

Sets, Heads and Spreading in LFG*

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comments welcome, but please do not criticize in print

1 Complex Predicates and f-structure in LFG

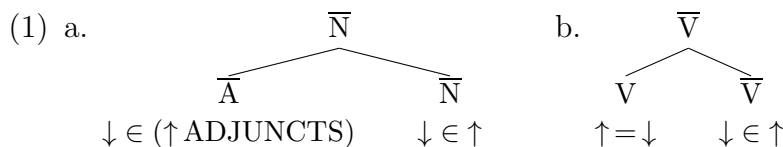
LFG has traditionally proposed relatively flat covert structures (f-structures) for a variety of constructions, such as adjectival modification and ‘restructuring’ complex predicates, which in most other frameworks are analysed as having hierarchical covert structures, usually binary branching ones. This leads to a variety of problems that were addressed in Andrews and Manning (1993, 1999), henceforth AM93 and AM99, 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 other phenomena. I will here show that the major analyses of AM99 and AM93 can be reformulated making greater use of the properties of glue semantics along with a similar but different, independently motivated and more conservative innovation in the LFG syntactic framework, the concepts of ‘hybrid object’ and ‘distributive attribute’ introduced for the treatment of coordinate structures in Kaplan & Dalrymple (2000), henceforth DK, along with some additional essentially notational proposals for coordinate structures. An important related topic that will not be taken up is the treatment West Germanic Verb Clusters, which are normally grouped with Complex Predicates in the Minimalist Program (Wurmbrand (2007, 2015), and many other publications), but in LFG are generated with the use nested VP XCOMPs together with functional uncertainty of object NPs. (Kaplan & Zaenen 2003). I will also not try to deal another construction, (probably more) often called a ‘complex predicate’, wherein a noun or similar item combines with a verb to express a concept that in many languages would be expressed as a single

* I’m indebted to the glue semantics discussion group and the audience at ALS 2015 for helpful comments on a presentation of some of this material.

verb, since these involve some major additional features, such as especially a tendency to be interpreted noncompositionally.

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 & Maxwell (1988). Distributive attributes, when attributed to a set, are also attributed to all the members of that 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 AM, with only a minor further addition, ‘undersharing’, to deal with cases where distributive attributes don’t distribute in certain constructions.

For some preliminary examples, the following structures are proposed for ‘modal adjectives’ such as *former* and *alleged* (a), and for Romance ‘restructuring’ predicates¹ (b), often also called ‘light verbs’:



The construction of (a) is standardly analysed in LFG with ‘f-structure flattening’, whereby the upper and lower \bar{N} ’s in (a) share the same f-structure, and this is a popular proposal for the \bar{V} ’s in (b) as well, but the flattening leads to a variety of difficulties discussed by AM93,99, which amount to insufficient ‘respect for the tree’ (Alsina 1997). These difficulties do not appear to have been satisfactorily resolved. I will show that using singleton sets rather than f-structure equality permits a straightforward analysis.

For complex/restructuring predicates, the difficulties for LFG don’t appear to have multiplied, indeed, many of them have been resolved by Lowe

¹As first discussed in generative terms by Aissen & Perlmutter (1976) and Rizzi (1978).

(2016), but the problem of respect for the tree remains. The present proposal fixes this, 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 AM99 has with ‘inside-out functional uncertainty’ that is discussed in Andrews (2001).

In the next section, I will present the basic theoretical ideas, and then, in the following sections, give 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 entirely upon glue semantics rather than distributive attributes), these being the main targets of analysis in AM93 and AM99. The other complex-predicate structures discussed in AM99 are Wagiman and Urdu, and a bit of Italian. Italian seems essentially similar to Spanish, while Urdu fits easily into the approach we take for Romance. The Wagiman construction on the other hand is a verb+noun complex predicate, which we are not considering here. We conclude with some general theoretical discussion.

2 Formal Ideas

Here we deal with some formal ideas, most involving coordination in some way or another. First we examine more closely the essential ideas of hybrid objects and attribute distribution, and second, some further aspects of coordinate structures that are relevant at certain places in the sequel. Finally, a brief discussion of the status of stipulations in generative grammars, which I believe to have changed substantially in the last decade or so.

2.1 Hybrid Objects and Distribution

Here we present the notions of hybrid object, distribution of attributes, and the stipulative restrictions on distribution (‘undersharing’) that we will turn out to need. The basic idea of DK about sets and distribution 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 each of 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 $\forall f \in s, A(f) = V$.²

This can be seen as a kind of attribute-spreading in the sense of AM99, but with an additional subtlety.

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

$$(3) \left[\left[\begin{array}{l} \left\{ \left[\begin{array}{l} F \quad Y \end{array} \right] \right\} \\ \left\{ \left[\begin{array}{l} F \quad Z \end{array} \right] \right\} \end{array} \right] \right]$$

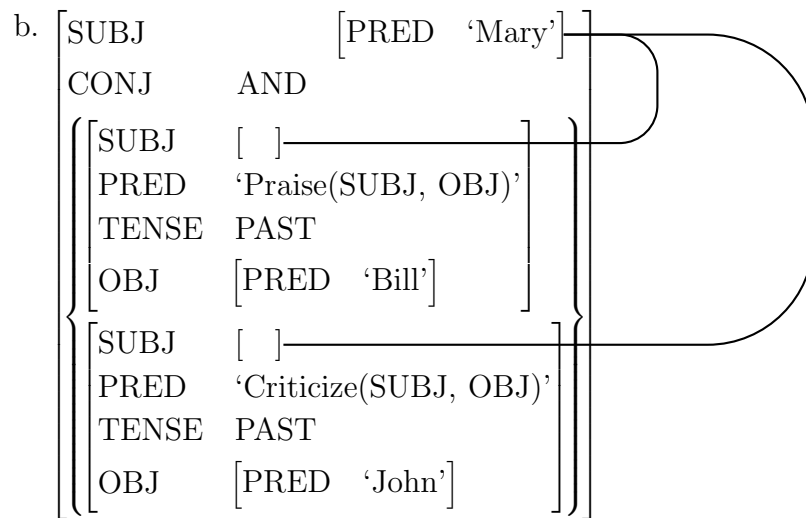
As long as nothing ascribes any F-value to the entire structure, it is possible that $Y \neq Z$. But if anything ascribes a value X for F to the entire structure, then (3) must become more highly specified as (X is to be read as a shared value, rather than multiple copies):

$$(4) \left[\begin{array}{l} F \quad X \\ \left\{ \left[\begin{array}{l} F \quad X \end{array} \right] \right\} \\ \left\{ \left[\begin{array}{l} F \quad X \end{array} \right] \right\} \end{array} \right]$$

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

²This 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 & 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.



In this case, SUBJ is supposed to be shared and OBJ is not, but other possibilities are both or neither (we will not consider phenomena of ‘Right Node Raising’):

- (6) a. Mary praised Bill and Susan praised John
 b. Mary (both) praised and criticized John

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 AM99. On this account, if F were 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 effectively 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):

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

$$\text{ b. } \left[\begin{array}{c} F \ X \\ \left\{ [F \ X] \right\} \end{array} \right]$$

For our present applications, this produces the behavior we want, corresponding to obligatory sharing of certain attributes across ARG in the system of AM99, 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 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, some other analysis is possible, such as use of functional uncertainty.
- 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 & 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 some grammatical features, but not for grammatical functions such as SUBJ and OBJ, although it is not at all clear that this can be excluded by UG. So the proposed typology is that PRED and ADJUNCTS are invariably not distributed, while governable grammatical relations and feature attributes are distributed, but distribution may be blocked in specific constructions by an undersharing specification.

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, p.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 attribute. 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 somewhat more like that of AM99 than the present one, but nevertheless differs in at least two fundamental ways as well as in 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. And, of course, a multi-valued attribute induces a set in an extremely natural way.

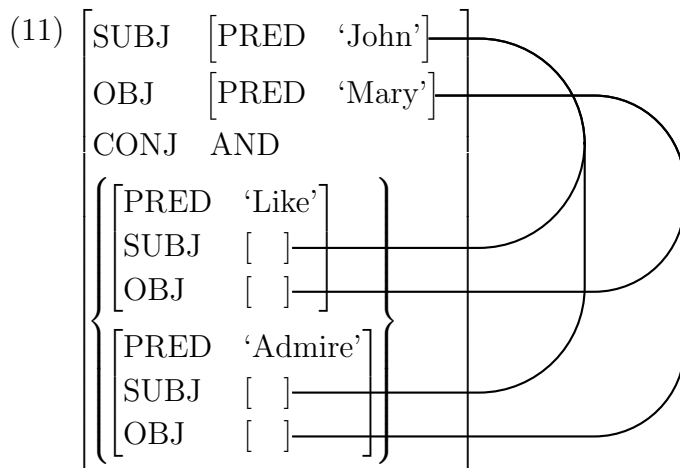
2.2 Aspects of Coordination

Since our analyses will be using glue semantics, and some of the structures will behave very similarly to coordinate structures, we will need to deal with some features of coordination, first the problem of ‘resource deficit’, and second, the treatment of n -ary boolean operators.

Resource deficit arises in connection with examples such as:

- (10) John likes and admires Mary

Assuming that the c-structure has a coordinated V, the form of analysis in Dalrymple (2001, ch 13) will give us the following f-structure:



Due to the $\uparrow=\downarrow$ annotations on the path from S to coordinate V, the attributes CONJ, SUBJ and OBJ apply to the entire structure, which turns out to be a hybrid object because the coordinated V supplies it with two members. The latter two attributes are furthermore distributive, so shared with the f-structures of the conjuncts.

But in the glue semantics we have a problem, because we have two verbs, each wanting both a subject and an object, but only have one of each. This creates a problem of ‘resource deficit’, discussed by Dalrymple (2001, ch 13), for which essentially two solutions have been proposed. The first is due to Kehler et al. (1995), and is based on the idea that ‘occurrences’ of substructures, as determined by the structures they are attributes of, can function as resources. Dalrymple criticizes this idea on the basis that it gives wrong results for constructions such as ‘Raising’ (functional control), where an item bears GFs to more than one structure, but is only interpreted once.

A technically sound solution on the other hand is provided by Asudeh & Crouch (2002), but this requires extremely complex meaning-constructors that far exceed reasonable bounds on what might plausibly be acquired by first language learners (‘Plato’s Problem’), and are not very plausible as things that might have evolved as part of UG (‘Darwin’s Problem’). Here I will suggest yet another idea, more conservative than that of Kehler *et al.*, but allowing simpler formulations than Asudeh and Crouch.

The resource deficit problem of (11) and other coordinate structures and similar constructions is constituted by the fact that we have multiple predicates, each demanding satisfaction by a given argument, which is, however only provided once. I propose that the deficiency can be addressed with

a convention, which can be regarded as an aspect of instantiation that is triggered by this circumstance, which can be formulatd like this:

- (12) Whenever an input literal g is distributed between the n members of a set, the following meaning-constructor is added to the glue premises:
 $\lambda x.[x, \dots, x] : g \rightarrow \otimes^n g$, where $\otimes^n g$ means ‘ M tensored with itself n times’.

This deals with at least the simple cases of argument-distribution in a way that is somewhat ad-hoc, but won’t subvert the formalism in any serious way, since only a finite amount of material will be added to the initial constructors, in a way heavily constrained by the syntactic structure (the convention does not apply to its own output).

Then we need to manage the interpretation of the results of conjunction, which are in effect an n -ary operations. I will first present my suggested (and hopefully suggestive) notation, then explain what it is supposed to mean:

- (13) $\lambda P.Conj^*(P)^* : (\downarrow \in)_\sigma^* \rightarrow \uparrow_\sigma$

On instantiation, we replace $*$ with the actual number of iterations. Then on the glue side, we interpet an n -exponeniated term M as $\otimes^n M$, which we assume to branch to to the right (we don’t put something like \otimes^* into the rule formulation itself because we want this to be as concise as possible). The lambda-variable on the left is then a variable of the corresponding binary-branching pair type, while the expression within the body of the meaning-side is interpreted as a combination of binary uses of the conjunction, and lprojections (of the lambda-calculus with paris) picking apart the variable. A recursive definition of the latter is:

- (14) a. $Conj^1(P)^1 = P$
 b. $Conj^{n+1}(P)^{n+1} = \pi_1(P)Conj(Conj^n(\pi_2(P))^n)$

In other words, if $n = 1$ just return P , otherwise return the result of applying the conjunction to the first projection of P and the result of doing it to the second projection with n reduced by 1.

This analysis places the major burden of accounting for these phenomena on the syntax and the syntax-semantics interface; a potential alternative would be to try to apply the ideas of Boolean Semantics (Keenan & Faltz (1985), Winter (2001)), and, in effect, first combine the predicates in a

boolean manner, and then apply that to the single provided copies of the arguments. We take the present approach because it provides something good enough for our present purposes with less apparent effort.

2.3 Stipulations and the Goals of Generative Grammar

The analyses presented here will occasionally rely on stipulations in the grammar that would have widely been regarded until about 10 years ago as serious problems in a framework that was supposed to be helpful for explaining the possibility of language acquisition. But the rise of Bayesian and related approaches (Chater et al. (2015) and much other recent literature) greatly alleviates this problem, since the acquisition of at least reasonably simple stipulations can be motivated by ‘indirect negative evidence’, that is, the ability to explain the absence of certain forms and combinations from a good-sized corpus.³ So we obviously still want to keep stipulations at a minimum, but the tolerable minimum is I think considerably greater than it was in 1999.

3 Attributive Adjectives

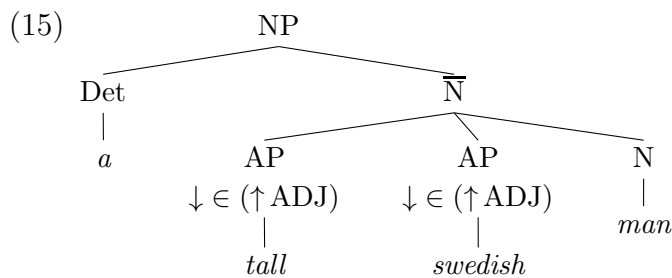
In this section we will examine a topic in the syntax of attributive adjectives that loomed large in AM93, but not in AM99, namely, the properties of ‘modal’ adjectives as opposed to (somewhat generalized) ‘intersective’ ones. We first make some basic observations about some facts and their (lack of) treatment in most of the LFG literature, then present the basic proposal, and finally elaborate it a bit in order to manage iterated intersective adjectives.

3.1 Adjectives and Scope

LFG has generally followed the ‘flat structure’ approach to adjectival modifiers advocated by Jackendoff (1977), e.g. Dalrymple (2001, pp. 256-257). The adjectives are introduced as APs whose f-structure correspondents are

³Related to but not necessarily identical to the property that a grammar can have to a greater or lesser degree of success in predicting what comes next in ambient linguistic performance Ramscar et al. 2013.

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):



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:⁴

- (16) 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 (1983*b*) and also a major topic of AM93. Consider for example the pair:

- (17) 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 lying in the past, but his unscrupulousness as persisting, while the second locates both in the past, so

⁴There are also 'pseudo-modal' adjectives such as *fake*, which Partee (2010) analyzes as being actually intersective, but exhibiting modal-like behavior due to pragmatic accommodation effects.

that he could well now 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.

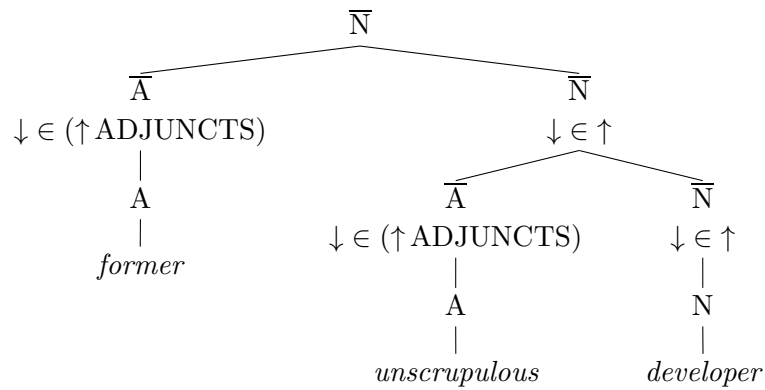
Theoretically, it might be possible to preserve the syntactic analysis of Dalrymple (2001) unaltered, but capture the semantic interpretational facts with restrictions involving f-precedence (Kaplan & Zaenen (1989), Dalrymple (2001, pp. 171-174)). One issue is that the concept would have to be generalized so as to involve some kind of c-structure-based command relationship, in order to deal with the concentricity effects as discussed in Andrews (1983*b*).⁵ Another is that the formulations seem to come up rather complex, and it is difficult to devise a single, plausibly universal, constraint that manages to deal with a wide range of cases including further phenomena beyond those of AM93, AM99, such as the NP-internal agreement discrepancies discussed in Pesetsky (2013) and Smith (2015). This motivates the present approach as opposed to the extensive flattening that is a traditional characteristic of f-structure.

3.2 Nesting Structures

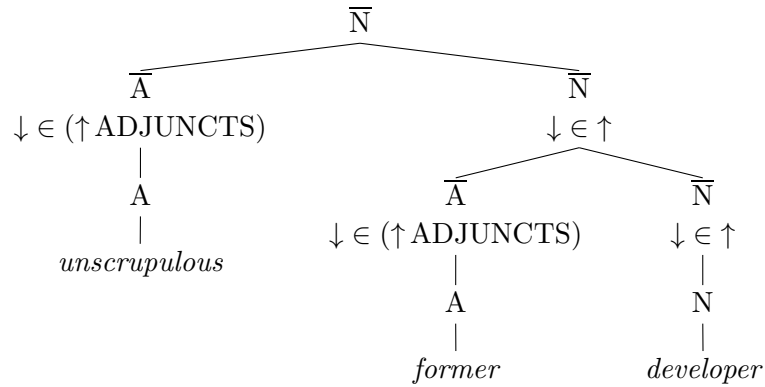
I propose the following annotated c-structures for ‘former unscrupulous developer’ and ‘unscrupulous former developer’ ($\uparrow = \downarrow$ annotations on the preterminals omitted):

⁵There is also a very interesting discussion of concentricity effects with the Greek polydefinite construction in Velegrakis (2011).

(18) a.



b.



On the assumption that ADJUNCTS and PRED are non-distributive, these produce the following f-structures:

(19) a.
$$\left[\begin{array}{l} \text{ADJUNCTS } \{[\text{PRED 'Former'}]\} \\ \left\{ \left[\left[\text{ADJUNCTS } \{[\text{PRED 'Unscrupulous'}]\} \right] \right] \right\} \\ \left\{ \left[\text{PRED 'Developer'} \right] \right\} \end{array} \right]$$

b.
$$\left[\begin{array}{l} \text{ADJUNCTS } \{[\text{PRED 'Unscrupulous'}]\} \\ \left\{ \left[\left[\text{ADJUNCTS } \{[\text{PRED 'Former'}]\} \right] \right] \right\} \\ \left\{ \left[\text{PRED 'Developer'} \right] \right\} \end{array} \right]$$

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 as heads of the nominal projection, 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, pp. 360-371). They oppose treating ordinary adjectives as heads of the nominal projection on the basis that they can take their own PP complements (only in formal styles, as far as I can make out), but this can also happen with modal adjectives:⁶

- (20) *i ipotitheméni apó ton Iosíf apistía tis Mariás*
 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.

3.3 Basic Intersectives

For the glue semantics analysis, for the intersective adjectives, one possibility would be the glue analysis of Dalrymple (2001, ch.11). But this has

⁶One of the problems that needs to be 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 analyses 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 this were in general possible, such an interpretation would be culturally inconceivable for this example.

the problematic feature that, in order to accommodate phenomena of adverbial modification presented in Kasper (1995), every intersective adjective requires two meaning-constructors, a simple one of type $e \rightarrow p$ 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 with this is that it 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. This does not seem to happen. I suggest that we can account for this by introducing the second constructor, which I'll call the 'Intersector', with the phrase-structure rules. An adjective such as 'unscrupulous' will then have lexically only a single rather simple meaning-constructor which Dalrymple formulated like this:

$$(21) \quad \lambda x. \text{Unscrupulous}(x) : (\uparrow\text{VAR}) \rightarrow (\uparrow\text{RESTR})$$

However since that time, interesting proposals have been made about NP-structure, to the effect that agreement features are packaged in bundles such as CONC(ORD), for NP-internal agreement, and IND(EX), for external verb agreement.⁷ So VAR could be replaced by either IND(EX)CONC(CORD); here I choose the former because it is more consistently associated with semantics, while RESTR can plausibly just be eliminated entirely, replaced by the σ -projection of the f-structure.

To account for attributive adjective agreement in languages that have it, we would want to share IND between the mother nominal and the adjunct AP, and although agreement does not provide a motivation in English, we include it anyway.⁸ We will use the '= IND' abbreviation from AM99 to express this sharing constraint:

⁷The original proposals were by Wechsler & Zlatić (2003); see Bresnan et al. (2016) for an updated presentation, and for dissent from Wechsler's version, Alsina and Arsenejević (2012*b*, 2012*a*); their version of the idea would be superior for our purposes, because there would only be one attribute available as a somewhat plausible replacement for VAR rather than two.

⁸A possible justification might be the constraint of 'Functional Consistency' properly in Andrews (2007, example 15), but developing this properly is beyond the scope of this paper.

$$\begin{array}{lcl}
(22) \bar{N} & \rightarrow & \text{AP} & \bar{N} \\
& & = \text{IND} & \downarrow \in \uparrow \\
& & \downarrow \in (\uparrow \text{ADJUNCTS}) & \\
& & \lambda PQx.P(x) \wedge Q(x) : & \\
& & [(\downarrow \text{IND})_{\sigma} \rightarrow \downarrow_{\sigma}] \rightarrow [(\uparrow \in \text{IND})_{\sigma} \rightarrow (\uparrow \in)_{\sigma}] \rightarrow (\uparrow \text{IND})_{\sigma} \rightarrow \uparrow_{\sigma} &
\end{array}$$

We will later revise this slightly to manage iterated intersectives, but it will suffice until we have dealt with modal adjectives, which require something different, which is not adequately supported by Dalrymple’s treatment.

3.4 Modal Adjectives

These 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 the other being 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

$$\begin{array}{l}
(23) \text{ In both below, } \%G = (\text{ADJUNCTS} \in \uparrow): \\
\lambda Px.Former(P(x)) : [(\%G \in \text{IND})_{\sigma} \rightarrow (\%G \in)_{\sigma}] \rightarrow \\
\quad (\%G \text{ IND})_{\sigma} \rightarrow \%G_{\sigma} \\
\lambda Px.Confess(x, P(x)) : [(\%G \in \text{IND})_{\sigma} \rightarrow (\%G \in)_{\sigma}] \rightarrow \\
\quad (\%G \text{ IND})_{\sigma} \rightarrow \%G_{\sigma}
\end{array}$$

It should be evident that the scope relationships will now be captured. The constructors would be a bit simpler if the adjectives were not buried inside an ADJUNCTS attribute, but we have already motivated putting them inside something that can have its own complements. It might be worth pointing out that typologically, this might be a rather unusual construction. It is for example entirely absent from Bahasa Indonesia (Andrews 2010a), and might

⁹The diagrammatic notation of the DBA-based analyses of Andrews (2010a) helps with the cosmetic problem here, but any empirically concrete issues that might be at stake are beyond the scope of this paper.

even be restricted to relatively formal registers of languages with significant long term cultural heritage from the classical mediterranean world.

3.5 Iterated Intersectives

We have now handled the most basic cases, but a further possibility is what might be described as ‘conjunctive iteration’ of intersective adjectives, as discussed in AM93, on which the following discussion is heavily based:

(24) 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:

(25) *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):

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

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:

(27) 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 him.

(28) 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 integrate these into the analysis by putting a Kleene star on the AP, and using the notation of (13) in the annotation, yielding the following revision of rule (22):

$$\begin{array}{ccc}
(29) \bar{N} & \rightarrow & \begin{array}{c} \text{AP}^* \\ = \text{IND} \\ \downarrow \in (\uparrow \text{ADJUNCTS}) \\ \lambda PQx. \wedge^* (P(x))^* \wedge Q(x) : \\ [(\downarrow \text{IND})_\sigma \rightarrow \downarrow_\sigma]^* \rightarrow [(\uparrow \in \text{IND})_\sigma \rightarrow (\uparrow \in)_\sigma] \rightarrow (\uparrow \text{IND})_\sigma \rightarrow \uparrow_\sigma \end{array} \\
& & \bar{N} \\
& & \downarrow \in \uparrow
\end{array}$$

Observe that this analysis does not allow the inclusion of modal adjectives in intersective lists.

3.6 Concluding Remarks

The reader may well have already noticed that for the analysis to work at all, both the ADJUNCTS and PRED attributes will have to be nondistributive, 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:

- (30) 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:

- (31) 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, pp. 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 (c.f. the papers in Kim et al. (2005)) and little explored in LFG. But if we provisionally assume that all possessors bear the grammatical function POSS, and that there is in the semantics a relation \mathbf{R} covering at least ownership, we can get both readings by having the possessive marker introduce the following meaning-constructor:

$$(32) \quad \lambda P y x . P(x) \wedge \mathbf{R}(y, x) : ((\%G \text{ IND}) \rightarrow \%G_{\sigma}) \rightarrow (\uparrow \text{IND}) \rightarrow \\ (\%G \text{ IND}) \rightarrow \%G_{\sigma}, \%G = (\text{POSS } \uparrow)$$

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 and 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.

A final observation I will make is that it might not be impossible to import many aspects of a cartographic analysis into this approach, by treating our ADJUNCTS as actually being specifiers of nested covert nominal heads. But I won't try to explore this idea here.

3.7 Undersharing in Coordinate Structures

However we now encounter a problem, in connection with agreement. 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.

This problem can be solved by the mechanism of undersharing introduced in subsection 2.1. Although, in general, agreement features are distributive, the ones that don't distribute in coordinate structures can be excluded from

distribution by an undersharing specification. A basic analysis of English coordinate NPs for example might then look like this (based on Andrews (1983*a*)):

$$\begin{array}{lcl}
 (33) \text{ a. NP} & \rightarrow & \begin{array}{cc}
 (\text{NP})^+ & (\text{NP})^+ \\
 \downarrow \in \uparrow/\text{PERS, NUM} & \uparrow = \downarrow
 \end{array} \\
 \text{b. NP} & \rightarrow & \begin{array}{cc}
 \text{Conj} & \text{NP} \\
 \uparrow = \downarrow & \downarrow \in \uparrow/\text{PERS, NUM}
 \end{array}
 \end{array}$$

Rule (a) 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, perhaps, CONC and/or IND). As discussed in Andrews (1983*a*), 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 along the lines discussed in section 2.2. 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 & Kaplan (2000) need to recognize a difference between the functionally very similar or even identical 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. But, given the possibility of undersharing specifications, we do not have to postulate two distinct attributes with very similar functions.¹⁰ Observe that undersharing stipulations are will in general be motivated by the appearance in reasonably small corpora of examples that could not otherwise be generated, so that they do not provide a severe problem for learning (at least relative to the many other problems that need to be solved).

¹⁰Of 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.

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

- (34) 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, p. 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, p. 133)).

Their solution is to follow Wechsler & 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.

3.8 Conclusion

This concludes our discussion of set representations for NPs. There is clearly a great deal more to do in order to catch up with the great volume of Minimalist work on adjectives, but I think this is sufficient to provide a basis for

starting. Note, for example, that we might be able to integrate cartographic proposals such as those of Cinque (2010) into the analysis by treating our adjuncts as specifiers of covert nominal heads, a path made easier by the abandonment of ‘rollup movement’ in some recent work such as Abels & Neeleman (2012).

4 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 (2007):

- (35) 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).

4.1 F-structure

Our proposal of singleton sets provides a straightforward analysis using f-structure, where glue is useful, but probably not absolutely essential. 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 (35b) will for example get an f-structure like (36), 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:

$$(36) \left[\begin{array}{l} \text{SUBJ} \left[\begin{array}{l} \text{PRED} \text{ 'Pro'} \\ \text{PERS} \text{ I} \end{array} \right] \\ \text{PRED} \text{ 'Fer'} \\ \text{OBJ} \left[\begin{array}{l} \text{PRED} \text{ 'Pro'} \\ \text{PERS} \text{ III} \\ \text{GEND} \text{ FEM} \end{array} \right] \\ \text{OBJ}_{Rec} \left[\text{PRED} \text{ 'Nen'} \right] \\ \left\{ \left[\begin{array}{l} \text{PRED} \text{ 'Acabar'} \\ \text{VFORM} \text{ INF} \end{array} \right] \right\} \\ \left\{ \left[\begin{array}{l} \text{PRED} \text{ 'Llegir'} \\ \text{VMARK} \text{ DE} \\ \text{VFORM} \text{ INF} \end{array} \right] \right\} \end{array} \right]$$

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

$$(37) \lambda Px.Finish(P(x))(x) : ((\uparrow\text{SUBJ IND})_{\sigma} \rightarrow (\uparrow\in)_{\sigma}) \rightarrow (\uparrow\text{SUBJ IND})_{\sigma} \rightarrow \uparrow_{\sigma}$$

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 (but, if we generated multiple members without some constructor to combine them, assembly would fail due to resource surplus).

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,¹¹ using perhaps a PS rule like this

¹¹At a Pargram meeting, perhaps in 2008.

(note that this would accommodate the arguments of Manning (1996) for a right-branching structure):

$$(38) \text{ VP} \quad \rightarrow \quad \begin{array}{cc} \text{V} & \text{VP} \\ \downarrow \in (\uparrow\text{AUX}) & \uparrow = \downarrow \end{array}$$

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 auxiliaries 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.

4.2 Distributive Issues

In the present approach, we need to stipulate undersharing, because they behave distributively in certain other constructions, such as coordinate structures: 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*:

- (39) 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 assuming obligatory VMARK-distribution by introducing the V-MARKs in a slightly higher projection than VP, with a choice of coordinating either projection, coordination of the higher one being preferred in formal style.

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

- (40) 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, p. 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 contrasts as clear as those of (35), but one can nevertheless produce examples that show that the verb forms aren't shared uniformly through a collection of light verbs:

- (41) 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, p. 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 (1983*b*) 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:

- (42) 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 (42a) is I now think irrelevant to this issue because *a contracor* could be generated in either the upper or the lower \bar{V} so as to produce either of the required readings without issue, and (42b) 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.

4.3 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, p. 216), the causee Agent cannot be

a SUBJ(ect) of the caused verb.¹² 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’ non-light ones.

One possibility would be to invoke some version of the not thoroughly worked out approach to mapping theory suggested in AM99 and Andrews (2007), 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.

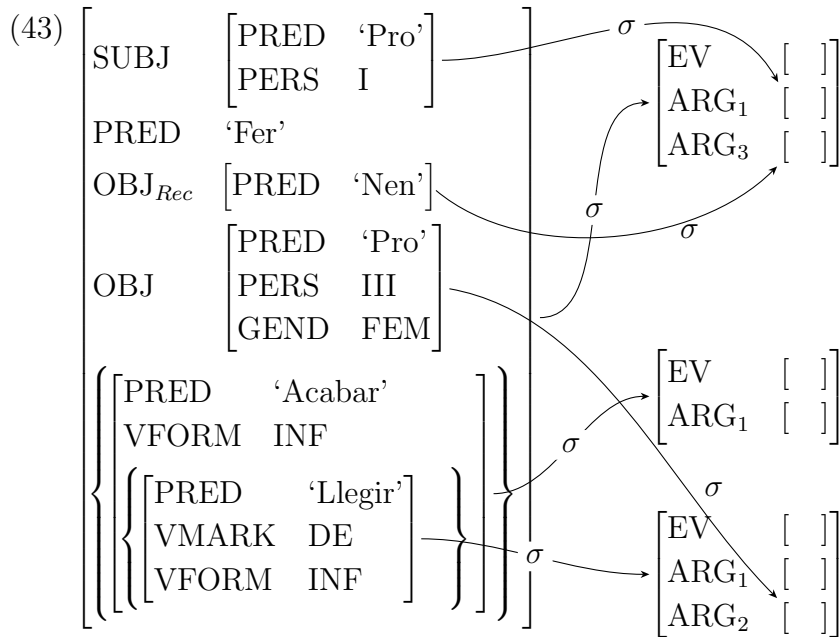
The AGT theory makes use of the semantic projection, which is however somewhat modified from previous glue work so as to have considerably more structure than the traditional semantic projection. In particular, for verbs, there are ARG_{*i*} attributes for the semantic values of the arguments, and an EV attribute for a Davidsonian ‘event’ variable.¹³ The Linking theory then equates the ARG_{*i*}-values with the semantic projections of grammatical relation values. Although the argument structure/semantic projection is richer than the traditional semantic projection in LFG, it doesn’t have to be a recursive projection of f-structure, since lexical items access the s-structure through f-structure, which has the required kind of recursive structure.

With the proposed semantic projection added, (36b) becomes (simplified to reduce clutter by omitting IND attributes):¹⁴

¹²Andrews (2007) 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.

¹³Although 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.

¹⁴AGT also have a REL argument in the semantic projection, which I omit, due to not seeing any function for it here.



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 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 in the constructors, we 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 relationship to the semantics. We then propose the following (pre-linking) constructors for the verbs in our examples:

$$\begin{aligned}
(44) \quad & \lambda yxe.Llegir(e, x, y) : (\uparrow\text{ARG}_2) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma \\
& \lambda Pxe.(\exists e_2)Acabar(e, x, P(e_2, x)) : [(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma] \rightarrow \\
& \quad (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma \\
& \lambda Pyxe.(\exists e_2)Fer(e, x, y, P(e_2, y)) : [(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma] \rightarrow \\
& \quad (\uparrow\text{ARG}_3) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma
\end{aligned}$$

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).

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:

- (45) 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_1 attribute of the *Llegir* constructor of (44) in a simple finite clause, assembly will fail because nothing supplies any meaning for the first argument (in this case, Agent) semantic role.

But in a complex predicate construction, the constructors as formulated in (44) will require the ARG_1 's of the subordinate verbs to be suppressed,

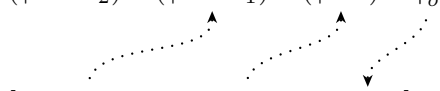
most straightforwardly by the same logic of obligatory control constructions as presented in Asudeh (2005), with the difference that we are formulating the obligatory control over s-structure rather than f-structure attributes. It is unlikely that a reader with no previous exposure to glue can quickly 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 (43). The glue side of *Llegir* and the first argument glue term of *Acabar* (for the sub-event argument) are (a) and (b) below (since the argument structure attributes seem to be associated consistently with semantic types, the latter are omitted):

- (46) a. *Llegir* $(\uparrow\text{ARG}_2) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$
- b. *Acabar* subev $[(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma]$

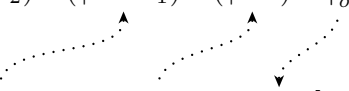
The sequence of implications in (a) is a right-branching stack of (linear) implications in accord with the convention of omitting rightmost parentheses, so that all but final ‘ \uparrow_σ ’ term are antecedents of such conditionals, and correspond intuitively to ‘input ports’ where content provided by an argument is to be supplied, while the final term ‘ \uparrow_σ ’ 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 ‘ $(\uparrow \in \text{ARG}_1)$ ’ in (b) designates the same location in the f-structure as the ‘ $(\uparrow\text{ARG}_1)$ ’ 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 links directed from the satisfiers to the argument-positions that they satisfy (formally, these links can be regarded as axiom-links in a proof-net, and are not really directed, because their direction is predictable from context):

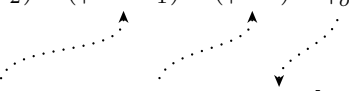
- (47) a. *Llegir* $(\uparrow\text{ARG}_2) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$

 b. *Acabar* subev $[(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma]$.

This partial assembly will become a completely satisfied event argument for *Acabar* if we plug something into the ARG₂ position of *Llegir*, a step we won't take until the verbal meaning constructors have been composed with each other.

Expanding (b) to the full meaning-side for *Acabar* we get:

- (48) a. *Llegir* $(\uparrow\text{ARG}_2) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$

 b. *Acabar* $[(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma] \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$

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 ARG₁ with an NP argument, but another possibility is to stick the whole thing under the causative meaning-constructor for *Fer*:

- (49) a. *Llegir* $(\uparrow\text{ARG}_2) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$

 b. *Acabar* $[(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma] \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$
 c. *Fer* $[(\uparrow \in \text{ARG}_1) \rightarrow (\uparrow \in \text{EV}) \rightarrow (\uparrow \in)_\sigma] \rightarrow$
 $(\uparrow\text{ARG}_3) \rightarrow (\uparrow\text{ARG}_1) \rightarrow (\uparrow\text{EV}) \rightarrow \uparrow_\sigma$

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 (one from *Llegir* and two from *Fer*), and one EV to deal with; the latter is to be managed by TAM marking, not considered here, so we proceed onward to the ARG_{*i*}'s.

In general, for Romance languages, largely consistently with the Kibort-Findlay mapping theory, we can say that ARG₁ is expressed as/satisfied by a bearer of SUBJ or in passives by an oblique, ARG₂ by either SUBJ or OBJ, and ARG₃ by a bearer of OBJ_θ, always expressed as an *a*-PP (different from Germanic and Bantu languages, where OBJ_θ is expressed as a bare NP,

usually in ‘second object’ position). Here we have a slight divergence from previous analysis within the theory, wherein ARG₃ can also be expressed as OBJ, but I think that things work out better in Romance languages if we assume that they have a stipulation that prohibits this. For example, the ‘semitransitive’ verbs taking an *a*-object can simply have an ARG₁ and an ARG₃. These languages seem to quite rigorously lack any kind of double object construction, for which the dual linking possibilities of ARG₃ are very useful. These linkings are achieved by the appearance of putatively universal equations such as that of (50) below in the lexical entries, although the details of this are not relevant here::

$$(50) (\uparrow\text{ARG2}) = (\uparrow\text{SUBJ|OBJ IND})_{\sigma}$$

So in a causative structure, the Causer ARG₁ can link only to SUBJ.

For transitive verbs, the Causee Agent can be assumed to always be an ARG₁, and the constructor of (49c), works without issue, but for intransitives two problems arise. First, under widespread assumptions, some of them will be unaccusative and not have any ARG₁ at all, only an ARG₂, then, second, the Causee Agent is expressed as an ARG₂.

One possible solution is to use the two-place causative predicate motivated by Alsina (1996, p. 197) on the basis of examples like the following, where there is no overt Causee Agent:

- (51) El mestre ha fet treballar molt aquest curs
 The teacher has made work a lot this term
 The teacher has made people work a lot this term.

This version of the causative predicate takes a Causer and a Caused Event, but does not identify any particular entity that the Causer acts upon to produce the event. A full account of (51) in AGT will have to explain why the Caused verb doesn’t need any expressed agent; we will not try to provide one here.

The two-place causative also seems suitable for constructions in which the Causee Agent is optionally expressed as a *per*-oblique:

- (52) El alcalde ha fet enderrocar el pont (per un especialista)
 The mayor has made demolish the bridge by a specialist
 The mayor had the bridge destroyed (by a specialist)

This expression of the Causee Agent is only possible for transitive verbs; although Alsina analyses the Caused Object here as an argument of the Causative verb, I see no clear motivation for this. The two argument treatment would also seem to be plausible for indubitable unaccusative verbs with nonagentive arguments, or ones that perhaps lack full human agency Alsina (1996, p. 296):

- (53) He fet passer el ratolí pel forat
 I have made go the rat through the hole
 I made the rat go through the hole

But the subject of unaccusativity is in general rather tangled, and I don't have enough information about how it works out in Catalan to make a solid proposal.

But we clearly need a version of the three-place causative for undubitable unergatives such as (35). For them we can propose a second meaning constructor for *Fer*, like that of (35c), but replacing ARG₃ with ARG₂ (and possibly able to bind an ARG₂ in the complement as an alternate to ARG₁). The impossibility of expressing two ARG₂'s in the same GF-distribution domain (at least in Romance, where such a restriction seems solidly motivated) will prevent transitive Caused verbs from appearing with this constructor, but we need something to prevent the constructor of (35c) from appearing with unergatives. A constraint ($\uparrow \in \text{ARG}_2$) would appear to get this job done.

A possible alternative would be to say that *Fer* carries a nonconstructive implicational constraint, not shared by the semitransitive verbs:

- (54) (OBJ_θ) \supset (OBJ)

But this runs afoul of some facts concerning passive. Catalan has a limited capacity to passivise causative verbs (Alsina 1996, p. 187), subject to the constraint that the Caused verb be transitive or unaccusative. Transitive verbs in passivized causative constructions can have their Causee Agents expressed either as an *a*-phrase or a *per*-phrase:¹⁵

- (55) a. El pont ha estat fet enderrocar a/per un especialista
 The bridge has been made demolish a a specialist
 The bridge has been caused to be [demolished by a specialist]

¹⁵Alsina p.c. (Aug 2016), who furthermore finds all passives of causatives to be sound unnatural, but not really ungrammatical. The *pel* option is the oblique realization of the Causee Agent in the lower argument structure, as discussed in Alsina (1996).

- b. El poema ha estat fet llegir al/pel nen
 the poem has been made read by-the boy
 The poem has been caused to be read by the boy
 Such examples violate the putative constraint

The versions with *a*-marked Causee Agent would violate constraint (54), which therefore must be rejected.

4.4 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 & 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’:

- (56) a. Mwa:limu wa-aṅdik-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-aṅdik-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 aṅdika-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 ARG₁ 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. But 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 lexical causatives differ from syntactically analytic ones in that the Caused Theme can be an ARG₃, even though it is ARG₂ for the base form of the verb, so that the Causee Agent can be a ARG₂. The prediction is then that there could not be languages with a fusion of the properties of Bantu and Romance, with analytic Romance-style causatives showing a Bantu-style of assignment of grammatical relations to the arguments.

4.5 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 considered in AM99. 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 AM99 and Andrews (2007), and proposes an alternative that works well except for one thing, not handling concentricity and ‘respect for 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 will prove to be the winning bet. Now we move on to Tariana, which, we claim, has essentially the same kind of glue analysis as Romance, but with rather different c- and f- structures.

5 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’.

5.1 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:

- (57) 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 analysing them with the approach to coordination developed in section 2 seems to be at least provisionally adequate. However, since there is no overt conjunction, we will want to have a meaning-constructor that effects conjunction introduced by the PS rule, in the general manner proposed for iterated intersective adjectives in subsection 3.5 above.

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:¹⁶

- (58) 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:

- (59) 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.)

The symmetric and this asymmetric type need significantly different treatments, but building the f-structures with set-membership will cause the grammatical relations to share/distribute fully, accounting for the agreement pattern.

¹⁶This phenomenon is called 'concordant dependant inflection' (Durie 1997).

5.2 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 constraint on 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 classes. 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:

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

Aikhenvald argues very plausibly that the ordering restrictions are based on iconicity of the historical word orders of the constructions, but that they are synchronically just facts. 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 adopt it, but also allow both to be members for the analysis of symmetric SVCs.

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

- (61) $V \rightarrow (V)^*$
 $\langle \downarrow \in \uparrow \rangle$

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 $\uparrow = \downarrow$ annotation, which we take to be present by default if nothing else is specified, and $\downarrow \in \uparrow$.

¹⁷If 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.

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 (61) overgenerates substantially, and so needs to be constrained by glue.

5.3 Glue Analysis

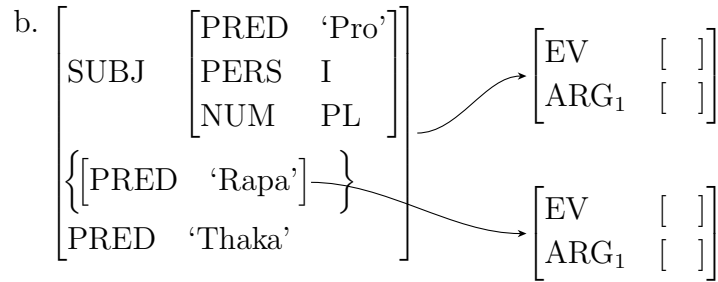
For the symmetric SVCs, we can use the conventions of subsection 2.2 to optionally add to (61) the following constructor:

$$(62) \quad \lambda P.And^*(P)^* : (\downarrow_\sigma)^* \rightarrow \uparrow_\sigma$$

Assembly will fail if this constructor is not produced when and only when all of the verbs generated are introduced as set-members.

Moving on to the asymmetric constructions, 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:

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



The relevant constructors will be as below, closely following those of (44):

$$(64) \quad \begin{aligned} & \lambda yxe.Rapa(e, x, y) : (\uparrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma \\ & \lambda Pxe.(\exists e_2)Thaka(e, x, P(e_2, x)) : [(\uparrow \in ARG_1) \rightarrow (\uparrow \in EV) \rightarrow (\uparrow \in)_\sigma] \rightarrow \\ & \quad (\downarrow ARG_1) \rightarrow (\uparrow EV) \rightarrow \uparrow_\sigma \end{aligned}$$

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):

- (65) na-na wa-yaRuphe-nuku
 3pl-OBJ our-language-TOPIC.NON.A/S
 [ma-sape-kade-ka na-pala]
 [NEG-speak-NEG-RECP.VIS 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:

- (66) 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 ARG₂ linked to OBJ. But then the Recipient will be ARG₃ realized as OBJ_θ, which lacks overt properties clearly distinguishing it from OBJ.

But if our analysis here together with the proposal in 4.4 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 reason that the subordinate verbs in Romance Complex Predicates don’t show person-number agreement with the grammatical subject of the whole construction is perhaps just 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. An alternate way of blocking concordant dependent inflection is with an undersharing specification for SUBJ, which can be historically motivated by positing a non-clause-union origin for the constructions (clearly correct, in the case of Romance).

5.4 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 serious problem, because each appearance of one of these verbs indicates what the order should be for it, so any theory relying in a sensible way on real-time prediction or MDL data-scores should be able to explain their acquisition.

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:

$$(67) \phi(c) \in \phi(\hat{*}) \Rightarrow c \ll \hat{*}$$

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 ordering 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, but can do it all with glue.

6 Misumalpan

For Romance and Tariana, we have essentially implemented the substance of AM99 in a more conservative framework using the same basic ideas, but our treatment of Misumalpan (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

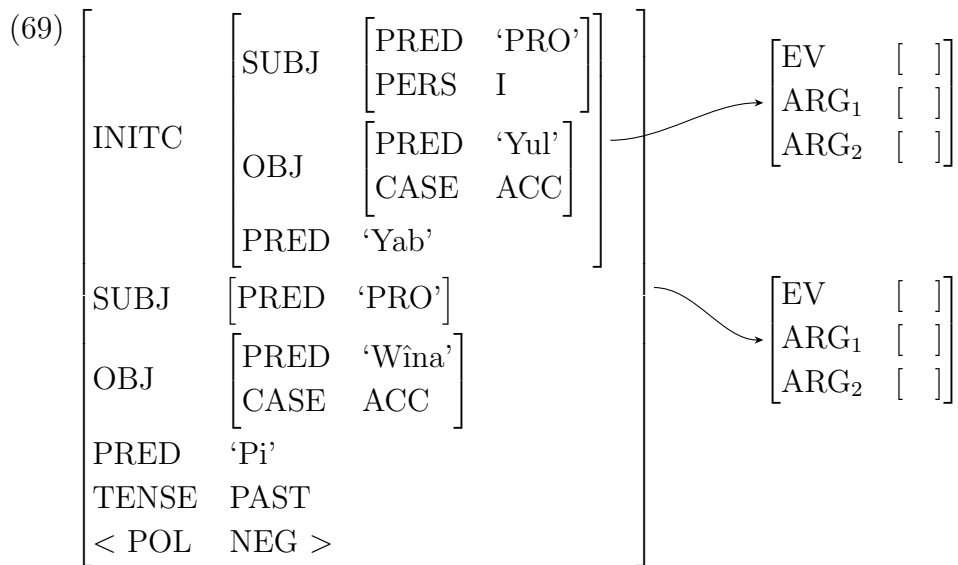
- (68) a. [Yang yul ba ra yab-ri] wîna pi-n
I dog the ACC give-OBV:ACT.1 meat eat-PAST.3
'I made the dog eat meat.' (MCD:29)
- b. [Yang yul ba ra yab-ri] wîna pi-ras
I dog the ACC give-OBV:ACT.1 meat eat-NEG
'I didn't make the dog eat meat.' (MCD:29)

In these examples, the superficial form is that of a 'consecutive' structure, where the bracketted material is a morphosyntactically 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 to the entire construction rather than just the second apparent clause: (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. We can continue to use the three-place causative predicate in the semantics, but the connection to the syntactic structure will have to be unusual (at least relative to current familiar analyses).

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:

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



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 need anything to enforce identity or coreference between the object of the Cause verb and the subject of the Effect verb (AM99, pp. 99-100). For example Bittner (1998, pp. 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:

- (70) 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)

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

- (71) 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 ARG₃, but can be an ARG₂, and that is what it in fact appears to be.²⁰ A rather simple meaning-constructor suffices:

- (72) $\lambda P y z . Cause(P)(y)(x) : (INITC \uparrow)_{\sigma} \rightarrow (\uparrow ARG_2) \rightarrow (\uparrow ARG_1) \rightarrow (INITC \uparrow)_{\sigma}$

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 (71) and (68b), 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:

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

²⁰Note 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 ARG₂ status of the Causee Agent.

- (73) 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 distinction between *p* and *ev* types is truly required (although, this is very useful elsewhere, and, I would guess, probably correct here).

7 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 AM99, along with a certain amount of additional material, especially from AM93. 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. The resulting theory seems to make some predictions, and is furthermore, due to the layering in the f-structure, much more compatible than mainstream LFG with many recent analyses from the Minimalist Program, as well as with HPSG, the original impetus for much of this work.

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