PROJECTIONS AND GLUE FOR CLAUSE-UNION COMPLEX PREDICATES

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Abstract

The paper shows how glue-semantics can be integrated into the LFG architecture as an (almost) normal projection, so that it can do the work of 'argument-structure' in accounts of predicate-composition such as Alsina (1996, 1997), Butt et al. (1997) and Andrews and Manning (1999).

A significant innovation is that that the standard 'semantic projection' is abandoned in favor of a σ-projection that directly connects the f-structure and the meaning-structure, similar to the original proposal for a semantic projection in Kaplan (1987), but running many-to-one from the semantic structure to the f-structure.

In this paper, I will propose an analysis of clause-union complex predicates, such as Romance causatives, in which the glue proof plays the role of argument-structure in analyses such as those of Alsina (1996) and Andrews and Manning (1999), and functions like a normal level of structure in LFG, with a projection relating it to the f-structure. We call this projection σ, since it has the same position in the theory as the σ-projection of Kaplan (1987), but it is opposite in direction to this, and quite different in function to the σ-projection in standard presentations of glue.

1 Prefab Glue

I will formulate the analysis using a formulation of glue which I will call 'prefab glue', which can be regarded as a version of proof-nets (Fry (1999), Moot (2002), Andrews (2004)), reorganized along the lines of the structure of proof-terms, so that glue assembly produces proof-terms (which are essentially logical forms) directly rather than requiring some kind of 'semantic trip' (de Groote and Retoré (1996), Morrill (2005)) or similar conversion (such as the one proposed by Perrier (1999), used by Andrews (2004)) to do this. An extended and slow-paced account of prefab glue is provided in Andrews (2007); the presentation here will be quite concise, and will assume a good grasp of glue. The only substantive differences between prefab glue and previous formulations are:

(1) a. IOFU instantiation rather than linear universal quantification is used to account for quantifier scope variation (as also proposed by Lev (2007)); this simplifies the glue linear logic to propositional rather than higher order, or first-order quantificational (Kokkonidis to appear).

b. the standard 'semantic projection' is eliminated, and the σ-correspondence runs from atomic-type nodes of the glue-proof to the f-structure.

† I am indebted to Alex Alsina for various Catalan examples, the audience at LFG07 for some questions, an anonymous editor for some useful comments, and to Elisabeth Mayer for help with proof-reading. All errors remain my own.

Some discussion of both of these points is provided in Andrews (2007).

Technically, we derive the glue-side of a meaning-constructor in prefab glue 'structure tree' format from one in regular format as follows. We assume that the glue-sides are formulas of linear intuitionistic implication-conjuction ($\multimap$ $\otimes$) logic whose atomic formulas are pairs consisting of an f-structure designator (a label if the constructor is instantiated) and a semantic type. For semantic types, we will use e for 'entities', and p for 'propositions' (following Pollard (to appear)).

The first step is to label the whole meaning-side and its subformula instances with polarities $+/-$ as follows:[1]

(2) a. The polarity of an entire meaning-side is negative

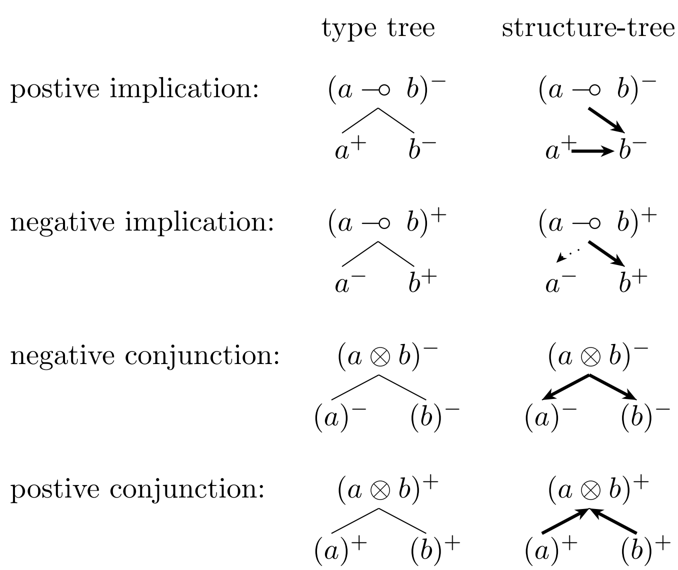
b. The polarity of the consequent of an implication is that of the entire implication.

c. The polarity of the antecedent of an implication is the opposite of that of the entire implication

d. The polarity of a component of a conjunction is that of the entire conjunction.

We next replace the original links with the 'dynamic graph'-links of de Groote (1999),[2] represented as bold arrows below, but retaining the original links between positive implications and their (negative) antecedents, represented as a dotted arrow below (the links are drawn upside-down to the usual orientation in the literature):

(3)



[1]The polarity rules go back at least to Jaśkowski (1963).

[2]The concept is originally due to Lamarche (1994), where it is called the 'essential net', but deGroote's paper is much more accessible (I must confess to understanding almost nothing of the Lamarche paper).

I will sometimes call the dotted links 'pseudo-daughter' links.

We now formulate assembly in the usual manner for proof-nets. The constructors to be assembled are taken as a collection of objects, and an additional structure is added consisting of a single positive polarity node $(f_p)^+$, where f is the label of the entire f-structure. This is essentially the same thing as a 'frame' in Type Logical Grammar (except that the logic is commutative).

Then we link negative to positive atomic formula occurrences with 'axiom-links', subject to the following rules:

(4) a. The linked pairs must be exhaustive and non-overlapping.

b. Members of a linked pair must have the same semantic type.

c. Members of a linked pair must have the same f-structure label.

The result of this is a 'proof-structure' in proof-net theory; to restrict proof-structures to ones constituting valid proofs, we need to impose a 'Correctness Criterion', which can be formulated like this (de Groote (1999), Moot (2002:94-95)), among many other ways:

(5) **Correctness Criterion:** The dynamic graph must be:

(a) rooted and acyclic.

(b) every dynamic graph path to the root that starts at the target of a dotted link must pass through the source of that link.

Note that the direction of the dynamic graph links, but not the pseudo-daughter links, is essential if the polarities are erased. A proof-structure that passes the Correctness Criterion is a proof-net, and represents a valid linear logic proof.

If the f-structure label information is ignored in the formation of the proof-structure, the constructors function somewhat like a numeration in Minimalism, and the possible proof-nets represent all possible ways of assembling the constructors consistent with their semantic types (Klein and Sag 1985).

For an example, here are instantiated constructors for the sentence *Bert likes everybody*:

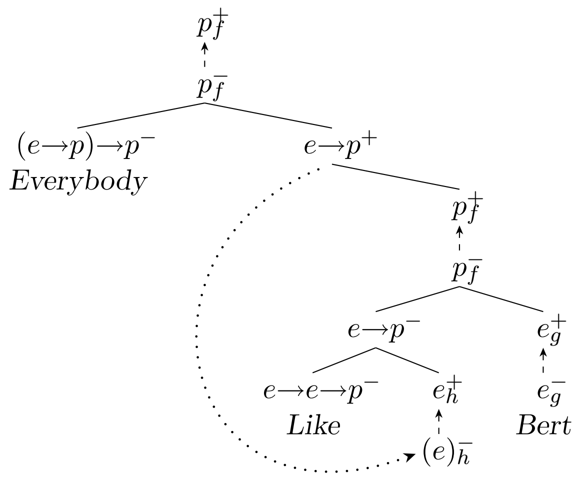
(6) *Everybody* : $(g_e \multimap f_p) \multimap f_p$

Bert : h_e

Like : $h_e \multimap g_e \multimap f_p$

Converted to structure-tree format, connected with axiom-links represented as dashed arrows, and arranged in a perspicuous manner, these constructors become:

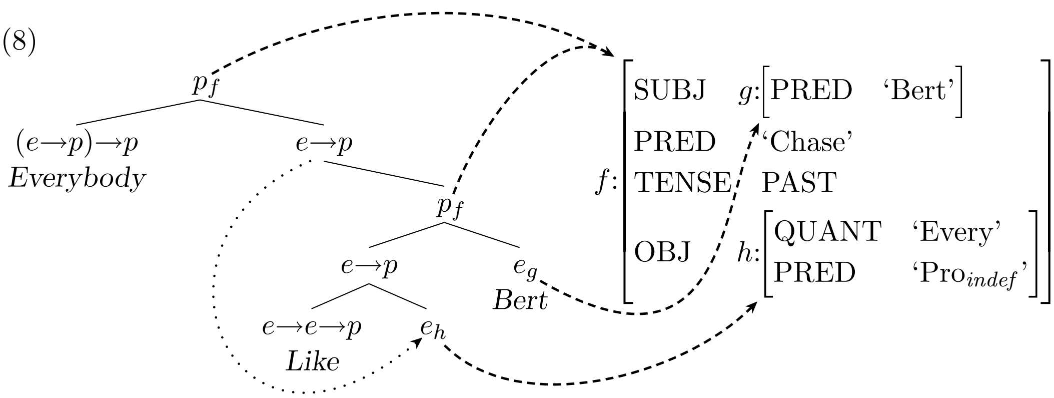
(7)



This looks very much like a structure-tree for a linear lambda-term, with the dotted pseudo-daughter link representing variable-binding.

The resemblance becomes essentially identity if we contract the axiom-links, and erase the polarities. Interpreting the f-structure label subscripting as a standard LFG correspondence relation (albeit opposite in direction to most of them), we get the following glue-structure f-structure pair for the sentence, where the heavy dashed lines represent the σ-correspondence:

(8)



This diagram is deliberately reminiscent of the ϕ-correspondence from c-structure to f-structure.

2 Glue as Argument-structure

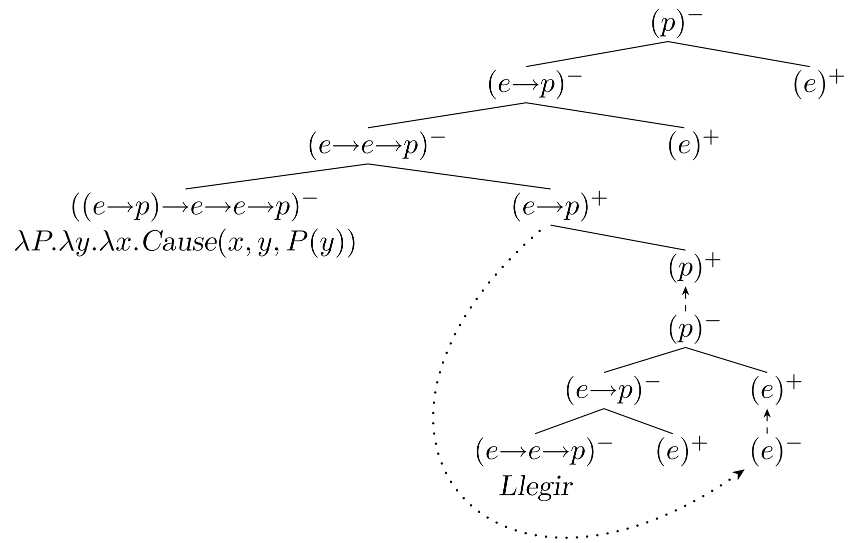
With meaning-constructors and proof-nets represented in this manner, it becomes apparent that glue-proofs have many of the properties of argument-structures as proposed by Alsina (1996) and many other works. Below is a meaning-constructor for the 'three place causative', without the syntactic information, whose meaning can be glossed as (b):

(9) a. $\lambda P.\lambda y.\lambda x.\mathit{Cause}(x, y, P(y))\ :\ (e{\to}p){\to}e{\to}e{\to}p$

b. x does something to y. Because of this, y does P.

Combining the structure-tree format version of this with that for a transitive verb (here *Llegir* 'read' in Catalan), we get a structure like this:

(10)



The Correctness Criterion will guarantee that the positive e in the property (innermost, $(e{\to}p)^+$) argument of the causative will link to an argument of the embedded verb, but not restrict it to the topmost one. Such a restriction seems plausible, and might be imposed by a semantic restriction that the controller of the property be its Agent, but we won't look into this issue here.

Observe however that (9) has many similarities to the results of 'predicate composition' proposed by Alsina (1996:191):

(11) 'cause<$[\text{P-A}]_3$ $[\text{P-P}]_2$ read <$[\text{P-A}]_2$ $[\text{P-P}]_1$>>'

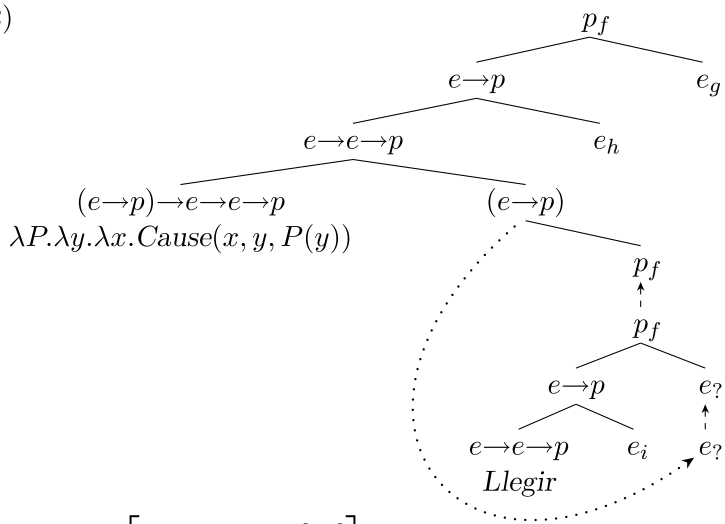
The subscripts represent (co-)linking to values of grammatical function in f-structure, roughly equivalent to our σ.

As discussed by Andrews and Manning (1999), the concept of predicate-composition and the associated structure (11) don't fit very well into standard LFG architecture. But they go much better when glue is involved. The intent of (11) is that the Cause predicate has three arguments, one of which is a composite involving the caused predicate. This is directly expressed in (10). The arguments in (11) are also presented in a definite order, represented by the hierarchical nesting relationships in (10).

A difference is that the entity argument-positions in (11) are tagged with Dowty's 'Proto-Agent' and 'Proto-Patient' labels. But this is a matter of the detailed formulation of linking theory, and there is no reason why meaning-constructor atomic formulas can't have such information added to their lexical specification, if this proves to be empirically warranted.

Especially important is that in a glue-based approach, there is no reason why the meaning-constructors for the causative and caused predicates can't 'output' to the same level of f-structure, consistently with the many arguments for the monoclausality of Romance causatives. This is supported by the fact that the σ-correspondence, with the present directionality, is independently required to be many-to-one by constructions such as sentence-adverbials, and quantifiers. We illustrate this here for the causative by f-structural co-labelling:

(12)



$$f{:}\begin{bmatrix} \text{SUBJ} & g{:}[\;\;] \\ \text{IOBJ} & h{:}[\;\;] \\ \text{OBJ} & i{:}[\;\;] \end{bmatrix}$$

This many-to-one property is of course also a characteristic of the c-structure-to-f-structure correspondence ϕ. The '?' subscript to some of the e's represents an issue concerning what their f-structure correspondents ought to be.

The idea of predicate composition thus appears to fit into LFG+glue, but we do need to reconstrue our idea of how the PRED-features themselves work. This is because if the causative and causee verb both introduce a PRED-feature at the same level of f-structure, these will clash. Fortunately, as pointed out by Kuhn (2001), meaning-constructors are able to take on most of the functions of PRED-features, in particular, the management of the Completeness, Coherence and Predicate Uniqueness constraints. Andrews (to appear) however shows that PRED-features can still play a useful role in connecting irregular morphology to multiple meanings of verbs, such as the irregular forms *went* and *gone* with a wide range of different meanings such as *go off*, *go out*, *go crazy*, etc. But for this function, the features can be located on a 'morphological projection' such as proposed by Butt et al. (1996) and Butt et al. (1999). This projection shares less aggressively than ϕ, so that each verb can put its PRED-feature on a different level. We will return to this issue later, but now consider the specification of grammatical functions in the causative constructor.

An initial thought might be that the constructor would have to look something like this:

(13) $\lambda P.\lambda y.\lambda x.Cause(x, y, P(y))$:

$$((\uparrow ?\mathrm{OBJ})_e \rightarrow \uparrow_p) \rightarrow (\uparrow ?\mathrm{OBJ})_e \rightarrow (\uparrow \mathrm{SUBJ})_e \rightarrow \uparrow_p$$

'?OBJ' here represents whatever we need to do to accommodate the well known alternation between dative causees for transitive caused verbs, and accusative ones for intransitives. This can be accounted for in various ways, such as for example Falk's (2001:115) proposal that transitives take the causee as an OBJ_θ, in effect the traditional 'indirect object' (IOBJ), while intransitives take it as an OBJ. The constructor synchronizes this GF between the object and controller-of-property positions, on the basis of the semantic relationship.

However, rather counterintuitively, this constructor will work as well:

(14) $\lambda P.\lambda y.\lambda x.Cause(x, y, P(y))$:

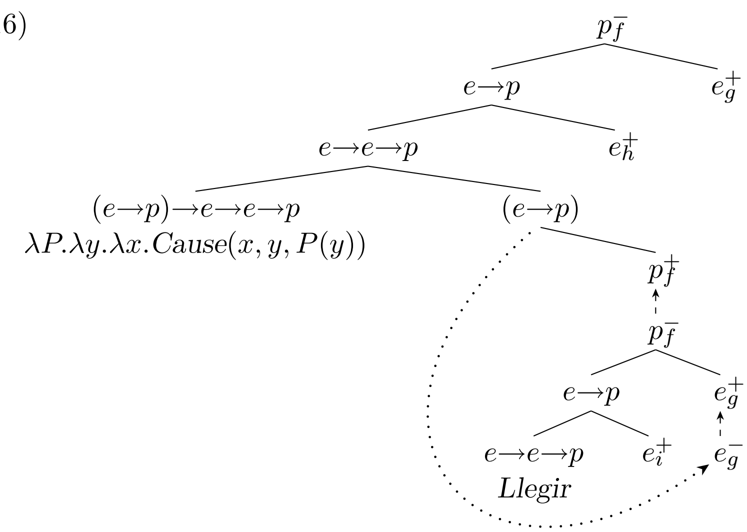
$$((\uparrow \mathrm{SUBJ})_e \rightarrow \uparrow_p) \rightarrow (\uparrow ?\mathrm{OBJ})_e \rightarrow (\uparrow \mathrm{SUBJ})_e \rightarrow \uparrow_p$$

And it has the advantage that it will work with an unmodified constructor for the caused verb, requiring no linking theory:

(15) *Llegir* : $(\uparrow \mathrm{OBJ})_e \rightarrow (\uparrow \mathrm{SUBJ})_e \rightarrow \uparrow_p$

These two constructors will fit together to yield this assembly, with accompanying f-structure (σ represented with co-labelling):

(16)



$$f{:}\begin{bmatrix} \text{SUBJ} & g{:}[\ \ ] \\ \\ \text{IOBJ} & h{:}[\ \ ] \\ \\ \text{OBJ} & i{:}[\ \ ] \end{bmatrix}$$

This works (note that since σ is many-to-one, there is no problem with the f-structure associated with (17) being monoclausal, as required for an analysis of complex predicates), even though the top e^+ argument of the caused verb and the e^- antecedent of the property argument of the controlled verb are associated with the causative subject f-structure g, which has nothing to do with the causee agent f-structure h. Note that this is not a specific property of the prefab glue formulation, but a consequence how glue premise-matching works.

So, although counter-intuitive, this is a somewhat tempting analysis of causatives, but that does not necessarily mean that it is the right thing to do. Next, I will argue that it isn't.

3 Problems with the Easy Analysis

I will present two kinds of problems, a general theoretical one, and a more concrete empirical difficulty.

The theoretical problem is that the technique employed in the analysis allows empirically wrong analyses of constructions which are standardly analysed in LFG with functional control. Consider the following meaning-constructor for *seem*:[3]

(17) $\lambda Px.\mathit{Seem}(P(x))$:
$((\uparrow \text{XCOMP SUBJ})_e \rightarrow (\uparrow \text{XCOMP})_p) \rightarrow (\uparrow \text{SUBJ})_e \rightarrow \uparrow_p$

Since we have already abandoned the usual Completeness and Coherence constraints in favor of glue assembly, the following f-structure, *without functional control*, can provide a satisfactory interpretation for a sentences such as *Bert seems to like Ernie*:

(18)
$$f{:}\begin{bmatrix} \text{SUBJ} & g{:}\begin{bmatrix}\text{PRED} & \text{`Bert'}\end{bmatrix} \\ \text{PRED} & \text{`Seem'} \\ \text{XCOMP} & h{:}\begin{bmatrix} \text{SUBJ} & i{:}[\ \ \ ] \\ \text{PRED} & \text{`Like'} \\ \text{OBJ} & j{:}\begin{bmatrix}\text{PRED} & \text{`Ernie'}\end{bmatrix} \end{bmatrix} \end{bmatrix}$$

[3]Partially inspired by some of the constructors in Asudeh (2002, 2005).

The constructor for the lower verb will construct the complement subject grammatical function, but the constructor (17) for *seem* will make it unnecessary for this to be functionally identified with anything else for the semantic interpretation to be found.

But although the analsyis works for this particular example, it leads to a variety of problems, such as the inability to account for 'long distance agreement' in languages such as Icelandic (Andrews 1982), or the narrow scope reading of examples like this, from Asudeh (2002, 2005):

(19) Every goblin seems to have pinched Merry

These phenomena provide evidence for functional control even though the basic semantic interpretation of simple examples doesn't require it. To explain these phenomena, LFG+glue ought therefore to contain some principle that would rule out the analysis without functional control, so that learners would adopt the standard analysis with functional control even without encountering the somewhat subtle evidence that motivates it.

The second, concrete, problem with the analysis (14–15) is that it fails to address Alsina's (1996) arguments that the causee agent is not a subject. For example, it is unable to host a floating quantifier, whereas the controlled subject of an Equi-construction can:

(20) Els metges ens deixen beure una cervesa cadascun
the doctors us let drink a beer each

a. Each of the doctors lets us drink a beer

b. *The doctors let each of us drink a beer

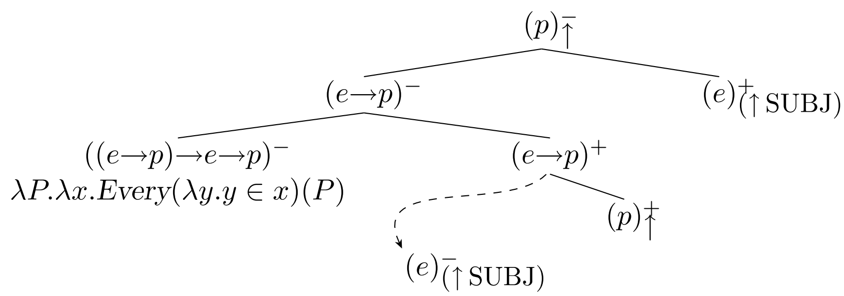
(Alsina 1996:217)

(21) Els metges$_i$ ens$_j$ han convençut de beure una cervesa cadascun$_{i/j}$
the doctors us have convinced of drink a beer each
The doctors each convinced us to drink a beer
The doctors convinced us to drink a beer each
(Alsina p.c.)

The following meaning-constructor seems appropriate for floating quantifiers which can only float off the subject, given in both standard (a) and structure-tree (b) format:

(22) a. $\lambda Px.Every(\lambda y.y \in x)(P) \ : \ ((\uparrow \text{SUBJ})_e {\rightarrow} \uparrow_p) {\rightarrow} (\uparrow \text{SUBJ})_e {\rightarrow} \uparrow_p$

b.



What it does is abstract over the subject GF to create a property from the predicate, and applies a semantically distributed version of this property to a plural subject.

Combining it with the caused verb and abbreviated representation **b** of the object of (20), we get:

(23) $\lambda x.Every(\lambda y.y \in x)(\lambda z.Beure(\mathbf{b})(z))$

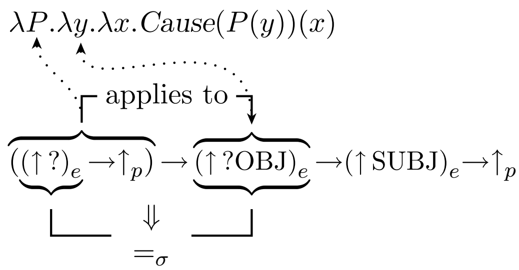
This can then combine with the causative verb and abbreviated representation of object to produce (24) with its β-reduction to the undesired reading of (20):

(24) $\lambda x.Let(x, \mathbf{ns}, (\lambda x.Every(\lambda y.y \in x)(\lambda z.Beure(\mathbf{b})(z)))(\mathbf{ns})) \Rightarrow_{\beta}$
$\lambda x.Let(x, \mathbf{ns}, Every(\lambda y.y \in \mathbf{ns})(\lambda z.Beure(\mathbf{b})(z))) \equiv$
$\lambda x.Let(x, \mathbf{ns}, Every(y, y \in \mathbf{ns}, Beure(\mathbf{b})(y)))$

To aid comprehension, we express the result of the reduction in two possible formats for the quantifier, first an 'Aristotelian' one where it relates two properties, then a '3-part' one where there is a variable and two formulas open on that variable.

To rule out these undesired analyses, I will suggest a constraint that rules out the intuitively odd property of the constructor (16), that it can in effect transmit a meaning via σ-linking to an f-structure that has nothing at all to do with that meaning. On its meaning-side, this constructor attributes the property expressed by the innermost argument to the entity expressed by the next-innermost one (the causee agent). This can be formulated in terms of the structural relationships within the meaning-side between the two lambda-variables corresponding to the arguments. The relationship that triggers the constraint is that the glue-subformula corresponding to the property has a (conditional, not anaphoric) antecedent of the same semantic type (e, in this case) as the one corresponding to the argument to which the property is applied, and the proposed constraint requires that, under these conditions, the σ-correspondents of these subformulas be the same as well. We can depict this constraint, which we will call Functional Consistency, diagrammatically as follows, where the material subtending the lower horizontal braces is what the constraint requires to hold, if the other material is present:

(25) Functional Consistency:



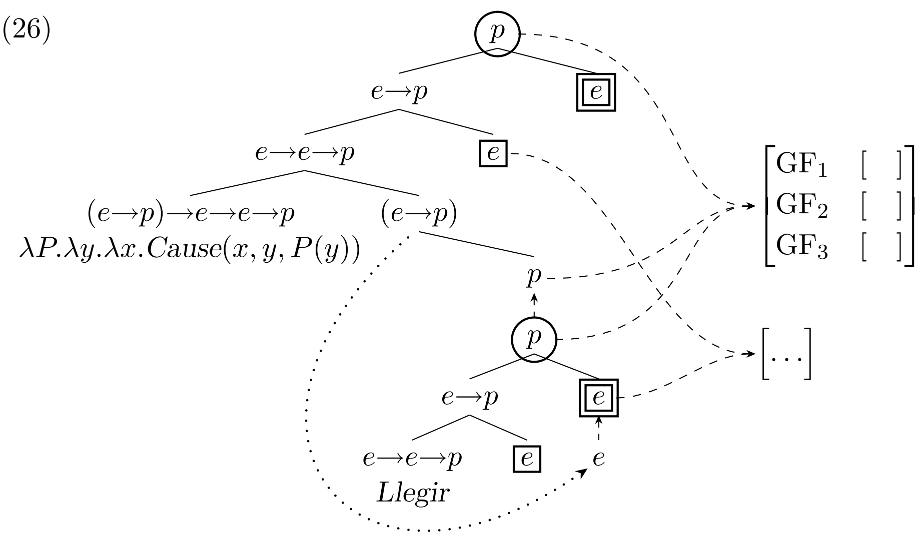
Functional Consistency will rule out the counterintuitive constructor (14), but allow one of the initially expected form (13). Likewise, the undesirably innovative (17) will be excluded, while conventional analyses using functional control will be allowed. In the absence of plausible alternatives for the allowed analyses that satisfy Functional Consistency, these can be regarded as required by the theory.

4 Linking Theory

Although it is in a sense good news that there are real reasons for ruling out the counterintuitive analyses, the accompanying bad news is that we will after all need a linking theory for the complex predicates. Fortunately, LFG+glue provides good support for producing such a theory. (26) below shows how notions such as (co-)argument, logical subject, and relative (semantic role-based) prominence can be formulated in terms of the structures.

One fundamental notion is the 'Final Output' of a meaning-constructor, which is the root node of the constructor in structure-tree format. These are circled (this concept might require adjustment if tensors are used in the formalism). Then 'basic arguments' are nodes of basic type that are daughters of nodes on the 'spine' from the meaning-bearing node to the final output. These are boxed. It is plausible that there is a typological division between languages that assign object grammatical functions to nodes of basic type other than e (such as Icelandic, where clausal complements are arguably NPs bearing ordinary object grammatical functions (Thráinsson 1979)), and those that don't, such as English and Dutch ((Koster 1978), (Bresnan 1994); see also Alsina et al. (2005)).

(26)



Basic arguments seem to behave differently from those of higher-order type, such as $e{\rightarrow}p$. In particular, there seems to be a rather solid constraint that a predicate take only one higher-order argument.

Another important concept is role-based semantic prominence, expressed by the hierarchical relationships between the basic arguments. This is widely, although not universally, assumed to be necessary.[4] A problem with it is that it is largely predictable from semantic roles; if relative prominence is totally so predictable, then it should not be an independent notion of the theory. I suggest that the semantic-role assignment contrasts between verbs such as *predecease*, on the one hand, and *outlive* and *survive*, on the other, show that relative prominence is sometimes independent of semantic roles. An important concept based on relative prominence is 'logical subject', double-boxed in (26); the logical subject is the most prominent argument of a predicate.

A somewhat more complex notion is that of 'co-argument': co-arguments are arguments whose Final Outputs have the same f-structural correspondent. So all of the boxed and double-boxed positions in (26) are co-arguments, with the result that they are simultaneously subjected to the constraints of linking theory. But if the two type p Final Arguments had different f-structure correspondents, then the arguments would fall into two sets of co-arguments, each linking independently, as appropriate for multiclausal constructions, including those with functional control. We might also want to recognize 'immediate' co-arguments, which would be arguments sharing the same Final Output.

Next, we face the challenge of producing an actual linking theory. In (26), the argument positions aren't connected to any GF-values in the f-structure correspondent of the final outputs, so the intended effects of the

[4] See for example Zaenen (1993), Asudeh (2001) for proposals that dispense with it.

linking theory aren't represented. But the effects of Functional Consistency are represented, by linking the two relevant argument positions to the same piece of f-structure material, which is however not integrated into the f-structure of the Final Outputs. There have unfortunately accumulated a rather large number of options for linking theory in LFG, usefully surveyed by Butt (1999). I can't systematically investigate all of these here, so will merely propose something that works out for the case at hand, and doesn't seem immediately and unsalvageably hopeless from a typological point of view.

In the first place, we accept a basic distinction between 'core' and 'oblique' grammatical functions, with the latter pre-specified for a morphologically marked oblique grammatical function, typically marked by a preposition in Romance or Germanic languages (or semantic cases in many others). Oblique grammatical functions don't participate in causative grammatical function alternations, so we need consider them no further here (but would have to in a consideration of applicatives). The non-oblique argument positions will then be ranked in terms of relative prominence, for the linking principles to apply to.

Observe that the approach has already made an improvement on Andrews and Manning (1999) in that it has a specific proposal for oblique arguments. Now we propose that in the lexicon, core arguments are optionally and constructively assigned any of the core grammatical functions SUBJ, OBJ and OBJ_θ. To be a bit more precise about this, I propose a notation whereby $\wr\!\uparrow$ means 'the σ-correspondent of the Final Output of the meaning-constructor I am an annotation of', while $\wr\!\downarrow$ means 'the σ-correspondent of the argument-position I'm attached to' (the squiggle in the arrows is supposed to indicate that these arrows are *not* evaluated with respect to positions in a c-structure, but to positions somewhere else, namely within a glue-assembly). We can now write the constructive GF-assignment principle as follows:

(27) $(\wr\!\uparrow \mathrm{SUBJ}|\mathrm{OBJ}|\mathrm{OBJ}_\theta) = \wr\!\downarrow$

This applies to all core argument positions, at least those of type e (leaving the treatment of other types aside, in this paper). (26) will now get the correct grammatical function assignment, as well as many incorrect ones.

We next have a constraint which requires the GFs of co-arguments to be assigned harmonically w.r.t. their relative prominence, with the GF's ranked:

(28) $\mathrm{SUBJ} > \mathrm{OBJ}_\theta > \mathrm{OBJ}$

A biuniqueness constraint can prevent the argument positions that are identified by Functional Consistency from getting distinct governable functions; we formulate it as a condition preventing one f-structure from bearing two governable GFs to another (but, in order to allow functional control, we permit an f-structure to bear distinct GF's to different f-structures).

Only one GF-assignment will now be available for ditransitives and causatives of transitives, but so far there will be three for intransitives. We can rule this out by requiring that the maximally prominent co-argument be assigned SUBJ, if it gets any core GF at all (passives can be plausibly treated as not assigning a core GF to the maximal co-argument). For transitives, and causatives of intransitives, this leaves two possibilities for the other co-argument, OBJ, or OBJ_θ. The former appears to be the default, with the latter appearing with various non-Patientlike semantic roles, such as Addressee, Object of Obedience, etc. We can propose that OBJ is assigned to the least prominent argument-position, subject to a semantic-role-based restriction which blocks this for non-Patientlike roles, leaving OBJ_θ as the only option. A sharp characterization of what this restriction is would be highly desirable, but will not be attempted here.

5 The Morphological Projection and Respect for the Tree

Now we turn to the other significant problem for monoclausal structures, accounting for how each semantically higher verb determines the form of the following one, and the arrangement in the c-structure reflects the semantic organization (called 'respecting the tree structure' in Alsina (1997)). These problems are illustrated in these examples (Alsina p.c; adapted from Alsina (1997)):

(29) a. L' acabo de fer llegir al nen
It I.finish of make read to the boy
'I just made/I finish making the boy read it.'

b. La faig acabar de llegir al nen
It.F I.make finish of read to the boy
'I make the boy finish reading it (say, a map ([GND FEM])).'

The appearance of the direct object clitic semantically associated with the final verb in front of the first one shows that these are clause-union constructions, but we see that the order of verbs nevertheless reflects the meaning, and each verb determines the form of the one after it, suggesting some kind of complement-structure.

The form-determination problem is basically the same as arises with monoclausal analysis of auxiliaries, and for it we can use the same solution, the 'morphological projection' proposed by Butt et al. (1996) and Butt et al. (1999). However we will suggest a slightly different version of the architecture, in which the morphological projection ('m-structure') comes between the c-structure and the f-structure, similarly to the argument-structure of Butt et al. (1997), but not that of Andrews and Manning (1999). The motivation for this is to impose a principle that f-structure shares more aggressively than m-structure, rather than just differently.

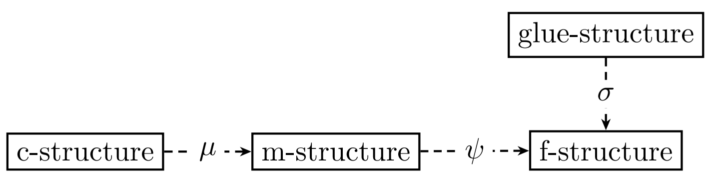
The m-structure projection is governed by various principles, the most important of which is that it is shared between 'primary' (but not extended) X-bar projections and their heads. Therefore I and IP, and V and VP, will have the same m-structure correspondent, but the IP and VP levels will have different m-structure correspondents. But, as in the original m-structure proposals, the VP will be the m-structural DEP of the IP (an S-complement of IP will also share m- and therefore f- structure). VP-complements will furthermore have the option of being treated either as complements (biclausal), or as extended projections (monoclausal).

Although distinct at m-structure, extended projections will always be merged at f-structure, so that the f-structures of familiar constructions will for the most part look the same as in standard LFG, except for the location of certain attributes, which will be located at m-structure rather than f-structure (from which they can however be located by means of inverse projections, albeit in a functionally uncertain manner).

Amongst these attributes are of course the verbal form features distinguishing infinitives and participles, and the prepositional markers in (29), but also, innovatively the PRED-features, whose semantic functions have been taken over by glue, and whose most obvious and possibly only remaining function is to control the morphological spellout of lexical items, as discussed in Andrews (to appear). I will not now make any proposals concerning nominal features; the existence of two places in which they can be put seems promising in light of Wechsler and Zlatić (2003), but the details may well fail to work out.

The architecture so far can be diagrammed like this:

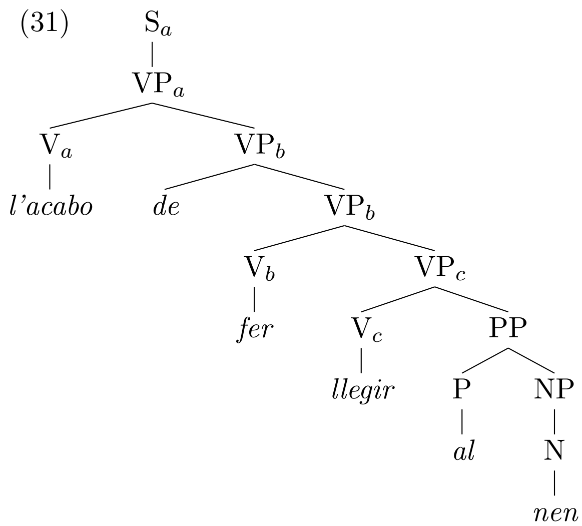
(30)



$$\phi = \psi \circ \mu$$

and partial c-, m- and f-structures for (29a) presented as follows, where a, b, c are m-structure labels, prefixed to the m-structures they label, and postfixed to the f-structure that these m-structures correspond to under ψ:

(31)



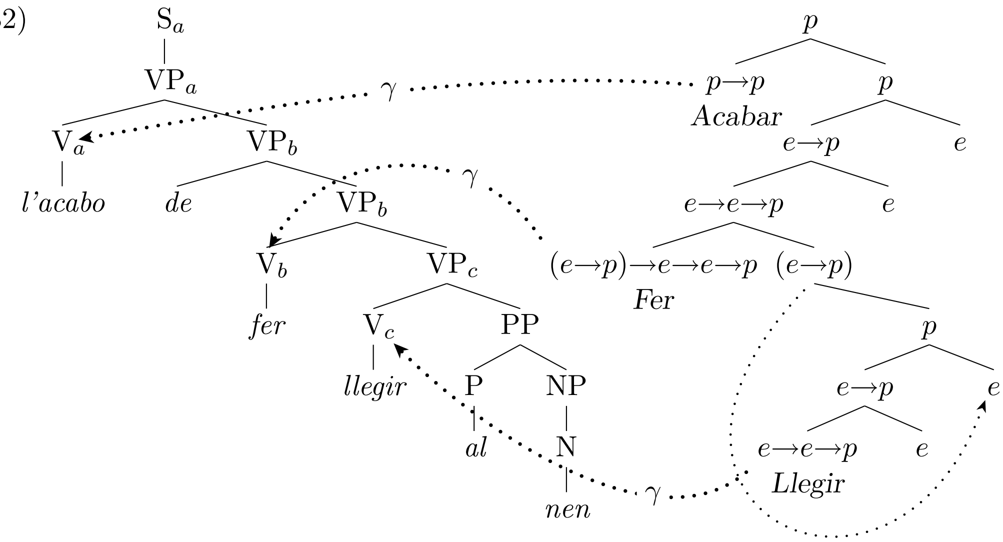
$$a:\left[\begin{array}{ll} \text{PRED} & \text{‘Acabar’} \\ \text{VFORM} & \text{FIN} \\ \text{DEP} & b:\left[\begin{array}{ll} \text{PRED} & \text{‘Fer’} \\ \text{VFORM} & \text{INF} \\ \text{VMARK} & \text{DE} \\ \text{DEP} & c:\left[\begin{array}{ll}\text{PRED} & \text{‘Lllegir’}\\ \text{VFORM} & \text{INF}\end{array}\right]\end{array}\right]\end{array}\right] \qquad \left[\begin{array}{ll}\text{SUBJ} & [\ \ ] \\ \text{IOBJ} & [\ \ ] \\ \text{OBJ} & [\ \ ]\end{array}\right]: a,b,c$$

We can now get the forms of the examples of (29), but each will have both meanings rather than the sole correct one.

Alsina (1997:237-238) addresses this issue with an informally stated constraint to the effect that predicate composition must mirror the c-structure. In effect, all of the predicates found under a VP in the c-structure must constitute a composite PRED-value which in some sense corresponds to that VP (Alsina's example (50)). This indicates the presence of another projection, which in the present context, would be most naturally construed as directly linking the glue-structure and the c-structure. I will call this projection γ, and construe it as running from the meaning-bearing nodes of the glue-structure (left terminal daughters) to the c-structure node that lexical item introducing the constructor appears under in the c-structure.[5] The result for (29a) will be:

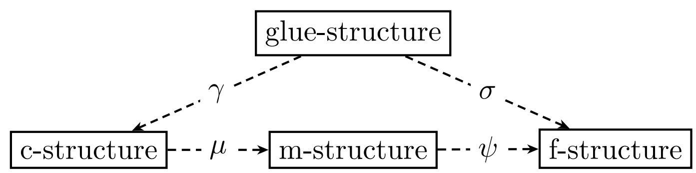
[5]This may need to be revised in light of idioms, and meaning-constructors introduced directly by PS-rules, if these latter exist.

(32)



The revised architecture will then be:

(33)



$\phi = \psi \circ \mu$ γ connects meaning nodes to their c-structure introducers

We then need some constraints which will assure that the relationships between meaning-constructors in the assembled glue-structure reflect the c-structure relationships between their introducers.

A problem which the constraint needs to be able to deal with is the ambiguous interpretation of adverbs in examples like:[6]

(34) He fet beure el vi a contracor a Maria
I-have made drink the wine against will to Mary
I made Mary drink the wine against her/my will
(Manning (1992), Andrews and Manning (1999:126), from Alex Alsina p.c.)

The constraint I suggests involves a glue-structure relationship that I will call 'Extended Argument of', and a c-structure relationship that I'll call 'β-command':

(35) **Extended Argument of**: Meaning-bearing glue node m is an extended argument of meaning-bearing glue-node n iff the dynamic path of m joins the dynamic path of n before the FinalOutput of n (= 'Feeds Into' from Andrews (to appear)).

[6]Andrews (2003) gets into trouble with this.

(36) **β-command:** c-structure node c β-commands node d iff every $\overline{\mathrm{X}}$ projection dominating c dominates d.

Note that in a complex predicate, the higher verb will β-command the lower, but not vice-versa, even if they are in an extended projection relation.

The constraint is then:

(37) **γ-harmony:** If $\gamma(m)$ β-commands $\gamma(n)$ but not vice-versa, and if $\phi(\gamma(m)) = \phi(\gamma(n))$, then n must be an extended argument of m (the condition on $\phi \circ \gamma$ is supposed to keep this from applying to adjuncts, so as to allow the ambiguity of (34)).

Perhaps more elegant formulations can be found, but (37) relates the levels of glue-structure and c-structure by means of a constraint that is plausibly universal, and intuitively iconic.

6 Conclusion

By construing meaning-constructors as being essentially the same thing as argument-structures, we have managed to capture many of the insights of Alsina's analysis of complex predicates in a more formalized framework, glue-semantics, that explicitly integrates argument-structure with a general account of semantic composition in LFG.

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