Sets, Heads and Spreading in LFG*

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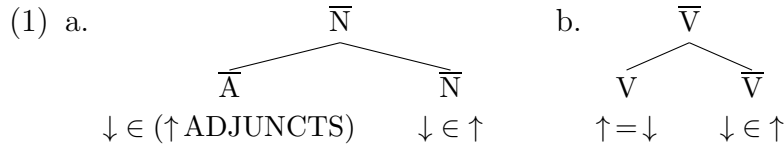
LFG has traditionally proposed flat covert structures (f-structures) for a variety of constructions, such as adjectival modification and 'restructuring' complex predicates, which are analysed as having hierarchical covert structures, usually binary brancing ones, in most other frameworks. This leads to a variity of problems that were addressed in Andrews and Manning (1993, 1999), henceforth AM93, AM99, or AM for both, where substantial modifications to the LFG architecture were proposed, involving extensive sharing of attributes across structural levels, so that LFG could account for the evidence for more hierarchy without losing its accounts of agreement, case-marking and various other phenomena. I will here show that the analyses of AM can be reformulated using a similar but different, independently motivated and more conservative innovation, the concepts of 'hybrid object' and 'distributive attribute' introduced for the treatment of coordinate structures in Kaplan and Dalrymple (2000), henceforth DK.

The notion of distributive attribute in fact goes back to the unfortunately no longer available Bresnan et al. (1985), and is taken up and further developed in Kaplan and Maxwell (1988). Distributive attributes, when attributed to a set, are attributed to all members of a set, and vice versa, allowing for the satisfaction of the Completeness and Coherence conditions in examples such as *John bought and read the book*. The other ingredient, hybrid objects, is due to John Maxwell: a hybrid object is an f-structure that has both nondistributive attributes and a set of members; the nondistributive attributes hold of the entire structure independently of the members, while the distributive attributes hold of the entire structure if and only if they apply to all the set members. The crucial observation here is that there is no motivated formal requirement, but merely a traditional practice, that the set component of a hybrid object have more than one member. Therefore, hybrid objects with singleton sets can provide the attribute-sharing across nested structural levels that is needed to support most of the analyses of

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AM,[1] without substantial innovations beyond those of DK, and within the LFG framework presented by Dalrymple (2001).

For example, the following structures are proposed for 'modal adjectives' such as *former* and *alleged* (a), and for Romance 'restructuring' predicates[2] (b), often also called 'light verbs':

(1) a.

$\overline{\text{N}}$
$\overline{\text{A}}$ $\overline{\text{N}}$
$\downarrow \in (\uparrow \text{ADJUNCTS})$ $\downarrow \in \uparrow$

b.

$\overline{\text{V}}$
V $\overline{\text{V}}$
$\uparrow = \downarrow$ $\downarrow \in \uparrow$

The construction of (a) is standardly analysed in LFG with 'f-structure flattening', whereby the upper and lower $\overline{\text{N}}$'s in (a) share same f-structure, and this is a popular proposal for the $\overline{\text{V}}$'s in (b) as well, but the flattening leads to a variety of difficulties discussed by AM, which amount to insufficient 're-spect for the tree' (Alsina 1997). These difficulties do not appear to have been satisfactorily resolved; rather, they seem to be getting worse, as for example with some of the NP structure phenomena analyised by Pesetsky (2013) within the Minimalist Program. I will show that using singleton sets rather than f-structure equality permits a reasonably successful analysis, with only a minor innovation beyond Dalrymple (2001).

For complex/restructuring predicates, the difficulties for LFG don't appear to have multiplied, indeed, many of them have been resolved by Lowe (2016), but the problem of respect for the tree remains. The present proposal fixes this, and and we will show that it does this in a way that is compatible with another recent development in LFG, the version of Lexical Mapping theory proposed in Asudeh et al. (2014)), henceforth AGT. Furthermore, in both cases, we resolve the problem that AM has with 'inside-out functional uncertainty' that is discussed in Andrews (2001). These analysis and the others we will present also depend on a greater use of glue semantics, which turns out to be able to provide interpretations for some fairly unpromising-looking structures.

Before launching into the details, I will comment briefly on why this might be at least somewhat relevant to people who do not themselves work in LFG. LFG is a grammatical framework which has been stable for many decades (in

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[1]The exception being Misumalpan causatives, for which a different solution, making use of glue semantics, is available.

[2]As first discussed in generative terms by Aissen and Perlmutter (1976) and Rizzi (1978).

effect, since 1979, with the first major publication, Bresnan (1982), appearing three years later), and has accumulated a large collection of reasonably consistent and often implementable (or not too far from implementable) analyses of a typologically diverse collection of languages. An important value of LFG is large scale consistency across analysis, a value which this paper supports by bringing a collection of analyses previously couched within a substantially different version of LFG into the canonical version, with very little change to their substance. The current state of the theory is presented in detailed advanced textbook form by Bresnan et al. (2016).

Until recently, LFG appeared to have a very serious problem relative to GB and the Minimalist Program in that it could be argued to be excessively stipulative, since full LFG grammars typically involve a considerable amount of language-specific rule formulations, implying too many options in the space of possible grammars for plausible learning. But with the apparent demise of what might be called 'strong principles and parameters' — the idea that there are only principles and parameters, and not very many of either — an unknown amount of hard-to-manage stipulation seems to be a fact that all theories need to face. In addition, Bayesian and related kinds of learning theories (see Chater et al. (2015) for a recent discussion) appear to at least offer the potential of using 'implicit negative evidence' to support the acquisition of various kinds of constraints that were previously problematic, reducing the conceptual gap between the theories.[3] The amount of stipulation in LFG analyses is still arguably rather excessive, but it is overt and tangible in a relatively stable (although not completely unchanging) framework.

The present approach furthermore better supports hierarchical structures that are more similar to those used in Minimalist analyses, hopefully facilitating more in the way of careful comparison of the differences between the results of the symmetrical device of attribute-sharing employed by LFG with the asymmetrical ones of probes, goals, movement, etc. employed by the Minimalist Program.

In the next section, I will present the basic theoretical ideas, and then, in the following sections, analyses of English modal and intersective adjectives, Catalan light verbs and causatives (applying generally to other Romance languages), Tariana serial verb constructions, and Misumalpan serial verbs (where the analysis relies upon glue semantics rather than distributive attributes), these being the main targets of analysis in AM. The other complex-

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[3]But see Yang (2016) for a dissenting view.

predicate structures discussed in AM99 are Wagiman and Urdu, and a bit of Italian. Urdu fits easily into the approach we take for Romance, Italian likewise does not seem to motivate major changes (but certain of its features, such as 'Long Passives' ought to be investigated in terms of the AGT linking theory), and I won't consider Wagiman, since the discussion is brief, and the constructions rather different from the verb-combining constructions considered here. We conclude with some general theoretical discussion.

1 Distribution and Restriction

In this section I will discuss in greater detail some formal issues related to distribution and restriction. DK is concerned both with the representation of features and the representation of coordinate structures; here I will consider only the latter. The idea can be presented as consisting of four components:

(2) a. There are two kinds of attributes, distributive and nondistributive.

   b. There are 'hybrid objects' consisting of both nondistributive attributes and sets (the latter as traditionally used in LFG).

   c. Nondistributive attributes are specified independently for the entire hybrid object and its individual set members.

   d. Distributive attributes are specified subject to the following 'distributivity scheme' (whose application is a bit subtle): For any distributive attribute A and set s, $A(s) = V$ iff $\forall f \in s, A(f) = V$.[4]

This can be seen as a kind of attribute-spreading in the sense of AM, but with an additional subtlety.

   Consider a structure like this, where the attribute F is distributive:

(3) $$\left[\left\{ \begin{bmatrix} F & Y \end{bmatrix} \\ \begin{bmatrix} F & Z \end{bmatrix} \right\} \right]$$

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[4]This is the formulation of Dalrymple (2001:158); that of DK is slightly different, phrased in terms of 'properties' which appear to include attributes as well as values, while that of Kaplan and Maxwell (1988) is even more different, involving a concept of 'generalization' over f-structures which applies recursively to sub-attributes. Happily for us, all these proposals return identical behavior for singleton sets.

As long as nothing ascribes any F-value to the entire structure, it is possible that $Y \neq Z$. But if anything ascribes a value X for F to the entire structure, then (3) must become more highly specified as (we think of X as a shared value, rather than multiple copies):

(4)
$$
\begin{bmatrix}
\text{F} & X \\
\left\{ \begin{matrix} \begin{bmatrix} \text{F} & X \end{bmatrix} \\ \begin{bmatrix} \text{F} & X \end{bmatrix} \end{matrix} \right\}
\end{bmatrix}
$$

And if this is impossible, due to Y and Z being contradictory, then there is no solution (in effect, 'the derivation crashes'). This is exactly the effect we want in coordinate structures, where grammatical relations are sometimes shared and sometimes not:

(5) a. Mary praised Bill and criticized John

b.
$$
\begin{bmatrix}
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'Mary'} \end{bmatrix} \\
\left\{ \begin{matrix}
\begin{matrix} \text{CONJ} & \text{AND} \end{matrix} \\
\begin{bmatrix}
\text{PRED} & \text{'Praise(SUBJ, OBJ)'} \\
\text{TENSE} & \text{PAST} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'Bill'} \end{bmatrix}
\end{bmatrix} \\
\begin{bmatrix}
\text{PRED} & \text{'Criticize(SUBJ, OBJ)'} \\
\text{TENSE} & \text{PAST} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'John'} \end{bmatrix}
\end{bmatrix}
\end{matrix} \right\}
\end{bmatrix}
$$

In this case, SUBJ is shared and OBJ is not, but other possibilities are both or neither:[5]

(6) a. Mary praised Bill and Susan praised John

b. Mary (both) praised and criticized John

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[5]But there is also the issue of 'right node raising' (Mary praised and/but Susan criticized John) which raises special issues and won't be discussed here.

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The 'distributivity convention' (2d) handles this and other issues associated with coordinate structures well.

The behavior is therefore significantly different from attribute-sharing as conceived by AM. On this account, if F where to be shared across set-membership, both X and Z in (3) would have to be shared with the entire structure, resulting in (4), which would make coordinate structures difficult to analyse.

Furthermore, if the values of F in the set members are specified the same by the internal structure of the members, then this becomes the value of F for the entire structure as well, for the satisfaction of constraining equations. In the case of grammatical relations in coordinate structures, this will never happen due to the Predicate Indexing convention (all instances of PRED-values are taken as distinct, even if they represent the same choice from the lexicon), but it can occur for ordinary feature-values. The effect is that distribution works in effectvely the same way for defining specifications (those that impose a feature-value) and constraining ones (those that check that it is there with a given value).

However, when the set is a singleton, this difference in behavior between distribution and sharing disappears. In (7a), for example, X is the value of F in every member of the hybrid object's set, so (7a) comes out identical to (7b):

(7) a. $\left[\left\{ \begin{bmatrix} \text{F} & X \end{bmatrix} \right\} \right]$

   b. $\begin{bmatrix} \text{F} & X \\ \left\{ \begin{bmatrix} \text{F} & X \end{bmatrix} \right\} \end{bmatrix}$

For our present applications, this produces the behavior we want, corresponding to obligatory sharing of certain attributes across ARG in the system(s) of AM, in the event that they are defined in either the entire structure or the set-member (but allows them to be undefined at both).

It would be ideal if there was a single universal classification of features into distributive and nondistributive, with uniform behavior in all languages, but, unfortunately, this appears to be too simplistic to work: sometimes it seems necessary, or at least advantageous, to have a certain amount of

stipulation in what shares and what doesn't. Although there are a number of possibilities, the approach that currently strikes me as best is as follows:

(8) a. There are certain attributes, such as PRED and ADJUNCT, which are universally and exceptionlessly non-distributive. In situations where they might be thought of as distributive, it seems plausible that, instead, the structure should be truly flat, therefore, allowing them to be stipulated as distributing would introduce unnecessary non-orthogonality into the theory.

b. Other attributes are assumed distributive by default, but can be blocked from sharing by an 'undersharing specification', for which we can use the 'restriction' notation of Kaplan and Wedekind (1993). In such cases, there is clear and overt positive evidence that the undershared attribute is behaving differently from the others.

In this paper, we will need undersharing for grammatical features, but not for grammatical functions such as SUBJ and OBJ; it remains to be seen if this potential restriction holds universally. So the proposed typology is that PRED and ADJUNCTS are invariably not distributed, governable grammatical are invariably distributed, while 'morphosyntactic' features such as NUMber, GENder, and VFORM (Verbal form, eg. infinitive vs. participle) are distributive by default but can be stipulated as nondistributive in specific constructions.

The final issue I will consider here is the status of the 'quasi-attribute' $\in$, representing set-membership. This is not normally presented as an attribute, comparable to SUBJ or COMP, but it is often notated as one, especially in iofu statements (Dalrymple 2001:154). But if we think of it as an attribute, we need to observe that it is multi-valued, which raises the issue of whether certain other attributes are also multi-valued, such as perhaps an attribute ADJUNCT to replace the set-valued ADJUNCTS. Proceeding along these lines, we could think 'membership' as a 'head' attribute 'H', with two peculiarities:

(9) a. H can be multi-valued.

b. Certain other attributes distribute across H in accordance with the distributivity scheme.
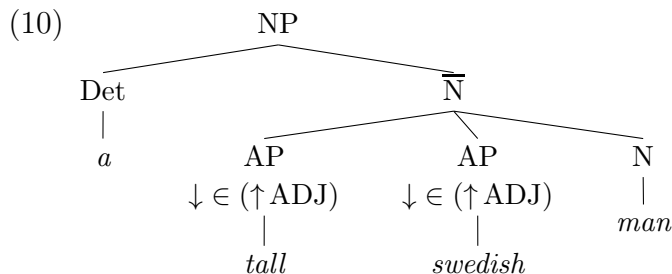
This conception is more like that of AM99, than the present one, but nevertheless differs in at least two fundamental ways as well as some details (a) the actual proposed extent of sharing is much more restrained (b) no attempt is made to think of the results of sharing as a 'projection' in the usual sense in which this word is used in LFG. Although I won't pursue it here, the idea derives some appeal from the fact that it is certainly natural to think of coordinate structures as multi-headed, with the behavior of distributive features a natural generalization of the kind of attribute-sharing that is characteristic of the concept of head in LFG.

2 Adjectives

In this section we will focus on two topics related to adjectives, the analysis of modal vs. intersective adjectives, and certain 'mixed agreement' patterns such as those of Russian professional nouns, recently analysed within the Minimalist Program by Pesetsky (2013) and (with different claims about data and analysis) by Smith (2015). Our treatment will be closer in spirit to Pesetsky than to Smith. We first discuss the empirical phenomena of scoping with modal adjectives, then develop our structural proposal, apply it to the agreement discrepancies, and finally conclude.

2.1 Adjectives and Scope

LFG has generally followed the 'flat structure' approach to adjectival modifiers advocated by Jackendoff (1977), e.g. Dalrymple (2001:256-257). The adjectives are introduces as APs whose f-structure correspondents are members of the set-valued attribute ADJUNCTS, yielding an annotated c-structure like this for *a tall Swedish man* (in the structure on p. 257, the topmost NP layer with the determiner is omitted, here the $\uparrow = \downarrow$ annotations are):

(10)

$$
\begin{array}{c}
\text{NP} \\
\diagup \qquad \diagdown \\
\text{Det} \qquad\qquad \overline{\overline{\text{N}}} \\
| \qquad\qquad \diagup \; | \; \diagdown \\
a \qquad \text{AP} \qquad \text{AP} \qquad \text{N} \\
\quad \downarrow \in (\uparrow \text{ADJ}) \quad \downarrow \in (\uparrow \text{ADJ}) \quad | \\
\qquad\qquad\qquad\qquad\qquad\qquad\qquad man \\
\quad\quad | \qquad\qquad\quad | \\
\quad\quad tall \qquad\quad swedish
\end{array}
$$

This works reasonably well for intersective adjectives, as treated in considerable detail by Dalrymple, and can arguably be extended to at least some subsectives, such as *skillful*, by treating them as taking an unexpressed *as*-argument, which is normally supplied by the head noun when the adjective is in attributive position, but supplied from context when the adjective is predicative:

(11) a. Brett is a skillful surgeon (but totally ordinary as a pilot).

    b. Wow, he's skillful! (as a surgeon) [watching Brett in the operating theater, implying nothing about his ability to land an airplane in strong and gusty crosswinds].

But the analysis fails to give a very satisfactory account of 'modal' adjectives such as *former* and *alleged*, because it doesn't account for the interpretational consequences of ordering as presented originally by Andrews (1983b) and also a major topic of AM93. Consider for example the pair:

(12) a. He is an unscrupulous former property-developer

    b. He is a former unscrupulous property-developer

The first characterizes his career as a developer as in the past, but his unscrupulousness as persisting, while the second locates both in the past, so that he could well be a comprehensively reformed character. We also note that *He is a formerly unscrupulous property developer* means that he's still a developer, but is no longer an unscrupulous one. When *former* is replaced by its adverbial variant, the attribution to past time applies only to the adjective, not the entire adj+noun combination.

An evidential issue with this kind of contrast is that many such pairs of adjectives seem to strongly prefer one order or the other, suggesting the possibility of a cartographic account using a very refined system of functional heads (e.g. Cinque 1994, 2010), but it seems to me that there are enough cases of two orderings with both adjectives retaining the same meaning but with the whole structure differing in its scope interpretation to rule this out. There are of course many other issues with adjective ordering; it remains to be seen whether the present proposal can be extended to cope with them.

Theoretically, it might be possible to preserve the syntactic analysis of Dalrymple (2001) unaltered, but capture the semantic interpretational facts

with restrictions involving f-precedence (Kaplan and Zaenen (1989), Dalrymple (2001:171-174)). One issue is that the concept would have to be generalized so as to involve some kind of c-structure-based command relationship, in order to deal with the concentricity effects as discussed in Andrews (1983b).[6] Another is that the formulations seem to come up rather complex, and it is difficult devise a single, plausibly universal, constraint that manages to deal with the full range of cases considered in AM, including both modal adjectives and complex predicates.[7] A final problem is that such an approach would probably have very limited prospects for explaining further phenomena, such as those discussed in Pesetsky (2013) and Smith (2015), as we will discuss below. Our analysis will therefore work by using singleton sets to project more of the articulation of c-structure into the f-structure level, where it control the semantics, as well as having in principle a further range of possible effects, while using distribution to implement the phenomena that motivate the flattening that is a traditional characteristic of f-structure.

2.2 Nesting Structures

I propose the following annotated c-structures for 'former unscrupulous developer' and 'unscrupulous former developer' ($\uparrow = \downarrow$ annotations on the preterminals omitted):

(13) a.

$$
\begin{array}{c}
\overline{\text{N}} \\
\end{array}
$$

$\overline{\text{A}}$
$\downarrow \in (\uparrow \text{ADJUNCTS})$
|
A
|
former

$\overline{\text{N}}$
$\downarrow \in \uparrow$

$\overline{\text{A}}$
$\downarrow \in (\uparrow \text{ADJUNCTS})$
|
A
|
unscrupulous

$\overline{\text{N}}$
$\downarrow \in \uparrow$
|
N
|
developer

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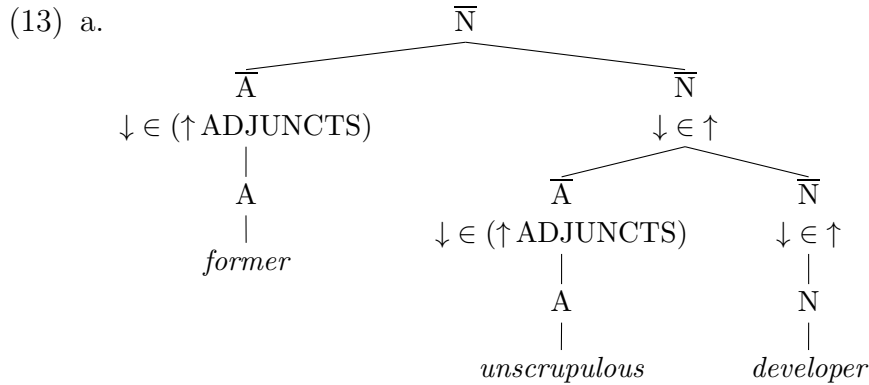
[6]There is also a very interesting discussion of concentricity effects with the Greek polydefinite construction in Velegrakis (2011).

[7]Andrews (2007a) formulates a constraint for complex predicates, but doesn't attempt to extend it to modal adjectives.

b.

```
                              N̄
                 ┌────────────┴────────────┐
                 Ā                          N̄
          ↓ ∈ (↑ADJUNCTS)                 ↓ ∈ ↑
                 │              ┌──────────┴──────────┐
                 A              Ā                     N̄
                 │        ↓ ∈ (↑ADJUNCTS)           ↓ ∈ ↑
           unscrupulous         │                    │
                                A                     N
                                │                     │
                             former               developer
```
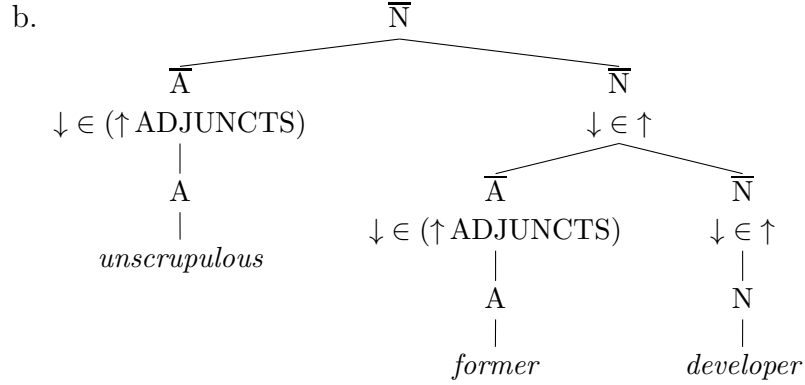
On the assumption that ADJUNCTS and PRED are non-distributive, these produce the following f-structures:

(14) a.
$$
\begin{bmatrix}
\text{ADJUNCTS} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Former'} \end{bmatrix} \right\} \\[2ex]
\left\{ \begin{bmatrix} \text{ADJUNCTS} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Unscrupulous'} \end{bmatrix} \right\} \\[2ex] \left\{ \begin{bmatrix} \text{PRED} & \text{`Developer'} \end{bmatrix} \right\} \end{bmatrix} \right\}
\end{bmatrix}
$$

b.
$$
\begin{bmatrix}
\text{ADJUNCTS} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Unscrupulous'} \end{bmatrix} \right\} \\[2ex]
\left\{ \begin{bmatrix} \text{ADJUNCTS} & \left\{ \begin{bmatrix} \text{PRED} & \text{`Former'} \end{bmatrix} \right\} \\[2ex] \left\{ \begin{bmatrix} \text{PRED} & \text{`Developer'} \end{bmatrix} \right\} \end{bmatrix} \right\}
\end{bmatrix}
$$

A decision that can be questioned here is treating modal adjectives as ADJUNCTS-members in the same manner as intersective adjectives. An alternative would be to have them introduce PRED-values directly, yielding f-structures similar to what we will be proposing for Romance restructuring predicates in the next section.

But aside from greater uniformity of structures, a further justification for the present treatment is that Modern Greek has modal adjectives whose behavior is essentially similar to those of English, in that they only appear prenominally and not as predicate adjectives (Alexiadou et al. 2008:360-371).

They oppose treating ordinary adjectives as heads of the nominal projection on the basis that they can take their own prepositional complements which (in some written styles, but not speech, as far as I can make out), but this can also happen with modal adjectives:[8]

(15) i   ipotitheméni apó ton Iosíf   apistía   tis   Marías
     the suspected   by the Joseph infidelity the(Gen) Mary(Gen)
     Mary's suspected/alleged infidelity according to Joseph
     `http://www.sostis.gr/blog/item/490-h-gennhsh-sta-evaggelia`,
     seen 16 March 2016

If both intersective and modal adjective PRED-features appear in members of an ADJUNCT-value, then they can have their individual PP complements without causing issues. The availability of PP complements for modal adjectives together with the fact that these adjectives obey the same agreement principles provides evidence that modal adjectives have the same f-structures as intersective ones.

For the glue semantics analysis, for the intersective adjectives, one possibility would be the glue analysis of Dalrymple (2001:ch.11). But this has the problematic feature that, in order to accomodate phenomena of adverbial modification presented in Kasper (1995), every attribute adjective requires two meaning-constructors, a simple one of type $e{\to}p$ that predicates a property of an entity, and a much more complex one that conjunctively combines this meaning with that of the other nominal components of the NP. The problem is that this raises the possibility that some intersective adjectives could resist adverbial modification for the reason that they don't have these two constructors, but just a single one that combines their meaning with that of the surrounds without allowing for the adverbial modifiers. I suggest that we can avoid this problem by introducing the second constructor, which I'll the 'Intersector', with the phrase-structure rules. An adjective such as 'unscrupulous' will then have the same meaning-constructor is in Dalrymple (2001):

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[8]One of the problems that needs to avoided with examples of this sort is the 'fake gun' problem discussed in Partee (2010). It is a well-known observation that *fake* semantically seems like it ought to be modal, but shows considerable intersective behavior (*this gun is fake*). Partee manages this by treating *fake* as essentially intersective, but able to force a broadening of the extension of *gun* to include fake ones (as 'kinds of guns'). But a suspected or alleged activity cannot be plausibly regarded as a kind of that activity, since it may not exist at all, and even if it could, such an interpretation would be culturally inconceivable for this example.

(16) $\lambda x.Unscrupulous(x)$: $(\uparrow\text{VAR})\rightarrow(\uparrow\text{RESTR})$

A first version of the PS rule will then be:

(17) $\overline{\text{N}}$ $\rightarrow$ $\quad$ AP $\qquad\qquad\qquad$ $\overline{\text{N}}$
$\qquad\qquad\qquad\qquad\ \downarrow\in(\uparrow\text{ADJUNCTS}) \qquad\quad \downarrow\in\uparrow$
$\qquad\qquad\qquad\qquad\ \lambda PQx.P(x)\wedge Q(x)$:
$[(\downarrow\text{VAR})\rightarrow(\downarrow\text{RESTR})]\rightarrow[(\uparrow\in\text{VAR})\rightarrow(\uparrow\in\text{RESTR})]\rightarrow(\uparrow\text{VAR})\rightarrow(\uparrow\text{RESTR})$

Another possibility might be to treat this constructor as a universally available, 'of course' modality formula with universal quantifiers automatically added to all collections of glue premises:

(18) $!(\forall X,Y,Z)(\lambda PQx.P(x)\wedge Q(x)$:
$\qquad [(x\,\text{VAR})\rightarrow(x\,\text{RESTR})]\rightarrow[(y\,\text{VAR})\rightarrow(y\,\text{RESTR})]\rightarrow(z\,\text{VAR})\rightarrow(z\,\text{RESTR})$
$\qquad \wedge\, x\in(z\,\text{ADJUNCTS})\wedge y\in z$

Note that this latter treatment would appear to require the constructor to be able to introduce VAR and RESTR attributes, which would then require some care to avoid the undecideability issues considered in Johnson (1991).

However an issue arises when we try to extend the analysis to 'conjunctively iterated' adjectives, such as these, discussed in AM93, from which most of the following is drawn:

(19) Max is a ruthless, dishonest, unscrupulous developer

That these are a different construction from single adjectives without a pause is shown by the fact the comma-pause is not acceptable with modal adjectives:

(20) *Max is a former, unscrupulous developer

On the other hand the comma-separated intersective adjectives can appear either before or after a modal adjective (AM93:27-29):

(21) a. Max is a former greedy, unscrupulous developer

$\qquad$ b. Max is a greedy, unscrupulous former developer

They are furthermore not some kind of coordinated AP because (a) they can't appear as predicate modifiers (without special intonation, at the end of an utterance) and (b) modal adjectives can be conjoined by *and*, but not sequenced by commas:

(22) a. *Max is greedy, unscrupulous [requires a long pause and special intonation]

   b. *The fact that Max is greedy, unscrupulous discourages other local business owners from having anything to do with thim.

(23) a. In 2010, Vlad was a future and former President of Russia

   b. * In 2010, Vlad was a future, former President of Russia

The construction seems clearly limited to intersective semantics.

   We can in fact retain the c-structure analysis of AM93:28, modulo the present proposal, but need to modify the meaning-constructor. A plausible proposal would be to modify it to be a schema, for which I suggest the following:

(24) $\overline{\text{N}}$ $\rightarrow$ $\quad\quad\quad\quad\quad\quad$ (AP)* $\quad\quad\quad\quad\quad$ $\overline{\text{N}}$
$$\downarrow \in (\uparrow \text{ADJUNCTS}) \quad\quad\quad \downarrow \in \uparrow$$
$$\lambda P^* Q x. \bigwedge (P^*(x)) \wedge Q(x) :$$
$$[(\downarrow \text{VAR}) \rightarrow (\downarrow \text{RESTR})]^* \rightarrow [(\uparrow \in \text{VAR}) \rightarrow (\uparrow \in \text{RESTR})] \rightarrow (\uparrow \text{VAR}) \rightarrow (\uparrow \text{RESTR})$$

The idea here is that for each instance of AP that is produced by the Kleene star, you get an indexed instance of the P (property) variable, which are each applied to x with the results conjoined by the $\bigwedge$ operator. This is clearly hopeless as a language-particular stipulation (rule, parameter, or whatever other term one my prefer), but must be in effect a universal principle. Therefore the exact details of the notation don't matter very much, as long as the effect is well-defined. Note further that if we treat this is a schema, these notations don't have to appear in the semantic assembly itself, only specific instantiations dependent on how many AP's are produced by the Kleene star. Such an approach could also be applied to the proposal of (18) to use quantified 'of course' formulas.

   Proposing some meaning-constructors to be universal 'principles' rather than rules/parameters might be seen as a change in the theory of glue semantics, but it has been implicit since the treatment of coordinate structures in Asudeh and Crouch (2002), where the meaning constructors proposed were far too complex to be plausibly considered as learned by finding the right way to assemble the symbols they were composed of. There is a further conceptual issue in that in some sense, if we toss a bunch of property-denoters into a bag and say 'do something with this', the obvious thing to do is to

conjoin them, whereas (24) does not look particularly obvious, especially on first encounter (although perhaps a more sophisticated mathematical framework could help with this). But the strategy here is to state in a precise way what is to be done, in the hope that this will help in finding better ways to do it.

We now have a workable treatment of intersective adjectives, but modal adjectives require something different (and not adequately supported by Dalrymple's treatment). They apply in effect as propositional operators on the predications formed by applying the nominal head to the referent of the NP. There are two slightly different cases, one being adjectives such as *former* and *alleged*, which plausibly don't predicate anything of the NP referent directly, and those such as *confessed* and *self-proclaimed*, where the referent also functions as an argument (originator of a proposition concerning themselves). Under the present proposal, it seems best to use the same glue specifications for both types, with the difference between them confined to the semantic side. Since the lexical items are buried inside members of an ADJUNCTS attribute, we need to use local variables to make the constructors look reasonable:[9]

(25) In both below, $\%G = (\text{ADJUNCTS} \in \uparrow)$:

$$\lambda Px.Former(P(x)) \ : \ [(\%G \in \text{VAR}) \rightarrow (\%G \in \text{RESTR})] \rightarrow$$
$$(\%G \, \text{VAR}) \rightarrow (\%G \, \text{RESTR})$$
$$\lambda Px.Confess(P(x))(x) \ : \ [(\%G \in \text{VAR}) \rightarrow (\%G \in \text{RESTR})] \rightarrow$$
$$(\%G \, \text{VAR}) \rightarrow (\%G \, \text{RESTR})$$

It should be evident that the scope relationships will now be captured.

It is a pleasant consequence of using the schema (24) for the intersectives that modal and intersective adjectives can't be combined in comma-separated lists, an effect that I found difficult to achieve if the intersectives are handled entirely by means of constructors added by the lexical items of the intersective adjectives.

The reader may well have already noticed that for the analysis to work at all, the ADJUNCTS attribute (and also PRED) will have to be nondistribu-

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[9]The diagrammatic notation of the DBA-based analyses of Andrews (2010a) helps with the cosmetic problem here, but it is unclear to me that there are any real issues at stake. Templates could also be used to make things look better, but I think that there needs to be more thought than there appears to have been about the properties of templates as a scientific idea, as opposed to an engineering convenience.

tive, which does not as far as I can see cause any problems in the analysis of coordinate structures. For example, I'm aware of no motivations to apply the adjuncts to the individual conjuncts rather than the whole coordination in examples like these:

(26) a. John took a photo of a bird and made a video of a lizard on Mt. Majura yesterday.

b. Mary yelled and kicked the car door five times.

On the other hand, requiring distributivity of governable GFs such as POSS and OBL_θ seems to work out:

(27) a. Kennedy's alleged assassin was murdered before he could be tried.

b. The alleged setting in final exams *(of hard problems) will be punished severely, if this is found to have actually occurred.

In (a), the possessor is arguably a Patient argument of *assassin*, but by all conventional ideas about phrase-structure, appears outside of the syntactic scope of the modal adjective. In (b), on the other hand, the *of*-PP is demonstrably an argument, because the sentence becomes ungrammatical if it is omitted, but nevertheless seems able to appear after an adjunct.

Another interesting case is *my former mansion* from Cinque (2010:30-31), also discussed in Morrison (2014). This could be either a mansion that is no longer mine, or something that is still mine but no longer a mansion, perhaps because it has been swallowed by a sinkhole or blown to rubble by a drone-strike. The semantics of possessives is complex, little explored in LFG, and has moved substantially beyond the proposal of Williams (1982) that a grammatical possessor could be anything but a non-owner (c.f. the papers in Kim et al. (2005)), but, if we provisionally assume that all possessors bear the grammatical function POSS, and that there is in the semantics a relation **R** covering at least ownership, we can get both readings by having the possessive marker introduce the following meaning-constructor:

(28) $\lambda Pyx.P(x) \wedge \mathbf{R}(y,x)$: $((\%G\,\mathrm{VAR}){\to}(\%G\,\mathrm{RESTR})){\to}({\uparrow}\mathrm{VAR}){\to}$
$(\%G\,\mathrm{VAR}){\to}(\%G\,\mathrm{RESTR}), \%G = (\mathrm{POSS}{\uparrow})$

This works because POSS is shared across all the levels, but can only be interpreted at a single level (it doesn't matter which), yielding the required two readings.

Argument possessives, such as *my reported death* or *America's envisioned response to Ebola* can on the other hand be managed by having the lexical item of the noun specify an argument bearing the grammatical relation POSS. In classic LFG, this undermines the Completeness and Coherence conditions amd the distinction between 'governable' and 'non-governable' grammatical functions, but these are called into doubt by glue semantics anyway, and have always been rendered somewhat problematic in the light of the behavior of possessive constructions, which have never been comprehensively analysed in LFG.

2.3 Features and 'Undersharing'

However we now encounter a problem, in connection with agreement. Happily, there is a possible solution, 'undersharing' specifications, which can do additional useful work.

(Non)Distribution in Coordinate Structures For single-headed structures of the kind we have been considering, we would seem to want 'agreement' features such as person, number, gender and case to behave distributively, since they are usually shared between the head N and the entire NP, regardless of the presence of adjectives. However, for the analysis of coordination, DK require that these agreement features be in general nondistributive, although they discuss how noun-class in Xhosa is distributive.

What I propose for this is the idea of 'stipulated undersharing' introduced in section 1. In general, the agreement features are distributive, or perhaps the attributes that they occur as bundled values of, such as INDEX and CONCORD, in many analyses (below I will suggest that INDEX exists but CONCORD doesn't, the supposed CONCORD attributes being direct attributes of the nominal f-structure). But in coordinate structures, the ones that don't distribute are stipulated as nondistributive by an undersharing stipulation, which, as mentioned above can be notated with the 'restriction' notation of Kaplan and Wedekind (1993), also presented in Dalrymple (2001:162-163). A simple analysis of English coordinate NPs for example might then look like this (based on Andrews (1983a)):

(29) a. NP $\rightarrow$ $(NP)^+$ $(NP)^+$
$\downarrow \in \uparrow /$PERS, NUM $\uparrow = \downarrow$

b. NP $\rightarrow$ Conj NP

$\uparrow = \downarrow$ $\downarrow \in \uparrow$/PERS, NUM

Rule (a) is introduces first one or more NPs as set-members, and then one or more as functionally identical to the entire coordinate structure. Rule (b) introduces NPs expanding to a conjunction and a single NP that is a set-member. In both cases, PERS and NUM are not shared (or, plausibly, INDEX is not shared). As discussed in Andrews (1983a), feature-compatibility can be made to assure that the same conjunction will be used in every instance of (b) that is chosen, and glue semantics can be made to provide interpretations (c.f. Asudeh and Crouch (2002), although I think a template-based approach using the '*' notation of (24) would be a better idea). Note that this treatment relies very heavily on glue semantics as a filter. For example if we expand the second component of (a) using the ordinary NP rules rather than (b), semantic assembly will fail and the structure will be blocked.

While stipulations such as the undersharing specifications would ideally not be necessary, it appears to be very difficult to come up with general principles that can eliminate them. For example Dalrymple and Kaplan (2000) need to recognize a difference between the attributes CLASS, which is distributive, and GEND(er), which isn't. On the present approach, a language like Xhosa, with its apparently distributive noun class attribute, lacks an undersharing specification for it, while European languages where 'gender' is not distributive have one. We do not have to postulate two distinct attributes with very similar functions.[10] Note in particular that in our present approach, where all but certain specified special attributes are distributive, the presence of a undersharing specification in a construction is revealed by the appearance in the data of structures that would be impossible without it, that, positive evidence (and the corpus does not tend to have be of great size to contain relevant examples). So these stipulations do not constitute a severe problem for learning (at least relative to the other problems that have to be solved!).

A similar set of issues arise with respect to Australian NP structure as discussed by Nordlinger and Sadler (2008). They argue that numerous Australian NP constructions, which present overtly as juxtaposition, should be represented f-structuraly as sets. But issues arise as to what features should distribute, and when. For example, in (a) below, the juxtposed NP elicits

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[10]Of course, we would have to rethink this if the difference in distribution between 'class' and 'gender' turned out to correlate closely with other differences, in ways that couldn't be explained by language history.

plural agreement, the sum of dual and singular markings of its components, while in (b), it elicits singular (rather than dual, the result of adding two singulars):

(30) a. Mima-nikinyi-yi   puluku   kujarra kangkuru-jirri waraja
wait.for-IMPF-3PL.SUB 3DU.DAT two   kangaroo-DU   one
yalapara
goanna
The two kangaroos and one goanna waited for those two (simplified from example 38, DS:428; Nyangumarta, from Sharp (2004:315)).

     b. Garid-ni   bungmanyi-ni gin-amany   yanybi
husband-ERG old.man-ERG 3SG.M.A-P.TWD get
(Her) old man husband came and got (her) (example 44, DS:433; Wambaya from Nordlinger (1998:133)).

Their solution is to follow Wechsler and Zlatić (2003) in locating the gender, number and person attributes in an INDEX substructure, which can then be shared, or not, as specified by the annotated PS rules (as a first approximation, subject to handling numerous complexities surveyed in footnote 24 (pg 435)). But given what we have said so far, sharing of INDEX could be the default, stipulatively suppressed in the case of the constructions that are interpreted as coordination. The widespread suppression of number distribution in coordinate structures can be plausibly explained in functional terms: if number distribution in them was not suppressed, it would be impossible to have coordinating NPs with different numbers in positions where agreement rules would impose number on the whole NP. In the next subsection, we examine some more complex cases where stipulated undersharing seems to help solve some descriptive problems associated with 'agreement mismatches'.

Undersharing and Agreement Mismatches Our first case, discussed and analysed in Pesetsky (2013:34-45), involves gender (non-)agreement with professional occupation nouns in Russian, which are grammatically masculine, but can refer to women. And when this happens, the agreement possibilities become interesting. The simplest situation is that all agreeing elements, incuding past tense verbs (which agree in gender+number) are masculine:

(31) nov-iy   vrač-ъ   prišёl-ъ
new-M.NOM.SG doctor-M.NOM.SG arrived-M.NOM.SG
The new doctor (M/F) arrived

But it's also possible to flip the modifiers to feminine, as long as any modifier 'further out' than a feminine modifier is also feminine:

(32) a. nov-iy   vrač-ъ   prišl-a
      new-M.NOM.SG doctor-M.NOM.SG arrived-F.NOM.SG
      The new doctor (M/F) arrived

     b. nov-aja   vrač-ъ   prišl-a
      new-F.NOM.SG doctor-M.NOM.SG arrived-F.NOM.SG
      The new doctor (M/F) arrived

     c. *nov-aja   vrač-ъ   prišël-ъ
      new-F.NOM.SG doctor-M.NOM.SG arrived-F.NOM.SG
      The new doctor (M/F) arrived

Mid-NP gender switching is however only possible for 'outer' adjectives, arguably intersective ones that modify the person, but not for 'inner' ones that modify the profession actvity (p. 37, citing previous work by Crockett and Skoblikova), and is furthermore somewhat dubious between two 'outer' adjectives (but having the outermost masculine while the inner one is feminine is completely impossible (p 38)):[11]

(33) a. ?U menja očen' interesn-aja   nov-ij
      To me   very interesting-F.NOM.SG new-M.NOM.SG
      vrač-ъ
      doctor-M.NOM.SG
      I have a very interesting new doctor(F)

     b. *U menja očen' interesn-ij   nov-aja
      To me   very interesting-M.NOM.SG new-F.NOM.SG
      vrač-ъ
      doctor-M.NOM.SG
      I have a very interesting new doctor(F)

To capture the basic ideas here in a LFG analysis, we will find it most convenient to abandon the conventional codescriptional approach to meaning-constructres for grammatical features, and instead adopt the 'analysis by

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[11]Smith (2015:148-149) says that this is impossible, but appears to be unaware of Pesetsky's discussion, and of the relevance of the 'high' vs. 'low' adjective distinction.

description' (DBA) approach proposed in Andrews (2007a, 2008, 2010a). Indeed, it might even be necessary to make this move, although I do not here try to insist that there is no co-descriptional solution, only that DBA is simpler and more plausible.

The basic idea of this approach is that glue constructors are introduced by 'Semantic Lexicon Entries' (SLEs) that specify how attribute-value pairs in the f-structure can be 'checked off', either singly or in combination, to introduce a meaning constructor. Here for example are SLEs for a regular noun, the plural feature, and a pluralia tantum noun:

(34) a. $\begin{bmatrix} \text{PRED} & \text{'Horse'} \end{bmatrix} \Leftrightarrow \lambda x.Horse(x)Z : (\uparrow\text{VAR}){\rightarrow}(\uparrow\text{RESTR})$

b. $\begin{bmatrix} \text{NUM} & \text{PL} \end{bmatrix} \Leftrightarrow \lambda P.Pl(P) : ((\uparrow\text{VAR}){\rightarrow}(\uparrow\text{RESTR})){\rightarrow}$
$(\uparrow\text{VAR}){\rightarrow}(\uparrow\text{RESTR})$

c. $\begin{bmatrix} \text{PRED} & \text{'Scissor'} \\ \text{NUM} & \text{PL} \end{bmatrix} \Leftrightarrow \lambda x.Scissors(x) : (\uparrow\text{VAR}){\rightarrow}(\uparrow\text{RESTR})$

'$\uparrow$' is here interpreted to refer to the f-structure on the left (so that the effect is the same as if the constructors were introduced in the lexical entries of the overt words), and we assume an analysis of plurality whereby it converts a predicate that applies to individual 'count' objects into one that applies to nonsingleton collections of the same kind of thing, whatever kind of implementation of this idea is used. The meaning of the semantic value *Horse* is assumed to be inherently count, applying only to a single entity of the specified type, while *Scissors* is inherently ('fake') mass, able apply to collections of any size, including singletons (but rejecting the indefinite article *a*). We will not attempt to elaborate the semantics here, but see Smith (2015) for extensive discussion of relevent topics (in a very different framework than the present one).

There is furthermore a requirement that:

(35) Every attribute must be either:

    a. checked off by one and only one SLE

    b. licensed by a syntactic condition

Case (b) is for structural case such as ergative, nominative or accusative, that lack any clear semantic interpretation, but clearly appear only when licensed.

We won't develop any particular proposal about this here, but the general approach of Nordlinger (1998) seems suitable, except that we would associate the conditions with the feature-values rather than directly with lexical items.

Now with number marking, independent interpretation of the feature in the manner of (34b) is the rule, while joint interpretation with a PRED is exceptional, but with gender it is the reverse: gender markers (usually) have some kind of independent interpretation, such as male vs. female, but more often they are co-interpreted with a lexical stem, languages differing in how easy it is vary the gender with a given stem to reflect the sex of the referent (on the whole rather easy in Modern Greek, basically impossible in Russian or Icelandic). So assuming a conventional three value gender system for Russian, we would have the following SLE for *vrač-ъ* 'doctor':

(36) $\begin{bmatrix} \text{PRED} & \text{'Vrač'} \\ \text{GEND} & \text{MASC} \end{bmatrix} \Leftrightarrow \lambda x.Doctor_{med}(x) : (\uparrow\text{VAR}) \rightarrow (\uparrow\text{RESTR})$

Given the account of feature distributivity above, the default behavior is for GEND to be shared though all the levels of the structure. This occurs in Russian, and is the only possibility in Greek or Icelandic, but in Russian, as we have seen, there is another possibility, in effect for the agreement to switch to semantic rather than grammatical (above the level of inner adjectives).

Given the availability of undersharing specifications, we can provide a rather direct rendering of Pesetsky's analysis, which might in fact be able to be simpler than the original, depending on other aspects of how the theory works. What Pesetsky proposes is a 'gender switching' head 'Ж', which takes a grammatically masculine complement, and produces a result that is grammatically and semantically feminine. We can achieve this effect by adding an expansion of NP that undershares GEND, and perhaps introduces a GEND FEM specification at the upper level (although there is a good prospect for eliminating this). I will represent this in (37) below by putting the possibly unnecessary specification in square brackets (the difference between inner and outer adjectives is not captured here, and won't be):

(37) NP $\rightarrow$ NP
$[(\uparrow\text{GEND}) = \text{FEM}]$
$\downarrow \in \uparrow/\text{GEND}$

Let's consider first the version of (37) where the GEND FEM feature is introduced by the rule. The feature needs to be 'checked off'/licensed, but

since it is not in an appropriate relationship with any feminine gender noun, the only way for this to to happen is for it to be interpreted semantically as feminine (unless there is something else in the grammar to license it, which is presumably not the case here).

But under some additional conditions, we can simplify the analysis a bit further by eliminating the feminine gender specification from (37). We need two assumptions:

(38) a. The use of 'constraining' specifications is highly limited to a few special circumstance, such as existential statements. Specifications introduced by inflection are therefore almost always 'defining'.

b. The non-feminine inflections (masculine and neuter) both introduce a feature-value whose semantic reading implies 'not female'.

In this case, the only situations where an agreement discrepancy could arise is when there is an agreeing element, which will by (38a) have to deposit a feature, which by (38b) will have to be interpreted. It will therefore by unnecessary to explicitly introduce the GEND FEM with (37), at least for the cases that are discussed in the literature. An interesting empirical test might be if there are science-fiction stories with android robot characters referred to by neuter pronouns. If such a character who had decided to become a physician could be described as a *novoje(Neut) vrač*, that would be evidence against introduction of a specifically feminizing construction, and in favor of having the agreeing forms introduce a feature that must be semantically interpreted.

So we need a meaning-constructor for the feminine gender feature, which will presumably be the same one that is used for the semantically interpreted feminine gender with pronouns, adjectives missing a head nominal, etc. For this, I propose the same form of constructor as for plurals, except that the semantic property added is *Female*:

(39) $\begin{bmatrix} \text{GEND} & \text{FEM} \end{bmatrix} \Leftrightarrow \lambda P.xP(x) \wedge \textit{Female}(x) : (\uparrow_e \rightarrow \uparrow_p) \rightarrow \uparrow_e \rightarrow \uparrow_p$

But we need one more thing: as written, the PS rule has nothing to get the meaning of the lower NP up to the upper level, so we need to add a constructor to it to accomplish this:

(40) NP $\rightarrow$ NP
$$[(\uparrow\text{GEND}) = \text{FEM}]$$
$$\downarrow \in \uparrow/\text{GEND}$$
$$\lambda P.P : ((\downarrow\text{VAR})\rightarrow(\downarrow\text{RESTR}))\rightarrow(\uparrow\text{VAR})\rightarrow(\uparrow\text{RESTR})$$

Some details of the Russian that we won't get into here are why:

(41) a. (40) can't appear underneath 'inner' adjectives

    b. (40) prefers not to appear in between two 'outer' adjectives

A final technical issue of (39) is the off-line parsability constraint discussed (not under that name) by Kaplan and Bresnan (1982:266-267), which requires there to be no empty nodes or 'cyclical subderivations' in which an X exhaustively dominates another X. We can remain off-line parsability by including the annotations as well as the usual c-structure category in the account of what an 'X' is (so that if the parser finds itself positing an 'X annotated with ν' dominated exaustively by another 'X annotated with ν', it will abandon that branch).

The second case discussed by Pesetsky involves number marking and agreement in Lebanese Arabic, based on Ouwayda (2013). In this language, numbers less than or equal to 10, and most quantifiers, appear with plural nouns and agreement, as one would expect. Numbers > 10 and the quantifier *kam* 'how many/small number of' show however a different behavior, in which the noun itself and lower adjectival modifiers must be singular, but higher adjectives and predicate nominals can be either singular or plural, with effects on the semantic interpretation (singular agreement supresses a collective interpretation, allowing oonly a distributive one). Furthermore, there is a concentricity effect: adjectives come after the noun, and if the first adjective is plural, a second one must also be, but the reverse is impossible:

(42) a. tleteen walad   kesleen   mnazam-iin Htajj-u
     thirty child(SG) lazy(SG) organized-PL complain-PL
     Thirty organized children complained (e.g. about their grades)

    b. *tleteen walad   kesleen-iin mnazam-   Htajj-u
     thirty child(SG) lazy-PL   organized(SG) complain-PL

To analyse this in the present version of LFG, I propose the following combination of ideas:

(43) a. To receive a singular interpretation, a count noun must appear in an f-structure with a NUM-value of SG (or, possibly, no NUM-value at all, if singular is taken to be the structurally unmarked number).

b. The quantifiers requiring a singular noun apply semantically to apply to a count singular interpretation (thereby forcing their noun to be singular).

c. These quantifiers can however co-occur with a plural number feature at their own level in order to allow a collective interpretation

d. The resulting clash is resolved by a number-undersharing rule similar to (37), which cannot appear at the level of 'inner adjectives'.

In this case, there is no reason to suppose that the rule itself introduces the number feature, since the quantifier is available to do that, so we can formulate it as:

$$\text{(44) NP} \quad \rightarrow \quad \begin{array}{c} \text{NP} \\ \downarrow \in \uparrow/\text{NUM} \\ \lambda P.P : ((\downarrow \text{VAR}) \rightarrow (\downarrow \text{RESTR})) \rightarrow (\uparrow \text{VAR}) \rightarrow (\uparrow \text{RESTR}) \end{array}$$

Although there are many further kinds of agreement discrepancies to consider, for which this kind of treatment is probably not appropriate (for example, many of those treated with the 'INDEX' vs 'CONCORD' distinction introduced by Wechsler (2004), and discussed with a suggested explanation on a historical basis by Bresnan et al. (2016)), these are of particular importance to the present proposal, because their concentric nature (both before and after the head noun) causes severe problems for the classic LFG flat NP architecture, but is not intrinsically problematic for most of its competitors, such as HPSG and the Minimalist Program. Nevertheless, it may be necessary to change some aspects of the implementation. The feature undersharing specifictions for example would not work easily if the feature specifications were buried inside a CONCORD attribute. One possibility would be that CONCORD does not exist as such, but its features are rather directly attributes of the nominal structure; another would be that it is actually CONCORD that is undershared. More work will be needed to sort this out.

2.4 Conclusion

This concludes our discussion of set representations for NPs. Although it should be clear that there are a great many technical details that need further work, the co-incidence of the concentric semantic interpretation and agreement effects provides strong evidence for the reality of the kind of nested structure that the idea of singleton sets and distributive features allows LFG to support, without major changes to its architecture. One current line of Minimalist research that needs to be better integrated with this material is the work on Greenberg's Universal 20 as reviewed and extended for example by Neeleman (2016). The basic observations about concentric structures seem consistent with the present approach, but the apparent fact of heads being able to be displaced to the front but not to the back (relative to where they ought to be if concentricity were strictly obeyed) seems potentially very challenging.

3 Complex Predicates in Romance

The classic problem posed by Romance Complex ('restructuring') Predicates is how to reconcile their apparently uniclausal nature, as evidenced by clitic climbing and other phenomena, with their 'respect for the tree' (Alsina 1997) as evidenced by the dependence of their interpretation on the linear arrangement, and also the distribution of verbal markers. These points are illustrated by these examples (Alsina p.c.), repeated from Andrews (2007b):

(45) 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 clitics *L'* and *La* associated with the semantically most deeply embedded verbs illustrates the monoclausal nature of the construction; if it is monoclausal, then, for the clitic to be OBJ of the first verb will render it the OBJ of the last verb as well. On the other hand, both the semantics and the determination of the form of each verb by the one before it militate against a monoclausal analysis. This tension has led to

considerable debate in LFG, as discussed in AM99, and, most recently, Lowe (2016).

3.1 F-structure

Our proposal of singleton sets provides a straightforward analysis using f-structure, glue-compatible but without essential reliance on glue. Consistently with what we needed for modal adjectives, PRED has to be nondistributive, so that each level has its own PRED. Then. given the c-structure suggested in (1), example (45b) will for example get an f-structure like (46), where SUBJ and OBJ are taken to be distributive, but, to control clutter in the diagram, we do not attempt to explicitly represent this. We also don't try to represent the lexical specifications of the predicates for their arguments, which involves issues of linking theory that we take up below:

$$
(46) \quad
\begin{bmatrix}
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'Pro'} \\ \text{PERS} & \text{I} \end{bmatrix} \\
\text{PRED} & \text{'Fer'} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'Pro'} \\ \text{PERS} & \text{III} \\ \text{GEND} & \text{FEM} \end{bmatrix} \\
\text{OBJ}_{Rec} & \begin{bmatrix} \text{PRED} & \text{'Nen'} \end{bmatrix} \\
\left\{ \begin{bmatrix} \text{PRED} & \text{'Acabar'} \\ \text{VFORM} & \text{INF} \\ \left\{ \begin{bmatrix} \text{PRED} & \text{'Llegir'} \\ \text{VMARK} & \text{DE} \\ \text{VFORM} & \text{INF} \end{bmatrix} \right\} \end{bmatrix} \right\}
\end{bmatrix}
$$

The lexical items for the light verbs then specify their semantic complements as values of $\in$. A sample constructor would be:

$$
(47) \quad \lambda P x.Finish(P(x))(x) \ : \ ((\uparrow\text{SUBJ})_e \rightarrow (\uparrow\in)_p) \rightarrow (\uparrow\text{SUBJ})_e \rightarrow \uparrow_p
$$

Note that the outside-in functional uncertainty associated with the $\in$ path does not cause an assembly problem for glue, since all that is required for

assembly is that the required parts be found somewhere in the specified area; a fully specified location is not needed.

A potential alternative analysis might be to have each light verb introduce a member of some kind of set of 'auxiliary' f-structures, with f-precedence determining their relative scope, roughly as proposed for auxiliaries in Bahasa Indonesia by Andrews, Mistica and Arka.[12] using perhaps a PS rule like this (note that this would accommodate the arguments of Manning (1996) for a right-branching structure):

(48) VP $\rightarrow$ V VP
$\qquad\qquad\qquad$ $\downarrow \in (\uparrow\text{AUX})$ $\qquad$ $\uparrow = \downarrow$

However there is a factor present in the Romance languages that is absent from Indonesian, which is verb-marking.

In Catalan (and Spanish), most light verbs select either infinitive or gerund as the verb form of their nonfinite semantic complement, and in many cases also specify a verb-marker, homophonous with a preposition, such as *a* or *de*. Some auxilaries also take a past participle. We could use the 'm-projection' proposed by (Butt et al. 1996), which is an additional level of structure, projected off c-structure, where certain morphologically relevant features reside. In these complex predicate structures, each VP would have an m-projection, shared with its V, the m-projection of each semantic complement being in the m-structure the DEP-value of its mother. But this requires setting up an entire projection to deal with a rather limited phenomenon that does not appear to exist in most languages (since it was proposed, the m-projection has not found many additional uses, although some have been suggested). In the present approach, we don't need a special projection; we merely need stipulate these features as undershared in this construction.

3.2 Distributive Issues

A benefit of this that there is no reason to expect them to be undershared in other constructions, such as coordinate structures, and indeed they aren't: VFORM distributes obligatorily, and VMARK must distribute at least optionally, although the facts are consistent with obligatory distribution. Below we see obligatory distribution of the infinitive VFORM and potentially optional distribution of the VMARK *de*:

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[12]At a Pargram meeting, perhaps in 2008.

(49) a. acabà   de riure   i   (de) plorar
         finish.PAST.3SG VM laugh.INF and (VM) weep.INF
         He/she stopped laughing and crying

     b. Quan acabis   de llegir   l'article   i   (de) fer-ne
         When finish.2SG VM read.gfINF the-article and (VM) make-of it
         el   resum,   avisa'm.
         the summary, advise-me.
         When you finish reading the article and summarizing it, let me
         know.

         Alex Alsina (pc; Dec 2 2014)

Although both versions of (b) are acceptable, the one with with the second
de included is more formal, so that, if omitted, it might be supplied by a
copy-editor. We can account for this with obligatory VMARK-distribution
by introducing the V-MARKs as a slightly higher projection that VP, with a
choice of coordinating either, coordination of the higher one being preferred
in formal style.

     Distribution of infinitive, gerund and past participle VFORM is illustrated
here:

(50) a. La Maria fa   riure i   plorar el   nen
         the Mary   makes laugh and cry   the boy
         Mary makes the boy laugh and cry
         Alsina (1997:222)

     b. La Maria està rient   i   plorant
         the Mary is   laughing and crying
         (Alsina p.c.)

     c. La Maria ha rigut   i   plorat
         the Mary   has laughed and cried
         (Alsina p.c.)

Unfortunately, with these other verb forms, nobody has produced layering
constrasts as clear as those of (45), but one can nevertheless produce ex-
amples that show that the verb forms aren't shared uniformly through a
collection of light verbs:

(51) a. La   vol   anar   acabant
      It.F wants.3sg do-gradually.INF finish.GER
      He wants to be gradually finishing it (e.g., a thesis)

   b. ??La va   volent   acabar
      It.F go.3sg want.GER finish.INF
      He is wanting to finish it

      (Alsina p.c., based on Espunya i Prat (1996:179), modified to
      include clitic-climbing)

(b) is marginal, presumably for semantic reasons, but I think good enough to
make the case that infinitive and gerund marking can appear in either order.

   An area where some substantive revision of the analyses proposed in
AM99 is required is adverb placement. The previous section and the discussion of frequency adverbs in Andrews (1983b) indicate that the ADJUNCTS
attribute is not distributive, while AM99:55 argue in effect that it is (given
the present proposal), on the basis of these examples:

(52) a. He   fet   beure el vi   a contracor   a la Maria.
      I have made drink the wine against x's will to the Mary
      'I have made Mary drink the wine against her/my will.'

   b. Volia   tastar   amb molt d'interès la cuina tailandesa
      I wanted to taste with much interest the cuisine Thai
      'I wanted to taste Thai food with much interest.'
      (with *with much interest* most naturally modifying *want*)

However (52a) is I now think irrelevant to this issue because *a contracor*
could be generated in either the upper or the lower $\overline{\text{V}}$ so as to produce
either of the required readings without issue, and (52b) could presumably be
produced by generating the OBJ (c-structurally a PP, as discussed by Alsina
(1996)) in the upper level, and supplied by distribution to the lower verb,
allowing the adverb to appear at its semantically appropriate level. Further
work will hopefully at some point reveal whether distribution of ADJUNCTS
is sometimes necessary (note that it can in fact always be implemented if
needed, with an explicit sharing equation).

3.3 Linking Theory

Finally, to make this analysis and the following one of Tariana work, we need a linking theory. The problem is caused by the causatives, wherein the 'causee Agent' of the lower verb is realized as a syntactic object of the causative verb. Furthermore, as shown by Alsina (1996:216), the causee Agent cannot be a SUBJ(ect) of the caused verb.[13] This object is an ordinary direct object if the caused verb is intransitive, an 'indirect object' marked by a and expressed by dative clitics if the caused verb is transitive. A further problem is that we can't use classic Lexical Mapping Theory in its original form, since the linking theory needs to apply to syntactically formed combinations of causative light verbs and 'caused' normal ('heavy') ones.

Some Approaches to Linking One possibility would be to invoke some version of the rather sketchy approach to mapping theory suggested in AM99 and Andrews (2007b), but what I will do here is to use the 'Kibort-Findlay' mapping theory (Findlay 2014) as adapted and presented in Asudeh, Giorgolo and Toivonen (2014), henceforth AGT. Not only does this seem able to handle the phenomena considered here adequately, but also supports analyses of a wide range of further phenomena of optional valence and valence change, and furthermore, might be able to make a prediction about possible systems that the AM99 system and its derivatives does not. This requires a certain amount of exposition that is somewhat tangential to the main theme of the paper; people for whom linking theory is not a priority can skip this material on the basis that something workable can surely be devised.

The AGT theory makes use of the semantic projection, which is however somewhat modified from previous glue work so as to have considerably more structure than the traditional semantic projection. In particular, for verbs, there are ARG_i attributes for the semantic values of the arguments, and an EV attribute for a Davidsonian 'event' variable.[14] The Linking theory then equates the ARG_i-values with the semantic projections of grammatical relation values. Although the argument structure/semantic projection is

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[13]Andrews (2007b) adapts Alsina's argument to show that a bizarre artifice which might be used to make a version of such an analysis work in glue will not deliver the correct results.

[14]Although presented as a 'replacement' for argument structure, the proposal could also I think be seen as one of using argument structure as a replacement for the semantic projection.

richer than the traditional semantic projection in LFG, it doesn't have to be a recursive projection of f-structure, since glue semantics can assemble the meanings together by combining references to f-structure and s-structure. With the proposed semantic projection added, (46b) becomes:[15]

(53)
$$\begin{bmatrix} \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'Pro'} \\ \text{PERS} & \text{I} \end{bmatrix} \\ \text{PRED} & \text{'Fer'} \\ \text{OBJ}_{Rec} & \begin{bmatrix} \text{PRED} & \text{'Nen'} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'Pro'} \\ \text{PERS} & \text{III} \\ \text{GEND} & \text{FEM} \end{bmatrix} \\ \left\{ \begin{bmatrix} \text{PRED} & \text{'Acabar'} \\ \text{VFORM} & \text{INF} \\ \left\{ \begin{bmatrix} \text{PRED} & \text{'Llegir'} \\ \text{VMARK} & \text{DE} \\ \text{VFORM} & \text{INF} \end{bmatrix} \right\} \end{bmatrix} \right\} \end{bmatrix}$$

$$\begin{bmatrix} \text{EV} & [\ \ ] \\ \text{ARG}_1 & [\ \ ] \\ \text{ARG}_3 & [\ \ ] \end{bmatrix}$$

$$\begin{bmatrix} \text{EV} & [\ \ ] \\ \text{ARG}_1 & [\ \ ] \end{bmatrix}$$

$$\begin{bmatrix} \text{EV} & [\ \ ] \\ \text{ARG}_1 & [\ \ ] \\ \text{ARG}_2 & [\ \ ] \end{bmatrix}$$
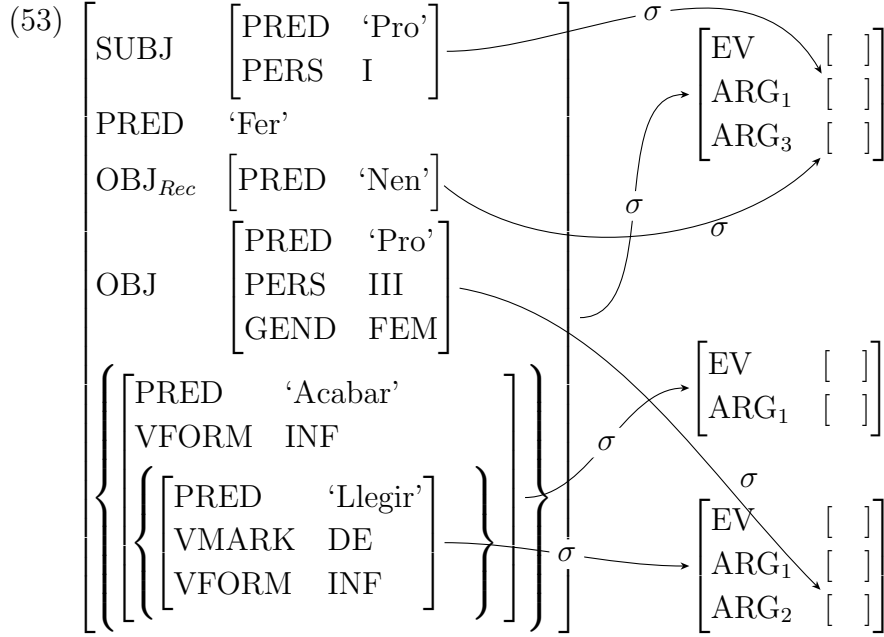
The argument structures and the σ-links between f-structures and outer-level semantic structures are produced by the lexical entries themselves (in AGT, via extensive use of templates), while the links between f-structures and the ARG_i values are produced by linking theory, as to be discussed later. Note that there are no σ-links to the EV-values, although these do play a role in the formulation of the meaning-constructors.

Glue assembly will work over the s-structures and their attributes. We won't consider how the s-structures are produced, but merely assume that they are specified in the lexical entries of verbs; Kibort and Findlay derive them by rules that supply ARG_i values on the basis of the standard LMT feature-specifications $[\pm r]$ and $[\pm o]$ ('restricted' and 'object', respectively).

The constructors we will assume are as below, where we're assuming an 'Agentive' sense of *acabar* 'finish', where it takes an Agentive argument

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[15]AGT also have a REL argument in the semantic projection, which I omit, due to not seeing any function for it here.

and an event. We also won't concern ourself with the innards of the event-semantics structures assumed by AGT, since these play no essential role here. To reduce clutter, we continue to follow the convention that if an σ-structure attribute is notationally accessed from an f-structure, then the σ-projection is automatically inserted. But there is an issue of event semantics we need to deal with, which is the relation between the semantically subordinate and superordinate events, and the nature of the former. Here I take the position that if John finishes writing a paper, there are two events involved, writing the paper (subordinate), and finishing the paper (superordinate), and that the former is existentially quantified. Likewise for causatives. These decisions can be challenged, but hopefully not in ways that vitiate the syntactic analysis and the main features of its relationhip to the semantics:

(54)
$$\lambda yxe.Llegir(e,x,y)\ :\ (\uparrow\text{ARG}_2){\rightarrow}(\uparrow\text{ARG}_1){\rightarrow}(\uparrow\text{EV}){\rightarrow}\uparrow_\sigma$$

$$\lambda Pxe.(\exists e_2)Acabar(e,x,P(e_2,x))\ :\ [(\uparrow\in\text{ARG}_1){\rightarrow}(\uparrow\in\text{EV}){\rightarrow}(\uparrow\in)_\sigma]{\rightarrow}$$
$$(\uparrow\text{ARG}_1){\rightarrow}(\uparrow\text{EV}){\rightarrow}\uparrow_\sigma$$

$$\lambda Pyxe.(\exists e_2)Fer(e,x,y,P(e_2,y))\ :\ [(\uparrow\in\text{ARG}_1){\rightarrow}(\uparrow\in\text{EV}){\rightarrow}(\uparrow\in)_\sigma]{\rightarrow}$$
$$(\uparrow\text{ARG}_3){\rightarrow}(\uparrow\text{ARG}_1){\rightarrow}(\uparrow\text{EV}){\rightarrow}\uparrow_\sigma$$

Note that the σ subscripts could be dispensed with by adopting a further convention that all literals on the glue side designate s-structure locations, but I haven't chosen to do this (as a reminder that we really are using the semantic projection).

Linking GRs   The meaning-constructors will effect glue assembly if we can get grammatical relations assigned to the ARG_i values in a suitable way, so doing this is our next task. There are two questions, the second being the most pressing case of the first:

(55) a. How in general do the grammatical relations get assigned?

   b. How is the alternation between OBJ and OBJ_θ handled for the causative verb, the latter used when the caused verb is transitive, the former when it is intransitive?

For linking, there is also the subsidiary issue of suppressing linking for the ARG_1's of the subordinate verbs.

Considering linking first, we can benefit from the feature of AGT that all linking is optional. That is, any ARG_i-value can fail to get equated with a

GR-value, although if glue assembly requires an input there, the derivation won't work. For example if we fail to link the ARG$_i$ attribute of the *Llegir* constructor of (54) in a simple finite clause, assembly will fail because nothing supplies any meaning fro the argument semantic role.

But in a complex predicate construction, the constructors as formulated in (54) will require the ARG$_1$'s of the subordinate verbs to be suppressed, most straightforwardly by the same logic of obligatory control constructions as presented in Asudeh (2005), with the difference that we are formulating the obligatory control over s-structure rather than f-structure attributes. It is unlikely that a reader with no previous exposure to glue can really understand how this works, but I will try to convey an impression. The presentation will be based on proof nets for derivations where the underlying sequent proof uses only the steps of Axiom and Implication-Left. See Andrews (2010a and 2010b) and the references cited there for a proper presentation. The approach is mathematically equivalent to the ND deduction presentation in Asudeh (2005) and later works such as Asudeh (2012), which is, however, I think, a bit harder to apply to these particular cases.

Consider first the assembly of the meanings of *Acabar* and *Llegir* in (53). The glue side of *Llegir* and the first argument glue term of *Acabar* (for the sub-event argument) are (a) and (b) below:

(56)   a.   *Llegir* $(\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

       b.   *Acabar* subev $[(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma]$

The sequence of implications in (a) is a right-branching stack of (linear) implications in accord with the convention of omitting rightmost parentheses, so that all but final '$\uparrow_\sigma$' term are antecedents of such conditionals, and correspond intuitively to 'input ports' where content provided by an argument is to be supplied, while the final term '$\uparrow_\sigma$' is an 'output port' that provides content, either to some containing structure or as the final interpretation of the structure. In a 'complex argument' (one consisting of an implication) the input-output 'polarities' are reversed, and because of the f- and s- structure relations, the '$(\uparrow \in ARG_1)$' in (b) designates the same location in the f-structure as the '$(\uparrow ARG_1)$' in (a), so that the former can be plugged into the latter (and thought of intuitively as supplying a bound variable to it).

We can represent the argument-satisfier relations by running directed links from the satisfiers to the argument-positions that they satisfy:

(57) a. *Llegir* $(\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

   b. *Acabar* subev $[(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma].$

This partial assembly will become a completely satisfied event argument for *Acabar* if we plug something into the ARG_2 position of *Llegir*. Expanding (b) to the full meaning-side for *Acabar* we get:

(58) a. *Llegir* $(\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

   b. *Acabar* $[(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma] \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

This has two open argument positions of the kind supplied by NPs, plus the event argument that would normally be bound by existential quantifiers associated with tense-markers (assuming event semantics, in line with AGT). We can fill the open ARG_1 with an NP argument, but another possibility is to stick the whole thing under the causative meaning-constructor for *Fer*:

(59) a. *Llegir* $(\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

   b. *Acabar* $[(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma] \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

   c. *Fer* $[(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma] \rightarrow$
              $(\uparrow ARG_3) \rightarrow (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma$

The top line of *Fer* hooks up with the unfilled arguments of *Acabar* in the same way that the former does with *Llegir*, so that the completed assembly now has three ARG_i's and one EV to deal with; the latter is to be managed by TAM marking, not considered here, so we procede onward to the ARG_i's.

In general, in Romance languages, we can say that ARG_1 is expressed as/satisfied by a bearer of SUBJ,[16] ARG_3 by a bearer of OBJ_{Rec}, always expressed as an *a*-PP, and ARG_2 by either SUBJ or OBJ. AGT accomplishes this with a collecton of 'universal mapping equations' associated with lexical entries. Thanks to distribution, if we add an equation such as:

(60) $(\uparrow ARG2) = (\uparrow SUBJ|OBJ)$

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[16]Or an oblique, for passives, but we will leave that out here.

to the lexical entry of *Llegir* (keep in mind our convention for supplying σ), the GF will be shared across all the levels of a structure such as (53), and in a nonpassive structure, if there is an ARG_1 in the same domain of sharing, that will have to be equated to SUBJ, so that OBJ will be the only choice for the ARG_2.

This however leaves us with the problem of why the Causee object is expressed as an OBJ_θ only when the caused verb is transitive:

(61) L'/*Li   he   fet   cantar
      Him(ACC/*DAT) I-made sing

This is our next topic.

ARG_3 alternations One applicable idea, accepted by both Findlay and AGT, is that in a completed f-structure, the highest grammatical function on the following hierarchy, due to Kibort, must be used (the ranking is based ultimately on the number of marked feature values in the feature decomposition of the grammatical functions):

(62) $SUBJ > OBJ, OBL_\theta > OBJ_\theta$

Unfortunately, neither Findlay nor AGT make a specific proposal as to how this is to be formalized in LFG, and, since we need to apply the principle in the syntax rather than just the lexicon, this is not a problem that can be safely overlooked.

I think this might be a case where the best analysis might be in terms of an optimality ranking principle which marks a structure as bad if there is another semantically and pragmatically equivalent structure differing only in that a given GR is replaced by one higher on the hierarchy. English would have no discourse role for a structure where an ARG_2 is expressed as an OBJ, so expressing such an argument as SUBJ is obligatory if possible. Languages with positional unaccusativity, such as Icelandic or Italian, on the other hand, do seem to have such a role, associated with introducing new entities so as to explain the Definiteness Effect, and perhaps other things). *Fer* will therefore have two completely homosemous options for its Causee Agent argument, ARG_2 and ARG_3, with the optimality principle therefore requiring the former when this is possible, which will not be the case when the Caused verb is transitive.

Fer (and other causative and permissive verbs in other languages that show similar behavior) will be unusual in allowing either ARG_2 or ARG_3

for the Causee Agent, while most arguments of most verbs are specified for one or the other (at least partially on semantic grounds), ordinary Romance transitives having ARG_2, the 'semitransitives' with a-objects having ARG_3.

A Problem and Possible Prediction The AGT approach we have presented however runs into an apparent problem with certain kinds of causative systems, such as the Bantu ones widely discussed by Marantz, Baker, Alsina and many others. A typical example is Chi-Mwiini from Manning and Sag (1998). Here there is a causative construction where the Causee Agent of a transitive verb becomes the direct object, subject to passivization, while the Caused Patient does not, but would appear to be some kind of 'second object':

(63) a. Mwa:limu wa-aṇḍik-ish-ize   wa:na   xaṭi
         teacher   SP.OP-write-CAUSE-ASP children letter
         The teacher made the children write the letter

    b. Wa:na   wa-aṇḍik-ish-iz-a: xaṭi   na mwa:limu
       children SP-write-CAUSE-PASS-ASP letter by teacher
       The children were made to write a letter by the teacher

    c. *Xaṭi aṇḍika-ish-izpa   wa:na   na mwa:limu
       letter SP-write-CAUS-PASS-ASP children by teacher

Manning and Sag show that the Causee Agent here has some 'logical subject' properties, indicating that it has the argument structure properties of an ARG_1 in AGT, and analyse the construction (and many others in other languages) using the list-based conception of argument structure that was also employed in AM99, while it is not so clear what the solution in AGT would have to be. One possibility, from which a prediction might be extracted, is that the Caused Theme/Patient argument of a lexical causative can be something like an ARG_4 rather than an ARG_2; if this option were made unavailable for nonlexical cauasatives, then grammatical relation assignment of (63a) would be unavailable for Romance-style causatives. This is consistent with what is known to me, although Tariana as discussed in the next section constitutes a near miss.

3.4 Conclusion

We thus have an account of Romance complex predicates that theoretically integrates well with the previous discussion of scoping adjectives, and can also do a reasonable job with other phenomena considere in AM. There is however a serious competitor, the 'pure glue' analysis of Lowe (2016). Lowe provides a comprehensive and cogent critique of all previous LFG analyses of complex predicates, including AM and Andrews (2007b), and proposes an alternative that works well except for one thing, not handling concentricity and 'respect the tree' constraints. The present paper can be seen as the placing of a wager that these constraints are fundamental and need to be catered for by the basic architecture of the theory, rather than by addons to a theory that doesn't have some kind of equivalent in f-structure to the nesting in c-structure. It remains to be seen whether this bet will prove to be the winner. Now we move on to Tariana, which, we claim, has essentially the same kind of glue analysis, with rather different c- and f- structures.

4 Tariana

Tariana is an Arawak language described by Aikhenvald (2003), henceforth Aikh2003, whose serial verb constructions (SVCs) were a major topic of AM99 (on the basis of a number of papers and personal communications; the grammar does not change the relevant parts of the landscape in any significant way). Aikhenvald distinguishes on mostly semantic grounds a rather large number of SVC types, of which AM99 was and this paper will be concerned with only a few: 'symmetric', and certain 'asymmetric' SVCs including 'modal' and 'causative'.

4.1 Types of Serialization

Symmetrical serialization is defined by Aikh2003:424 as consisting of two or more open class verbs, where none of the components is uniquely responsible for determining the semantic or syntactic properties of the construction, but rather all are on an equal footing. A typical example is:

(64) ma [wa-wa wa-dana] wa-yarupe=nuku
let's 1PL-read/play 1PL-write 1PL-thing=TOPIC
'Let's read and write up our language!' (Aikhenvald p.c.)

AM99 treat these as being essentially a kind of coordinate structure, and applying the syntactic LFG analysis of Dalrymple and Kaplan (2000) to them as coordinated verbs doesn't appear to create any problems. One thing that should be noted however is that they tend to pick up lexicalized, idiomatic interpretations. But this is generally rather common for coordinated lexical items; *Susan dragged John kicking and screaming to the phone to make the call* does not imply that John was literally doing these things, only demonstrating some kind of reluctance.

More unusual are the 'asymmetric' SVCs, many with the semantics of (VP) complement constructions, whose striking feature is that all of the verbs show person and number agreement with the syntactic subject of the clause, regardless of the semantic role that that argument bears to them (this phenomenon is called 'concordant dependant inflection' (Durie 1997)):

(65) ka:ru-ka   nuha [nu-a=mahka   nu-hyã=niki]
     fear-DECL I   1SG-give=RECPAST:NONVIS 1SG-eat=COMPLT
     piri=nuku   di-a=pidana
     2SG.son=TOPIC 3SGNF-say-REMPAST:INFR
     'Being afraid, I let (the fish) eat your son, he said.'
     (asymmetrical SVC, causative semantics, Aikh2003:425)

Another example, revealing at least some capacity for recursive combination, is:

(66) nu-na=tha   nu-ra   nu-sata dineiru
     1SG-want=FRUSTR 1SG-order 1SG-ask money
     'I want to order (him) to ask for money.'
     (Modal on Causative; elicited, Aikhenvald p.c.)

These two types seem to need somewhat different treatment, but building the f-structures with set-membership will cause the grammatical relations to share/distribute fully, accounting for the agreement pattern.

4.2 C- and F-structure

For the asymmetric constructions, following the grain of AM99, the obvious thing to do would be to characterize the semantically subordinate member of an asymmetric SVC as a member, and the other as a top-level head. On

the one hand, there is no real evidence for this treatment of the semantic head. In particular, there doesn't appear to be any general structural fact about the relative positions of the semantic head and complement (putative set member), which instead seems to be determined by the individual verbs, mostly in accordance with semantic groupings. So for some verbs, such as the ones we've seen so far, the semantically head comes first, the other second; for others, the order is reversed:

(67) tuiRi-kere na-hwa nema
　　 bird-island 3PL-stay 3PL.stand
　　 'They stayed at Bird Island for a long time.'
　　 (Aspectual; Aikhenvald 1999:480)

Aikhenvald argues very plausibly that the ordering restrictions are based on iconicity of the historical word orders of the constructions, although synchronically just facts, and introducing only one of them as a member doesn't seem to add anything to this explanation. But neither does it cause any problems, and, furthermore, it allows the meaning-constructors to be slightly simpler than if both are members. Therefore we will adopting it, but also allow the other later for symmetric SVCs.

　　 Therefore, the proposed annotated c-structure rule for SVCs is:

(68) V　　 →　　 (V)*
　　　　　　　　 <↓ ∈ ↑>

In the first place, we interpret this expansion of V as an alternative to lexical insertion, which produces simple verbs. A constraint against unfilled nodes will then block an empty expansion of the (V)*, and glue semantics together with the Offline Parseability Constraint will then require that at least two V's are produced.[17]

　　 These can then appear with various combinations of the ↑ = ↓, annotation, which we take to be present by default if nothing else is specified, and ↓ ∈ ↑. This analysis will extend to symmetric serializations, which we can assume to have all their members introduced with the set-member annotation. But the rule (68) overgenerates substantially, and so needs to be constrained by glue.

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[17]If one is produced with out the annotation, it will be ruled out by Offline Parseability, if one is produced with the annotation, the glue semantics won't be able to effect assembly.

4.3 Glue Analysis

The symmetric constructions can be treated essentially as coordinate structures, in one of two ways, either by a schema along lines similar to the one proposed above for iterative adjectives, or with a seed constructor and conjunct-adders as proposed for English coordinate VPs by Asudeh and Crouch (2002). I think the details in either approach are not very interesting, and able to be provided by anybody capable of making sense out of an exposition, so I will omit them.

Moving on to the asymmetric constructors, we find that in spite of the differences in syntax, the meaning-constructors can be exactly as they are in Romance, since the 'semantic complement' is specified as a member, and the NP arguments are associated with s-structure ARG-attributes. We illustrate with a simple example with an intransitive light verb, effects of linking theory not yet represented:

(69) a. [wa-Rapa   wa-thaka] wha
         1PL-dance 1PL-stop we
         We stopped dancing for a while
         (Aspectual; Aikhenvald 2003:433)

b.
$$\left[\begin{array}{l} \text{SUBJ} \left[\begin{array}{ll} \text{PRED} & \text{'Pro'} \\ \text{PERS} & \text{I} \\ \text{NUM} & \text{PL} \end{array}\right] \\ \left\{\left[\text{PRED}\quad\text{'Rapa'}\right]\right\} \\ \text{PRED}\quad\text{'Thaka'} \end{array}\right] \quad \begin{array}{l}\left[\begin{array}{ll}\text{EV} & [\ \ ] \\ \text{ARG}_1 & [\ \ ]\end{array}\right] \\[2em] \left[\begin{array}{ll}\text{EV} & [\ \ ] \\ \text{ARG}_1 & [\ \ ]\end{array}\right]\end{array}$$

The relevant constructors will be as below, closely following those of (54)

(70) $\lambda yxe.Rapa(e,x,y)\ :\ (\uparrow\text{ARG}_1)\rightarrow(\uparrow\text{EV})\rightarrow\uparrow_\sigma$
    $\lambda Pxe.(\exists e_2)Thaka(e,x,P(e_2,x))\ :\ [(\uparrow\in\text{ARG}_1)\rightarrow(\uparrow\in\text{EV})\rightarrow(\uparrow\in)_\sigma]\rightarrow$
         $(\downarrow\text{ARG}_1)\rightarrow(\uparrow\text{EV})\rightarrow\uparrow_\sigma$

These will assemble the same way, and linking can work in the same way, as it does in Romance.

For causatives, however, although the glue is the same, there is an apparent, but not, I claim, an actual difference in the linking. The apparent

difference is that causatives take what might be seen as two objects, both in the 'accusative' case (Aikh2003:275):

(71) na-na   wa-yaRuphe-nuku   [ma-sape-kade-ka
     3pl-OBJ our-language-TOPIC.NON.A/S [NEG-speak-NEG-RECP.VIS
     na-pala]
     3pl-put]
     She did not teach them our language

-na here marks pronominal non-subjects, while *-nuku* marks non-subject topics, both applying to both the theme and recipient of a ditransitive verb. The location of the negative in the SVC is also interesting, but I won't pursue that here. The problem is that it looks like we might have two objects, both the Caused Patient/Theme and the Causee Agent.

But this is not clearly motivated, because Tariana has apparent double object constructions where the Theme appears to acquire the object properties, even though the Recipient looks the same (Aikh2003:236-238, 143-148). An example is:

(72) na-na   kuphe-nuku   di-walita
     3pl-OBJ fish-TOPIC.NON.A/S 3sg-offer
     He offered them fish

But only the theme can be passivized (Aikh2003:236, 259), indicating that given AGT, it is ARG$_2$ linked to OBJ. But then the Recipient will be ARG$_3$ realized as OBJ$_\theta$, which lacks overt properties clearly distinguishing it from OBJ.

But if our analysis here together with the proposal in 3.3 are basically correct, we do get a prediction, which is that if passivization can apply at all to the causatives, only the Caused Object, not the Causee Agent, will be able to be passivized. Aikhenvald's grammar does not indicate whether causatives can be passivized, so this is a genuine prediction rather than a retrodiction of previously known facts from theoretical ideas devised later.

A further, somewhat unsettling, consequence of the framework that this analysis reveals that 'concordant dependent inflection' is actually what is expected if the caused verb in a clause union construction is of the same morphological type, e.g. 'finite', as a main verb. That is, the only reason that the subordinate verbs in Romance don't show person-number agreement with the grammatical subject of the whole construction is that they are 'non-finite'

rather than 'finite'. Since concordant dependent inflection does not seem to be especially common, this is something that needs closer investigation. Although this is expected in a clause union analysis, there are possible ways around it, such as with an undersharing specification for SUBJ. If such specifications occur, because they are essentially stipulative in terms of the formal theory, we should expect them to have some other explanation, such as a historical origin from a nonfinite structure, as is the case for Romance.

4.4   Linear Order

But, beyond the differences in c-structure and verb marking, there is a further difference between Romance and Tariana, which is the need for some way to express the verb-order restrictions in Tariana, which plausibly involve iconicity as their diachronic explanation, but are synchronically just facts that have to be stated. Our asymmetric c- and f-structures make it slightly easier to state the restrictions. These are stipulative, but this can be regarded as not a problem, because each appearance of one of these verbs indicates what the order should be (and the principles of Bayesian/MDL language learning (Chater et al. 2015) and other works) imply that having one order is better than having two, since it permits a better 'data score'/higher probability of the data given the (slightly more complicated) grammar, if there are a reasonable number of examples of the verb.

I propose that a reasonable way to formulate the constraint is with a constraining equation with a universal quantifier, using inverse projections to refer to linear order. For a verb like *thaka* that follows its semantic complement, what we want is that if a c-structure node's f-structure correspondent is a member of the set component of *thaka*'s f-structure, then it precedes the c-structure node that *thaka* is introduced under. '$\hat{*}$' is a standard notation for the c-structure node that a lexical item is introduced under, and we can use $\phi(c), \phi(\hat{*})$ to represent the f-structure correspondent of an arbitrary c-structure node c and $\hat{*}$, respectively, leading to:

(73) $\phi(c) \in \phi(\hat{*}) \Rightarrow c << \hat{*}$

This will be part of the lexical entry of verbs that come after their semantic complements in an SVC, while those that come before will be the same but with the orderng statement of the consequent of the conditional reversed.

Now we move on to Misumalpan, where we turn out not to have to use any unusual attribute-sharing at all, but can do it all with glue.

5 Misumalpan

For Romance and Tariana, we have essentially implemented the substance of AM99 in a more conservative framework using the same ideas, but our treatment of Misumplan (Miskitu and Sumu) will quite different: AM99 analysed these languages with a rather extreme use of projections, which glue can effectively eliminate.

Relevant examples from Miskitu are:[18]

(74) a. [Yang yul ba ra   yab-ri]   wîna pi-n
        I   dog the ACC give-OBV:ACT.1 meat eat-PAST.3
        'I made the dog eat meat.' (MCD:29)

    b. [Yang yul ba ra   yab-ri]   wîna pi-ras
        I   dog the ACC give-OBV:ACT.1 meat eat-NEG
        'I didn't make the dog eat meat.' (MCD:29)

In these examples, the superficial form is that of a 'consecutive' structure, where the bracketted material is a morphosynactically subordinate clause indicating what happens first, and the remaining material looks like a main clause, saying what happens next.
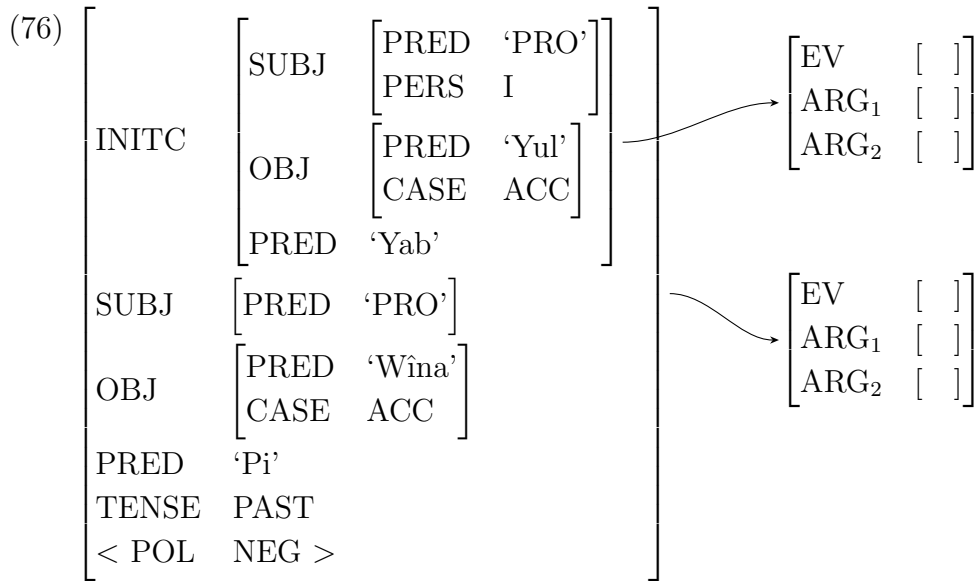
But the semantics of these constructions are different, and essentially causative. In particular, the negative applies not to the final result: (b) does not mean that I caused the dog to not eat meat, but rather to the entire proposition that I made the dog eat meat. The substantive semantics can be plausibly described in with the Wierzbickian DO (TO), BECAUSE OF and AFTER semantic primes, roughly and schematically, as follows:

(75) X did something to Y (I did something to the dog)
     because of this, after this, something happened (the dog ate meat).

In formal terms, we can use the usual three-place causative predicate, but the connection to the syntactic structure will have to be unusual.

For the morphology to work, we would appear to want the first clause to be the value of some grammatical function, which we'll call INITC (Initial Clause), with the second being the main clause:

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[18]AM99:83, based on work by Ken Hale and Danilo Salamanca.

(76)

$$
\begin{bmatrix}
\text{INITC} & \begin{bmatrix}
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'PRO'} \\ \text{PERS} & \text{I} \end{bmatrix} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'Yul'} \\ \text{CASE} & \text{ACC} \end{bmatrix} \\
\text{PRED} & \text{'Yab'}
\end{bmatrix} \\
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{'PRO'} \end{bmatrix} \\
\text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'Wîna'} \\ \text{CASE} & \text{ACC} \end{bmatrix} \\
\text{PRED} & \text{'Pi'} \\
\text{TENSE} & \text{PAST} \\
< \text{POL} & \text{NEG} >
\end{bmatrix}
\quad
\begin{bmatrix} \text{EV} & [\ ] \\ \text{ARG}_1 & [\ ] \\ \text{ARG}_2 & [\ ] \end{bmatrix}
\quad
\begin{bmatrix} \text{EV} & [\ ] \\ \text{ARG}_1 & [\ ] \\ \text{ARG}_2 & [\ ] \end{bmatrix}
$$

From a traditional perspective, this seems like a rather poor prospect for semantic interpretation, but glue can manage it far more deftly than AM99 realized.

In the first place, there does not appear to be obligatory control between the arguments. In particular, we don't seem to want anything to enforce identity or coreference between the object of the Cause verb and the subject of the Effect verb (AM99:99-100). For example Bittner (1998:64-65) shows that there can be a variety of relationships between the Causee Object or its possessor, and some argument in the caused clause:

(77) a. Upla   kumi sin   mai   mun-an   yul mai
       person one   'also' you(OBJ) cause-OBJ:ACT.3 dog you(OBJ)
       sam-ras   kan
       bite-NEG PAST.3
       Noone will cause you to be bitten by the dog
       (Causee object = caused object)

   b. Witin upla   kumi sin yula (ra)   pruk-an   law-ras
      he   person one   his dog (ACC) hit-OBV:3 get.angry-NEG
      kan
      PAST.3
      He didn't get anyone angry by hitting his$_i$ dog (Possessor of causee
      object = caused subject)

45

In these examples, the fact that the subject of the first clause is within the scope of the negative marker indicates that this is a causative rather than a consecutive structure. Furthermore, AM99:100 note an example from Sumu where there is no coreference at all:[19]

(78) Kârak   ârasyang   dai, yang alas âranayang
     he.laugh.OBV.3 laugh.NEG.1 PAST I   self laugh.PAST.1
     He didn't laugh me into laughing; I laughed by myself

Note that the obviatively marked verb is intransitive in the Sumu original, in spite of being rendered transitively in the free English translation. So AM99 conclude that there is no formal control or coreference requirement, but only a tendency, deriving from a requirement for a causal relationship.

Therefore the arguments can all be realized independently as NPs, with the further consequence that the Causee Agent does not have to be an ARG_3, but can be an ARG_2, and that is what it in fact appears to be.[20] A rather simple meaning-constructor suffices:

(79) $\lambda Pyz.Cause(P)(y)(x)$: $(\text{INITC}\uparrow)_\sigma \rightarrow (\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (\text{INITC}\uparrow)_\sigma$

Its mode of application is similar to that of a sentence-adverbial such as *apparently*, although it manages arguments that appear in its own clause. For both of the clauses, virtually any contemporary linking theory will suffice.

There is one interesting issue which the present literature does not entirely settle, as far as I am aware, which concerns the scope of negation. If we assume that the causative verb takes an argument of type p, which the caused verb provides, we predict an ambiguity in examples such as (78) and (74b), which apparently does not occur. This is a *prima facie* problem for the glue analysis, for which a possible solution would be to use more types. For example if the causatives complements were of an 'Event' type, and the negation only applied to 'Propositions', the scopes would be restricted as stated in the literature. On the other hand, there are some potential examples that could use further investigation. Causation of a negative might be semantically suspicious and therefore rejected, but permissive verbs also occur in the causative construction:

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[19]From an undated 'miscelleneous causative data' handout compiled by various people including especially Danilo Salamanca, and distributed by Ken Hale.

[20]Note that because the Miskitu accusative case-marker *ra* is highly multifunctional, also marking various kinds of obliques, it is the possibility of object agreement with the verb that indicates ARG_2 status of the Causee Agent.

(80) Witin yang ra   ai swi-n   skul   ra   wa-ri
     he   me   ACC me let-OBV:ACT.3 school ACC go-PAST.1
     He let me go to school

Nobody appears to have investigated whether negation of the caused verb
here could produce the meaning 'he let me not go to school'. So there is a
margin of doubt about the nature of the facts here, and whether a distinc-
tion between p and ev types is truly required (although, this is very useful
elsewhere, and, I would guess, probably correct here).

6   Conclusion

We have seen that a considerably more restrained use of attribute-sharing,
independently motivated for the analysis of coordinate structures, can be
combined with a more intensive use of glue semantics to capture the major
analysis of AM. The basic ideas are essentially the same as those of AM,
but the required changes to the LFG framework from the presentation of
Dalrymple (2001) are far less, essentially nothing more than the addition of
undersharing to the concept of distributivity. Classic LFG analyses would
furthermore require less revision, although more than is required for the
framework itself. We also find a high degree of compatibility with the recent
linking theory of AGT, which supports LFG analysis of a very wide range
of phenomena beyond the complex predicate structures we have examined
here, and, furthermore, generates a typological prediction about grammatical
relation change in complex predicates.

However there is another issue, the status of classic (negative) restric-
tion as proposed by Kaplan and Wedekind (1993). Should this be aban-
doned or delimited? I think abandonment would be premature, but I sug-
gest that restriction be limited to situations where the two partially identi-
fied f-structures do not have any containment relation in c-structure. This
would rule it out for all the constructions discussed here, with the result that
iofu will work for them without issue, but it might still be used for situ-
ations where there is extensive property-sharing between constituents that
are not related by a containment relationship, such as pronouns and their
antecedents.

The exclusion of this kind of restriction from phrase-structure rules such
as those involved with our complex predicate constructions could be achieved
with a constraint requiring that if there is a downward c-structure path from a

node A to a node B, there must also also a downward f-structure path. This is a very natural condition to impose, and excludes some rather odd configurations such as daughters who take their mothers as f-structure attribute-values but not vice versa.

References

Aikhenvald, A. Y. 1999. Serial verb constructions and verb-compounding in Tariana. *Studies in Language* 23:469–497.

Aikhenvald, A. Y. 2003. *A Grammar of Tariana*. Cambridge University Press.

Aissen, J., and D. M. Perlmutter. 1976. Clause reduction in spanish. In *Papers from the Second Annual Meeting of the Berkely Linguistic Society*, 1–30.

Alexiadou, A., L. Haegeman, and M. Stavrou. 2008. *Noun Phrase in the Generative Perspective*. De Gruyter.

Alsina, A. 1996. *The Role of Argument Structure in Grammar*. Stanford, CA: CSLI Publications.

Alsina, A. 1997. A theory of complex predicates: Evidence from causatives in Bantu and Romance. In A. Alsina, J. Bresnan, and P. Sells (Eds.), *Complex Predicates*, 203–246. Stanford, CA: CSLI Publications.

Andrews, A. D. 1983a. Constituent coordination in LFG. unpublished ms, The Australian National University. on the LFG archive at: `https://www.essex.ac.uk/linguistics/external/LFG/www-lfg.stanford.edu/pubs/papers/andrews/andrews-1983-0700.pdf`.

Andrews, A. D. 1983b. A note on the constituent structure of modifiers. *Linguistic Inquiry* 14:695–7.

Andrews, A. D. 2001. Noncanonical A/S marking in Icelandic. In A. Y. Aikhenvald, R. Dixon, and M. Onishi (Eds.), *Non-Canonical Marking of Subjects and Objects*, 86–111. Benjamins.

Andrews, A. D. 2007a. Generating the input in OT-LFG. In J. Grimshaw, J. Maling, C. Manning, and A. Zaenen (Eds.), *Architectures, Rules, and Preferences: A Festschrift for Joan Bresnan*, 319–340. Stanford CA: CSLI Publications. URL: `http://AveryAndrews.net/Papers` (Recent Publications (Refereed)).

Andrews, A. D. 2007b. Glue semantics for clause-union complex predicates. In M. Butt and T. H. King (Eds.), *The Proceedings of the LFG '07 Conference*, 44–65. Stanford CA: CSLI Publications. Retrieved November 15, 2010, from `http://cslipublications.stanford.edu/LFG/12/lfg07.html` (accessed Feb 19, 2010).

Andrews, A. D. 2008. The role of PRED in LFG+glue. In M. Butt and T. H. King (Eds.), *The Proceedings of the LFG '08 Conference*, 46–76. Stanford CA: CSLI Publications. `http://cslipublications.stanford.edu/LFG/13/lfg08.html` (accessed 19 Feb 2010).

Andrews, A. D. 2010a. 'Grammatical' vs. 'lexical' meaning constructors for glue semantics. In Y. Treis and R. D. Busser (Eds.), *Selected Papers from the 2009 Conference of the Australian Linguistic Society*. The Australian Linguistic Society. URL: `http://www.als.asn.au/proceedings/als2009.html`, also `http://arts.anu.edu.au/linguistics/People/AveryAndrews/Papers` (Recent Publications (Refereed)).

Andrews, A. D. 2010b. Propositional glue and the correspondence architecture of LFG. *Linguistics and Philosophy* 33:141–170.

Andrews, A. D., and C. D. Manning. 1993. Information-spreading and levels of representation in LFG. Technical Report CSLI-93-176, Stanford University, Stanford CA. `http://nlp.stanford.edu/~manning/papers/proj.ps` (accessed 19 Feb 2010).

Andrews, A. D., and C. D. Manning. 1999. *Complex Predicates and Information Spreading in LFG*. Stanford, CA: CSLI Publications.

Asudeh, A. 2005. Control and resource sensitivity. *Journal of Linguistics* 41:465–511.

Asudeh, A. 2012. *The Logic of Pronominal Resumption*. Oxford University Press.

Asudeh, A., and R. Crouch. 2002. Derivational parallelism and ellipsis parallelism. In L. Mikkelsen and C. Potts (Eds.), *WCCFL 21 Proceedings*, 1–14, Somerville MA. Cascadilla Press. Retrieved November 15, 2010, from `http://http-server.carleton.ca/~asudeh/research/index.html`.

Asudeh, A., G. Giorgolo, and I. Toivonen. 2014. Meaning and valency. In *Proceedings of the LFG14 Conference*, 68–88. CSLI Publications.

Bittner, M. 1998. Concealed causatives. *Natural Language Semantics* 7.

Bresnan, J. W. (Ed.). 1982. *The Mental Representation of Grammatical Relations*. Cambridge MA: MIT Press.

Bresnan, J. W., A. Asudeh, I. Toivonen, and S. Wechsler. 2016. *Lexical-Functional Syntax*. Blackwell. second edition.

Bresnan, J. W., R. M. Kaplan, and P. Peterson. 1985. Coordination and the flow of information through phrase structure. Unpublished ms.

Butt, M., M. E. Niño, and F. Segond. 1996. Multilingual processing of auxiliaries within LFG. In D. Gibbon (Ed.), *Natural Language Processing and Speech Technology*. Berlin: Mouton de Gruyter.

Chater, N., A. Clark, J. A. Goldsmith, and A. Perfors. 2015. *Empiricism and Language Learnability*. Oxford University Press.

Cinque, G. 1994. On the evidence for partial N-movement in the Romance DP. In G. Cinque, J. Koster, J.-Y. Pollock, L. Rizzi, and R. Zanuttini (Eds.), *In Paths towards Universal Grammar: Studies in Honor of Richard S. Kayne*, 85–110. Washington DC: Georgetown University Press.

Cinque, G. 2010. *The Syntax of Adjectives, a Comparative Study*. Cambridge MA: MIT Press.

Dalrymple, M. 2001. *Lexical Functional Grammar*. Academic Press.

Dalrymple, M., and R. M. Kaplan. 2000. Feature indeterminacy and feature resolution. *Language* 76:759–798.

Durie, M. 1997. Grammatical structures in verb serialization. In *Complex Predicates*. Stanford CA: CSLI Publications.

Espunya i Prat, A. 1996. *Progressive Structures in English and Catalan*. PhD thesis, Universitat Autònoma de Barcelona, Barcelona.

Findlay, J. 2014. Mapping theory without argument structure. Available on `academia.edu` (Mar 2015).

Jackendoff, R. S. 1977. $\overline{X}$-*syntax*. MIT Press.

Johnson, M. 1991. Features and formulae. *Computational Linguistics* 17:131–151.

Kaplan, R., and J. Bresnan. 1982. Lexical-Functional Grammar: a formal system for grammatical representation. In J. Bresnan (Ed.), *The Mental Representation of Grammatical Relations*. Also in Dalrymple *et al.* (eds) 1995 *Formal Issus in Lexical-Functional Grammar*.

Kaplan, R., and M. Dalrymple. 2000. Feature indeterminacy and feature resolution. *Language* 76:759–798.

Kaplan, R. M., and J. T. Maxwell. 1988. Constituent coordination in lexical-functional grammar. In *Proceedings of COLING-88, vol I.* also in Dalrymple, Kaplan, Maxwell and Zaenen (1995), pp 199-210.

Kaplan, R. M., and J. Wedekind. 1993. Restriction and correspondence-based translation. In *Proceedings of the Sixth European Converence of the Association for Computational Linguistics*, Utrecht. Available at: `ftp://parcftp.xerox.com/pub/nl/restricton.ps`.

Kaplan, R. M., and A. Zaenen. 1989. Long-distance dependencies, constituent structure and functional uncertainty. In M. Baltin and A. Kroch (Eds.), *Alternative Conceptions of Phrase-Structure*, 17–42. Chicago: Chicago University Press. also in Dalrymple, Kaplan, Maxwell and Zaenen (1995:137-165).

Kasper, R. 1995. Semantics of recursive modification. paper originally delivered at HPSG Workshop Tuebingen, June 1995. `http://www.essex.ac.uk/linguistics/clmt/papers/hpsg/` (accessed 19 Feb 2010).

Kim, J.-Y., Y. A. Lander, and B. H. Partee (Eds.). 2005. *Possessives and Beyond*. Vol. 29 of *University of Massachussetts Occasional Papers in Linguistics*. University of Massachussetts GSLA.

Lowe, J. 2016. Complex predicates: an LFG+glue analysis. *Journal of Language Modelling* 3:413462.

Manning, C. D. 1996. Romance complex predicates: In defence of the right-branching structure. paper presented at the Workshop on Surfaced-Base Syntax and Romance Languages, 1996 European Summer School on Logic, Language and Information, Prague. Draft available at URL: `http://nlp.stanford.edu/~manning/papers/`.

Manning, C. D., and I. A. Sag. 1998. Argument structure, valence, and binding. *Nordic Journal of Linguistics* 21:107–144.

MCD. undated. Misumalpan Causatives Data handout, collected from various sources and distributed by Ken Hale.

Morrison, A. 2014. An LFG approach to adjectival modification: accounting for English and Indonesian. Honours Thesis, The Australian National University, Canberra.

Neeleman, A. 2016. PP-over-V meets Universal 20. URL: `http://lingbuzz.auf.net/lingbuzz/002894`.

Nordlinger, R. 1998. *Constructive Case*. Stanford CA: CSLI Publications.

Nordlinger, R., and L. Sadler. 2008. From juxtaposition to incorporation: an approach to generic-specific constructions. In M. Butt and T. King (Eds.), *Proceedings of the LFG Conference, Stanford, August 2009*. Stanford, CA: CSLI Publications. `http://csli-publications.stanford.edu/LFG/13/lfg08toc.html` (accessed 19 Feb 2010).

Ouwayda, S. 2013. Where plurality is: agreement and DP structure. In S. Keine and S. Sloggett (Eds.), *Proceedings of NELS 42*. Amherst MA: GLSA Publications. URL: `http://www-scf.usc.edu/~ouwayda/download.htm`.

Partee, B. 2010. Privative adjectives: Subsective plus coercion. In R. Bäuerle, U. Reyle, and T. E. Zimmermann (Eds.), *Presuppositions and Discourse: Essays offered to Hans Kamp*, 273–285. Bingley UK: Emerald Group Publishing.

Pesetsky, D. 2013. *Russian Case Morphology and the Syntactic Categories.* Cambridge MA: MIT Press.

Rizzi, L. 1978. A restructuring rule in Italian syntax. In S. J. Keyser (Ed.), *Recent Transformational Studies in European Languages*, 115–158. MIT Press. republished as Chapter 1 in Rizzi (1982).

Sharp, J. 2004. *Nyangumarta: A language of the Pilbara Region of Western Australia.* Canberra: Pacific Linguistics.

Smith, P. W. 2015. *Feature Mismatches: Consequences for Syntax, Morphology and Semantics.* PhD thesis, University of Connecticut, Storrs CN.

Velegrakis, N. 2011. *The Syntax of Greek Polydefinites.* PhD thesis, University College London, London. URL: `iscovery.ucl.ac.uk/1302548/1/1302548.pdf`.

Wechsler, S. 2004. Number as person. In O. Bonami and P. C. Hofherr (Eds.), *Empirical Issues in Syntax and Semantics 5 (on-line Proceedings of the Fifth Syntax And Semantics Conference In Paris)*, 255–274. Retrieved November 15, 2010, from `http://www.cssp.cnrs.fr/eiss5/` and `http://uts.cc.utexas.edu/~wechsler/NumberAsPerson.pdf`.

Wechsler, S., and L. Zlatić. 2003. *The Many Faces of Agreement.* Stanford, CA: CSLI Publications.

Williams, E. 1982. The NP cycle. *Linguistic Inquiry* 13:277–295.

Yang, C. 2016. Rage against the machine. URL: `http://ling.auf.net/lingbuzz/002933`.