does not preserve the AAD. Assuming this dichotomy, one of the locative phrases would have to be treated as an argument (it is syntactically obligatory), and the other – as a typical adjunct. By contrast, they are both members of the LOC value in (40), without any indication of which one is an argument, and which one is an adjunct.

Similarly, once the implicit AAD vanishes, there is no need to assume that all OBLs are arguments, so the agentive *by*-phrase in passive constructions may be represented as $\text{OBL}_{\text{AGENT}}$, without any commitment to its argument/adjunct status. This evades the problem that led Grimshaw 1990 to the postulation of the interim class of "argument adjuncts", specifically for such *by*-phrases (and possessives, in the nominal domain), and liberates LFG researchers from having to make an arbitrary decision on the status of such agentive PPs.

4.2 HPSG-like proposal

The second possibility consists in replacing all such functional attributes with a single ordered DEP(endent)S list:

(41)
$$\left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{reside}\text{'}\\ \textsc{tense}\ \textsc{past}\\ \textsc{deps}\ \left\langle \left[\textsc{pred}\ \text{`}\textsc{John}\text{'}\right], \left\{ \left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{in}\text{'}\\ \textsc{deps}\ \left\langle \text{``}\textsc{France}\text{''}\right\rangle\end{array}\right], \left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{in}\text{'}\\ \textsc{deps}\ \left\langle \text{``}\textsc{a village}\ldots\text{''}\right\rangle\end{array}\right] \right\}, \right.\\ \qquad\qquad \left.\left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{for}\text{'}\\ \textsc{deps}\ \left\langle \text{``}\textsc{two years}\text{''}\right\rangle\end{array}\right] \right\rangle\end{array}\right]$$

This idea seems to mirror the HPSG analysis of Przepiórkowski 1999a, ch. 9, and Bouma et al. 2001, but it goes further. In HPSG, while the final values of DEPS do not distinguish between arguments and (some) adjuncts, the grammar still retains this distinction: arguments appear on DEPS by virtue of the lexical entries of heads, while adjuncts are added to this list via a separate mechanism. Moreover, according to Bouma et al. 2001, only some (post-verbal) adjuncts end up on DEPS. By contrast, I assume that all (at least all event-related, as opposed to speaker-oriented, etc.) prototypical adjuncts appear on DEPS and that they are introduced by the same mechanisms as prototypical arguments (cf. Section 3.2).

4.3 Combined proposal

The above two proposals reflect the fundamental difference between LFG and HPSG: the former implements what Pollard & Sag 1987, p. 118, call "a 'keyword' theory of grammatical relations", where each grammatical function receives

a name, and the latter is based on the obliqueness hierarchy (essentially, the accessibility hierarchy of Keenan & Comrie 1977, also reflected by the relational hierarchy of Relational Grammar), with particular grammatical functions defined as particular positions in this hierarchy (the highest element is the subject, etc.). This ordered list of grammatical functions is the locus of the HPSG binding theory (Pollard & Sag, 1994, ch. 6), and plays a role in its control theory (ch. 7).

LFG also assumes such an obliqueness hierarchy, here called *functional hierarchy* (to be distinguished from the *thematic hierarchy*), and refers to it in analyses of control (Bresnan 1982a, p. 294, Dalrymple 2001, p. 345), binding (Bresnan et al. 2015, chs. 9–10, and references therein) and *wh*-movement (Dalrymple 2001, p. 412 and references therein). However, unlike in HPSG, this notion has apparently never been formalised in LFG.

I propose to combine the two approaches in a way that encodes both: particular grammatical functions and the functional hierarchy. The gist of the idea is to represent grammatical functions as a *named list*, where each element of the ordered list is annotated with the appropriate extended grammatical function, and the whole list reflects functional hierarchy:

(42)
$$\left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{reside}\text{'}\\ \textsc{tense}\ \textsc{past}\\ \textsc{deps}\ \left\langle \textsc{subj}\colon \left[\textsc{pred}\ \text{`}\textsc{John}\text{'}\right],\right.\\ \qquad \textsc{loc}\colon \left\{\left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{in}\text{'}\\ \textsc{deps}\ \left\langle \textsc{obj}\colon \text{“}\textsc{France}\text{”}\right\rangle\end{array}\right], \left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{in}\text{'}\\ \textsc{deps}\ \left\langle \textsc{obj}\colon \text{“}\textsc{a village}\ldots\text{”}\right\rangle\end{array}\right]\right\},\\ \qquad \left.\textsc{dur}\colon \left[\begin{array}{l}\textsc{pred}\ \text{`}\textsc{for}\text{'}\\ \textsc{deps}\ \left\langle \textsc{obj}\colon \text{“}\textsc{two years}\text{”}\right\rangle\end{array}\right]\right\rangle\end{array}\right]$$

According to the f-structure (42), there are four dependents corresponding to three extended grammatical functions: SUBJ, LOC and DUR. The subject outranks all other dependents, and both locative dependents outrank the durative dependent (with the order between these two locatives undefined).

Technically, lists have a standard (Shieber, 1986, p. 29) encoding in feature structures via attributes such as FIRST and REST (or HEAD and TAIL). In the case of named lists, the FIRST (or HEAD) attribute is replaced with the specific name. So (42) above is a shorthand for the complete f-structure (43) on the next page.

The advantages of such a representation are multiple. First of all, it makes it possible to formalise compactly those modules of LFG which assume a functional hierarchy: they only need to make a reference to the order of elements on the DEPS list. Second, it extends the HPSG approach, in which some grammatical functions are already singled out (see Pollard & Sag 1994, ch. 9, and references therein, as well as the use of XARG in Sag 2007, etc.). Such an extension is needed for example to explicitly mark the passivisable object. Note that it is not sufficient to say that a verb has a passive form and assume that the second DEPS element is the passivis-

able object, as some such objects are optional and, as a result, the second position of a passivisable verb may be occupied by a dependent which is not passivisable.[8] Third, various grammatical phenomena which do not necessarily distinguish adjuncts from arguments, such as case assignment (Przepiórkowski, 1999a,b) and extraction (Bouma et al., 2001), now receive a uniform locus of analysis – this is in fact the main motivation for the introduction of DEPS in HPSG.

(43)
$$\begin{bmatrix}
\text{PRED} & \text{`RESIDE'} \\
\text{TENSE} & \text{PAST} \\
\text{DEPS} & \left\langle \begin{bmatrix} \text{SUBJ} & \left[\text{PRED} \quad \text{`JOHN'}\right] \end{bmatrix}, \begin{bmatrix} \text{REST} & \left\langle \begin{bmatrix} \text{LOC} & \left\{ \begin{bmatrix} \text{PRED} & \text{`IN'} \\ \text{DEPS OBJ} & \text{“FRANCE”} \end{bmatrix}, \begin{bmatrix} \text{PRED} & \text{`IN'} \\ \text{DEPS OBJ} & \text{“A VILLAGE...”} \end{bmatrix} \right\} \end{bmatrix}, \begin{bmatrix} \text{REST} & \left\langle \begin{bmatrix} \text{DUR} & \begin{bmatrix} \text{PRED} & \text{`FOR'} \\ \text{DEPS OBJ} & \text{“TWO YEARS”} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix} \right\rangle
\end{bmatrix}$$

Standard LFG analyses carry over to this new feature architecture, with two modifications. First, whenever an analysis refers to ADJ, it should now refer to an extended grammatical function representing a specific type of adjunct (e.g., LOC or DUR), or perhaps a disjunction of such grammatical functions. The second modification that is needed is more technical: functional equations accessing grammatical functions must be modified, as these functions are now embedded within DEPS. For example, an equation like: $\downarrow = (\uparrow \text{ OBJ})$ may now – at least in the case of English, with its obligatory subjects – be replaced with: $\downarrow = (\uparrow \text{ DEPS REST OBJ})$. In the case of extended grammatical functions other than subject or object, such equations are more complex, as the number of elements preceding them on the DEPS list is not constant. For example, the specification of a position in a syntactic rule which is occupied by locative or durative phrases may be adorned with an equation such as:

(44) $\downarrow \in (\uparrow \text{ DEPS REST}^* \{\text{LOC}|\text{DUR}\})$

Instead of specifying such equations directly, I propose a template (see the Appendix), let us call it GF, that should be used whenever an assignment to an extended grammatical function is to be made. With such a template in hand, the above equation will be shortened to @GF({LOC|DUR}), and typical syntactic rules will look as follows:[9]

[8] The external reviewer suggests defining objects as the second (after subjects) least oblique structurally cased NPs. However, as argued at length in Przepiórkowski 1999a, passivisation in some languages, including Polish, is dissociated from the structural vs. lexical case assignment dichotomy, so I will not follow this suggestion here.

[9] I adopt the usual abbreviatory conventions concerning the omission of head equations $\uparrow = \downarrow$ (Dalrymple 2001, p. 119, Bresnan et al. 2015, p. 106). Obviously, (46) is much simplified, as also other types of constituents may be sisters to I and as PPs may also bear grammatical functions other than LOC or DUR.

(45) IP $\longrightarrow$ NP I′
@GF(SUBJ)

(46) I′ $\longrightarrow$ I (NP) (PP)*
@GF(OBJ) @GF({LOC|DUR})

Additionally, I make use of abbreviations such as:

(47) $^{\text{D}}$SUBJ $\equiv$ DEPS SUBJ

(48) $^{\text{D}}$OBJ $\equiv$ DEPS REST* OBJ

(49) $^{\text{D}}$LOC $\equiv$ DEPS REST* LOC, etc.

Hence, @GF({LOC|DUR}) is equivalent to: $\downarrow \in (\uparrow \{^{\text{D}}\text{LOC}|^{\text{D}}\text{DUR}\})$. However, the definition of GF in the Appendix also makes sure that each extended grammatical function appears on DEPS at most once and that they appear in the order reflecting the functional hierarchy.

Let us illustrate this proposal with the running example (39). The main verb receives the following lexical entry, where only the penultimate line – requiring the presence of LOC within DEPS – is non-standard; an entry for an intransitive verb such as *slept* would be analogous, minus this penultimate line:

(50) *resided* I $(\uparrow \text{PRED}) = \text{`RESIDE'}$
@AGENT @PAST
$(\uparrow\ ^{\text{D}}\text{LOC})$
$\lambda e.reside(e) : (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$

I assume that the templates for AGENT and PAST are largely analogous to those proposed in Asudeh et al. 2014 (cf. their (48) and (54)):

(51) AGENT := @ARG1
$\lambda P \lambda x \lambda e.\ P(e) \wedge agent(e,x) :$
$[(\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma] \multimap (\uparrow_\sigma \text{ARG1}) \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$

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

@ARG1 in (51) invokes the part of LMT responsible for mapping agents to appropriate grammatical functions; as used in the lexical entry (50) for the past form *resided*, it has the same effect as: $(\uparrow\ ^{\text{D}}\text{SUBJ})_\sigma = (\uparrow_\sigma \text{ARG1})$; in the analysis of the running example, this glue resource is contributed by *John*. Hence, the combination of meaning constructors in (50)–(51) would yield:

(53) $\lambda x \lambda e.\ reside(e) \wedge agent(e,x)\ :\ (\uparrow_\sigma \text{ARG1}) \multimap (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$,

then, after combining with the meaning constructor provided by *John*:

(54) $\lambda e.\ reside(e) \wedge agent(e,j)\ :\ (\uparrow_\sigma \text{EVENT}) \multimap \uparrow_\sigma$,

and finally, after combining with the meaning constructor in (52):

(55) $\exists e.\ reside(e) \wedge agent(e,j) \wedge past(e)\ :\ \uparrow_\sigma$.

Obviously, this derivation for the ungrammatical sentence *John resided* is blocked by the unsatisfied constraint in the penultimate line of (50), but an analogous derivation would work for *John slept*.

For semantic prepositions, I assume lexical entries such as (56)–(57), analogous to the lexical entry for the benefactive *for* in Asudeh et al. 2014 (their (64)):

(56) *in* P
$(\uparrow \text{PRED}) = \text{'IN'}$
$\%\text{HD} = (^{\text{D}}\text{LOC} \uparrow)$
$\lambda x \lambda P \lambda e.\ P(e) \wedge \mathit{location}(e, x) :$
$(\uparrow {}^{\text{D}}\text{OBJ})_\sigma \multimap$
$[(\%\text{HD}_\sigma\ \text{EVENT}) \multimap \%\text{HD}_\sigma] \multimap$
$(\%\text{HD}_\sigma\ \text{EVENT}) \multimap \%\text{HD}_\sigma$

(57) *for* P
$(\uparrow \text{PRED}) = \text{'FOR'}$
$\%\text{HD} = (^{\text{D}}\text{DUR} \uparrow)$
$\lambda x \lambda P \lambda e.\ P(e) \wedge \mathit{duration}(e, x) :$
$(\uparrow {}^{\text{D}}\text{OBJ})_\sigma \multimap$
$[(\%\text{HD}_\sigma\ \text{EVENT}) \multimap \%\text{HD}_\sigma] \multimap$
$(\%\text{HD}_\sigma\ \text{EVENT}) \multimap \%\text{HD}_\sigma$

Note the local name %HD, which – in the case of the running example – points to the matrix f-structure shown in (43), but only if the PP headed by the preposition is the value of an appropriate extended grammatical function (LOC in (56) and DUR in (57)). So, while the rule (46) is indeterminate about the grammatical function assigned to the PP, the right function must be assigned for %HD to have a value and for the meaning constructor to be defined.

Once *in* combines with *France*, the following meaning constructor will result (with g referring to the matrix f-structure and f – to *France*):

(58) $\lambda P \lambda e.\ P(e) \wedge \mathit{location}(e, f) : [(g_\sigma\ \text{EVENT}) \multimap g_\sigma] \multimap (g_\sigma\ \text{EVENT}) \multimap g_\sigma.$

It will further combine with the meaning constructor introduced by *reside*, giving:

(59) $\lambda e.\ \mathit{reside}(e) \wedge \mathit{location}(e, f) : (g_\sigma\ \text{EVENT}) \multimap g_\sigma.$

Analogously, taking into consideration semantic contributions of *in a village...* and *for two years* (still ignoring the quantificational impact of the NPs), we get:

(60) $\lambda e.\ \mathit{reside}(e) \wedge \mathit{location}(e, f) \wedge \mathit{location}(e, av) \wedge \mathit{duration}(e, ty) :$
$(g_\sigma\ \text{EVENT}) \multimap g_\sigma.$

Combining this result with semantic contributions of the AGENT template, *John* and the PAST template, we end up with the expected:

(61) $\exists e.\ \mathit{reside}(e) \wedge \mathit{agent}(e, j) \wedge \mathit{location}(e, f) \wedge \mathit{location}(e, av) \wedge$
$\mathit{duration}(e, ty) \wedge \mathit{past}(e) : g_\sigma.$

Note that there is no fundamental difference between the representation of the durative *for two years*, a prototypical adjunct in (39), and the two locative phrases, at least one of which is obligatory and, hence, an argument. In fact, while other approaches would treat one locative phrase as an argument, and the other as an adjunct, here both locative phrases contribute to the value of the same LOC feature in (43), and have fully parallel semantic representations in (61).

5 Conclusion

Given that – after well over half a century of attempts to operationalise the purported argument–adjunct distinction – we do not seem any closer to a coherent and precise characterisation of this dubious dichotomy, it is high time to ask how detrimental it would be for LFG if it were generally conceded one day that AAD is just another linguistic hoax. The surprising answer is: formally, almost not at all. I argued that contemporary LFG makes this distinction only at the level of f-structures, and there only by insisting on the presence of the separate attributes (X)ADJ. I proposed three ways of getting rid of this dichotomy altogether, which do

not seem to compromise previous LFG analyses. In particular, the final proposal, which combines the main insights of LFG and HPSG, has the additional advantage of formally encoding the functional hierarchy, which plays a role in LFG analyses of binding, control and *wh*-extraction.

References

Ackema, Peter. 2015. Arguments and adjuncts. In Tibor Kiss & Artemis Alexiadou (eds.), *Syntax – theory and analysis. International handbook. Volume 1*, 246–274. Berlin: De Gruyter Mouton.

Andrews, Avery D. 2010. Propositional glue and the correspondence architecture of LFG. *Linguistics and Philosophy* 33(3). 141–170.

Asudeh, Ash, Mary Dalrymple & Ida Toivonen. 2008. Constructions with lexical integrity: Templates as the lexicon–syntax interface. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'08 conference*, 68–88. University of Sydney, Australia: CSLI Publications.

Asudeh, Ash, Mary Dalrymple & Ida Toivonen. 2013. Constructions with Lexical Integrity. *Journal of Language Modelling* 1(1). 1–54.

Asudeh, Ash, Gianluca Giorgolo & Ida Toivonen. 2014. Meaning and valency. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'14 conference*, 68–88. Stanford, CA: CSLI Publications.

Asudeh, Ash & Gianluca Giorgolo. 2012. Flexible composition for optional and derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'12 conference*, 64–84. Stanford, CA: CSLI Publications.

Bouma, Gosse, Robert Malouf & Ivan A. Sag. 2001. Satisfying constraints on extraction and adjunction. *Natural Language and Linguistic Theory* 19(1). 1–65.

Bouton, Lawrence F. 1969. Identity constraints on the do-so rule. *Papers in Linguistics* 1(2). 231–247.

Bresnan, Joan. 1982a. Control and complementation. In Bresnan (1982b) 283–390.

Bresnan, Joan (ed.). 1982b. *The mental representation of grammatical relations* MIT Press Series on Cognitive Theory and Mental Representation. Cambridge, MA: The MIT Press.

Bresnan, Joan. 1982c. Polyadicity. In Bresnan (1982b) 149–172.

Bresnan, Joan, Ash Asudeh, Ida Toivonen & Stephen Wechsler. 2015. *Lexical-functional syntax* Blackwell Textbooks in Linguistics. Wiley-Blackwell 2nd edn.

Culicover, Peter W. & Ray Jackendoff. 2005. *Simpler Syntax*. Oxford University Press.

Dalrymple, Mary (ed.). 1999. *Semantics and syntax in Lexical Functional Grammar: The resource logic approach*. Cambridge, MA: The MIT Press.

Dalrymple, Mary. 2001. *Lexical Functional Grammar*. San Diego, CA: Academic Press.

Dalrymple, Mary, Angie Hinrichs, John Lamping & Vijay Saraswat. 1993. The

resource logic of complex predicate interpretation. In *Proceedings of ROCLING 1993*, 3–21.

Dowty, David. 1989. On the semantic content of the notion of 'thematic role'. In Gennero Chierchia, Barbara H. Partee & Raymond Turner (eds.), *Properties, types and meaning: II*, 69–129. Dordrecht: Kluwer.

Dowty, David. 1991. Thematic proto-roles and argument selection. *Language* 67(3). 547–619.

Fillmore, Charles J. 1986. Pragmatically controlled zero anaphora. In *Proceedings of the twelfth annual meeting of the Berkeley Linguistics Society*, 95–107. Berkeley: Berkeley Linguistics Society.

Findlay, Jamie. 2014. Mapping theory without argument structure. Unpublished manuscript, University of Oxford.

Goldberg, Adele E. 2002. Surface generalizations: An alternative to alternations. *Cognitive Linguistics* 13(4). 327–356.

Goldberg, Adele E. & Farrell Ackerman. 2001. The pragmatics of obligatory adjuncts. *Language* 77. 798–814.

Grimshaw, Jane. 1990. *Argument structure* Linguistic Inquiry Monographs. Cambridge, MA: The MIT Press.

Grimshaw, Jane & Sten Vikner. 1993. Obligatory adjuncts and the structure of events. In Eric Reuland & Werner Abraham (eds.), *Knowledge and language*, vol. II, 143–155. Dordrecht: Kluwer.

Herbst, Thomas & Ian Roe. 1996. How obligatory are obligatory complements? An alternative approach to the categorization of subjects and other complements in valency grammar. *English Studies* 2. 179–199.

Jung, Yunsun. 1997. Obligatory adjuncts. In Ralph C. Blight & Michelle J. Moosally (eds.), *Proceedings of the 1997 Texas Linguistics Society Conference on the syntax and semantics of predication*, vol. 38 Texas Linguistic Forum, 161–171. Austin, TX.

Kaplan, Ronald M. & Joan Bresnan. 1982. Lexical-Functional Grammar: A formal system for grammatical representation. In Bresnan (1982b) 173–281.

Keenan, Edward L. & Bernard Comrie. 1977. Noun Phrase accessibility and Universal Grammar. *Linguistic Inquiry* 8. 63–99.

Koenig, Jean-Pierre, Gail Mauner & Breton Bienvenue. 2003. Arguments for adjuncts. *Cognition* 89. 67–103.

Kuhn, Jonas. 2001. Resource sensitivity in the syntax-semantics interface: Evidence from the German Split NP construction. In Detmar Meurers & Tibor Kiss (eds.), *Constraint-based approaches to Germanic syntax*, 177–215. Stanford, CA: CSLI Publications.

Lakoff, George & John Robert Ross. 1966. Criterion for Verb Phrase constituency. Mathematical Linguistics and Automatic Translation Report NSF-17 Computation Laboratory, Harvard University Cambridge, MA.

Lakoff, George & John Robert Ross. 1976. Why you can't *do so* into the sink. In James D. McCawley (ed.), *Notes from the linguistic underground*, vol. 7 Syntax and Semantics, 101–111. New York: Academic Press. Originally appeared as

Lakoff & Ross (1966).
Levin, Beth. 1993. *English verb classes and alternations: A preliminary investigation*. Chicago: University of Chicago Press.
McConnell-Ginet, Sally. 1982. Adverbs and logical form: A linguistically realistic theory. *Language* 58(1). 144–184.
Meijs, Willem. 1984. 'You can do so if you want to': Some elliptic structures in Brown and LOB and their syntactic description. In Jan Aarts & Willem Meijs (eds.), *Corpus linguistics: Recent developments in the use of computer corpora in english language research*, 141–162. Amsterdam: Rodopi.
Miller, Philip H. 1990. Pseudogapping and *Do So* substitution. In Michael Ziolkowski, Manuela Noske & Karen Deafon (eds.), *Papers from the 26th regional meeting of the chicago linguistic society*, 293–303. Chicago, IL: Chicago Linguistic Society.
Miller, Philip H. 1992. *Clitics and constituents in phrase structure grammar*. New York: Garland.
Needham, Stephanie & Ida Toivonen. 2011. Derived arguments. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'11 conference*, 401–421. Stanford, CA: CSLI Publications.
Nordlinger, Rachel. 1998. *Constructive case: Evidence from Australian languages*. Stanford, CA: CSLI Publications.
Panevová, Jarmila. 1974. On verbal frames in Functional Generative Description. Part 1. *The Prague Bulletin of Mathematical Linguistics* 22. 3–40.
Panevová, Jarmila. 1975. On verbal frames in Functional Generative Description. Part 2. *The Prague Bulletin of Mathematical Linguistics* 23. 17–52.
Parsons, Terence. 1990. *Events in the semantics of English: A study in subatomic semantics*. Cambridge, MA: The MIT Press.
Patejuk, Agnieszka & Adam Przepiórkowski. 2016. Reducing the 'F' in 'LFG': Arguments for fewer grammatical functions in Lexical Functional Grammar. In Doug Arnold, Miriam Butt, Berthold Crysmann & Tracy Holloway King (eds.), *The proceedings of the HeadLex16 conference*, Stanford, CA: CSLI Publications.
Pollard, Carl & Ivan A. Sag. 1987. *Information-based syntax and semantics, volume 1: Fundamentals* (CSLI Lecture Notes 13). Stanford, CA: CSLI Publications.
Pollard, Carl & Ivan A. Sag. 1994. *Head-driven Phrase Structure Grammar*. Chicago, IL: Chicago University Press / CSLI Publications.
Przepiórkowski, Adam. 1999a. *Case assignment and the complement-adjunct dichotomy: A non-configurational constraint-based approach*. Tübingen: Universität Tübingen Ph.D. dissertation.
Przepiórkowski, Adam. 1999b. On case assignment and 'adjuncts as complements'. In Gert Webelhuth, Jean-Pierre Koenig & Andreas Kathol (eds.), *Lexical and constructional aspects of linguistic explanation*, 231–245. Stanford, CA: CSLI Publications.
Przepiórkowski, Adam. 2016. Against the Argument–Adjunct Distinction in Func-

tional Generative Description. *The Prague Bulletin of Mathematical Linguistics* 106. 5–20.
Sag, Ivan A. 2007. Remarks on locality. In Stefan Müller (ed.), *Proceedings of the HPSG 2007 conference*, 394–414. Stanford, CA: CSLI Publications.
Sawicki, Lea. 1988. *Verb-valency in contemporary Polish* (Tübinger Beiträge zur Linguistik 319). Tübingen: Gunter Narr Verlag.
Sgall, Petr, Eva Hajičová & Jarmila Panevová. 1986. *The meaning of the sentence in its semantic and pragmatic aspects*. Dordrecht: Reidel.
Shieber, Stuart M. 1986. *An introduction to unification-based approaches to grammar* (CSLI Lecture Notes 4). Stanford, CA: CSLI Publications.
Somers, Harold L. 1984. On the validity of the complement-adjunct distinction in valency grammar. *Linguistics* 22. 507–530.
Szymańska, Izabela & Grzegorz Śpiewak. 2000. Deconstructing the so-called obligatory adverbial modification – an excercise in data interpretation. In Bożena Rozwadowska (ed.), *PASE papers in language studies: Proceedings of the 8th annual conference of the Polish Association for the Study of English*, 321–337. Wrocław: Aksel s.c.
Tesnière, Lucien. 1959. *Éléments de syntaxe structurale*. Paris: Klincksieck.
Toivonen, Ida. 2013. English benefactive NPs. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'13 conference*, 503–523. Stanford, CA: CSLI Publications.
Tutunjian, Damon & Julie E. Boland. 2008. Do we need a distinction between arguments and adjuncts? Evidence from psycholinguistic studies of comprehension. *Language and Linguistics Compass* 2(4). 631–646.
Vater, Heinz. 1978. On the possibility of distinguishing between complements and adjuncts. In Werner Abraham (ed.), *Valence, semantic case and grammatical relations*, vol. 1 Studies in Language Companion Series (SLCS), 21–45. Amsterdam: John Benjamins.
Williams, Alexander. 2015. *Arguments in syntax and semantics*. Cambridge: Cambridge University Press.
Zaenen, Annie & Dick Crouch. 2009. OBLs hobble computations. In Miriam Butt & Tracy Holloway King (eds.), *The proceedings of the LFG'09 conference*, 644–654. Trinity College, Cambridge, UK: CSLI Publications.
Žabokrtský, Zdeněk. 2005. *Valency lexicon of Czech verbs*: Charles University, Prague Ph.D. Thesis.

Appendix: Encoding the functional hierarchy

This appendix contains a definition of a template, GF, used to assign extended grammatical functions. Its sole argument passes the name of the function (SUBJ, LOC, etc.). This grammatical function is assigned to $\downarrow$, but it would be easy to define a more general two-argument template which also takes a path to the f-structure to be assigned the grammatical function.

The template is a disjunction of statements like the following, with the effect that $\downarrow$ is assigned the grammatical function OBJ if OBJ is indeed the function F passed via the template call (and similarly for other functions):

(62) $\text{F} =_c \text{OBJ} \wedge \downarrow \in (\uparrow \text{DEPS} \quad \text{REST}^* \quad \text{F})$

As just described, an equivalent template could be defined within one line. Splitting the definition into separate statements for each grammatical function is necessary to ensure that each grammatical function appears only once within DEPS, that the list contains no gaps (i.e., no REST without a grammatical function attribute at the same level of f-structure) and in order to encode the functional hierarchy, apparently not formally encoded in LFG so far. To this end, off-path constraints are attached to REST attributes in the path, to the effect that all of them must have accompanying attributes corresponding to less oblique grammatical functions. For example, in the case of OBJ, the full path must be either DEPS OBJ (e.g., in the case of prepositions, but – arguably – also in the case of some verbs in Russian or Polish) or DEPS REST OBJ, but then REST must have a sister attribute for a grammatical function less oblique than OBJ, i.e., for SUBJ.

This functional hierarchy is defined via the following abbreviations, each specifying the set of grammatical functions less oblique than the given one; for example, HGFS-OBLSO specifies the set of functions less oblique than $\text{OBL}_{\text{SOURCE}}$, i.e.: SUBJ, OBJ and $\text{OBJ}_{\text{THEME}}$:[10]

(63) $\text{HGFS-OBJ} \equiv \text{SUBJ}$

(64) $\text{HGFS-OBJTH} \equiv \{\text{HGFS-OBJ}|\text{OBJ}\}$

(65) $\text{HGFS-OBLSO} \equiv \{\text{HGFS-OBJTH}|\text{OBJ}_{\text{THEME}}\}$

(66) $\text{HGFS-OBLGO} \equiv \{\text{HGFS-OBLSO}|\text{OBL}_{\text{SOURCE}}\}$, etc.

Given such abbreviations, the GF template may be defined as follows:[11]

(67) $\text{GF(F)} := \{\text{F} =_c \text{SUBJ} \wedge \downarrow \in (\uparrow \text{DEPS F}) \mid$
$\text{F} =_c \text{OBJ} \wedge \downarrow \in (\uparrow \text{DEPS REST}^* \text{F}) \mid (\leftarrow \{\text{HGFS-OBJ}\})$
$\text{F} =_c \text{OBJ}_{\text{THEME}} \wedge \downarrow \in (\uparrow \text{DEPS REST}^* \text{F}) \mid (\leftarrow \{\text{HGFS-OBJTH}\})$
$\text{F} =_c \text{OBL}_{\text{SOURCE}} \wedge \downarrow \in (\uparrow \text{DEPS REST}^* \text{F}) \mid (\leftarrow \{\text{HGFS-OBLSO}\})$
$\text{F} =_c \text{OBL}_{\text{GOAL}} \wedge \downarrow \in (\uparrow \text{DEPS REST}^* \text{F}) \ldots\} (\leftarrow \{\text{HGFS-OBLGO}\})$

Note that such off-path constraints ensure that the DEPS list contains no gaps (whenever a function is assigned to some element of the list, all previous elements must also have associated grammatical functions) and that each grammatical function may occur at most once (it is assigned only if all grammatical functions assigned to previous DEPS elements are irreflexively less oblique).

[10] I do not make any substantive linguistic claims here about the relative order of various extended grammatical functions in the obliqueness hierarchy. Also, this formalisation assumes mostly traditional LFG grammatical functions, including $\text{OBJ}_{\text{THEME}}$, $\text{OBL}_{\text{SOURCE}}$, etc., rather than more semantically defined "functions", as suggested in the main text.

[11] I assume here that all extended grammatical functions are in principle iterable (cf. Section 2.2), so all functional attributes are set-valued.