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Contents

Editorial note

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The Editors

Complex Aspectual Structure in Hindi/Urdu

MIRIAM BUTT AND GILLIAN RAMCHAND

1   Introduction

South Asian languages are well known for possessing a large number of complex verbal constructions containing either a verb, a noun or an adjective as main predicator and a light verb as the part of the construction which carries the tense and agreement morphology.[1]Light verbs in these languages have long intrigued grammar writers (e.g., Kellog 1893, Chatterji 1926, McGregor 1968) and linguists, as the contribution of the light verb to the complex construction does not appear to be a purely functional one. This is especially evident with V-V sequences (main verb followed by a light verb) where the contribution of the light verb has often been characterized via aspectual terms such as perfectivity (Hook 1991, Singh 1994) or inception/completion (Butt 1995), but also via semantically less well defined terms like forcefulness, suddenness, volitionality, benefaction, etc. The range of meanings is broad and appears to be related to the basic lexical semantics of the base verb that is involved (i.e., *take* vs.*give* for benefaction, *fall* for suddenness, *hit* for forcefulness).[2]

While the morphological and syntactic properties of these verbal complex constructions have been described in some detail for the South Asian language Hindi/Urdu (e.g., Mohanan 1994, Butt 1995), the precise semantic characterization of the role of light verbs remains the subject of investigation

[2] See Hook 1974 for a detailed description, Butt and Geuder 2000 for a detailed examination of the range of uses of the light verb *give*.

and debate. This paper proposes to take a fresh look at the issue from a perspective which presupposes a tight mapping between syntactic structure and semantic combinatorial possibilities. We aim to show that the morphosyntax of predicational structures is closely correlated with aspectual and event-structure notions in semantic representation. Our primary language of investigation is Hindi/Urdu,[3] for which we examine three distinct syntactic types of V-V collocations. We argue that these morphosyntactically distinct types correlate exactly with three distinct semantic modes of combination, thus lending support to our view of the syntax-semantics interface.

In the following sections we first outline some basic facts about the morphological and syntactic structure of Hindi/Urdu and introduce the three different types of V-V constructions that we will be dealing with. We then go on to make the point that light verbs must be clearly distinguished from auxiliaries (as argued for in Butt and Geuder 2000), and proceed from there to a detailed discussion of the morphosyntactic and semantic differences between the types of V-V constructions examined in this paper. In section 6.1, we introduce a theory of semantic representation involving event variables and motivate a framework for expressing aspectual relationships within such a theory. With this framework in hand, we make a specific proposal about the mapping between the syntax and semantics of these constructions, showing how the analysis accounts for the properties of the constructions as described in the previous sections. In doing this, we offer a view of the mapping between syntactic predication and event structure that we hypothesise to be part of Universal Grammar. We argue that Urdu/Hindi makes for a particularly good case study of event building as the language provides very explicit morphosyntactic clues which can help guide the understanding of aspectual structures crosslinguistically. In the conclusion, we examine the implications of our proposal for other languages and the syntax-semantics interface in general.

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[3] The South Asian languages Urdu and Hindi are closely related. Both are among the 16 official languages of India and are spoken primarily in the north of India. Urdu is the official language of Pakistan. The data presented in this paper are drawn primarily from the dialect of Urdu spoken in Lahore, Pakistan, as well as from examples cited in the literature on both Urdu and Hindi.

2   The Basic Data

Hindi/Urdu is an SOV (head-final) language with a mixed system of periphrastic constructions and tense/aspect inflections. The verb either inflects by itself or co-occurs with inflecting auxiliaries which carry tense and aspect information. This is summarised in the table below for the verb *maar-* 'hit'.

(1)

	Pres	Past	Fut	Impf Pres/Past	Perf Pres/Past	Prog Pres/Past
Urdu		maara	maareegaa	maartaa +Aux (be)	maaraa +Aux (be)	maar rahaa + Aux (be)

maar-*hit*—3.Sg.M

Independent of this basic tense/aspect paradigm, there are three distinct classes of verbal construction that will concern us in this paper. These constructions all superficially consist of the structure V1 followed by V2, where only V2 inflects.

- **Type 1:** $V1_{stem}$ V2 structures formed from what looks like the stem form of the main verb and an inflecting light verb.

- **Type 2 :** $V1_{inf.obl}$ V2 constructions where the main verb is in the oblique form of the infinitive.[4]

- **Type 3:** $V1_{inf}$ + casemarker V2 constructions where the infinitive or gerund also bears a case marker identical to those found on nominal arguments.[5]

In Type 1, the two verbs clearly predicate jointly and there is a great temptation to analyse these constructions as lexicalised constructions. However, their formation is entirely productive and the two verbs are independent

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[4] The infinitive also functions as a verbal noun (Butt 1993).

[5] Case markers in Urdu are clitics. The clitic *koo* fulfills both dative and accusative functions. The phonologically null case is consistently glossed as nominative. For a detailed discussion of the case system of Urdu see Butt and King (1999).

prosodic words. Another idea has been to view the V2 in these constructions as a subtype of auxiliary (e.g., Hook 1991). We show in the next section that auxiliaries must be distinguished very clearly from this type of construction.

In contrast, the V2 in Types 2 and 3 is predicationally clearly more independent than in Type 1. We attach some significance to the fact that the infinitive/gerund never appears with a case marker in Type 2 and argue that Type 2 is an instantiation of complex predication, while Type 3 is not. All three types of V-V collocations will be shown to involve aspectual properties, such as completiveness, causation or inception. We will argue that the aspectual part of the meaning is a direct result of the combinatoric nature of the syntax-semantics interface.

2.1   Type 3: V1_Infinitive+Case V2

A number of examples of Type 3 constructions are given below. Many Type 3 constructions are similar to obligatory object-control structures in other languages, with verbs such as 'tell' or 'force' being used (see examples (2) and (3) respectively).[6]

(2)   anjum=nee   saddaf=koo   [xat   **lik^h-nee]=koo   **kah-aa**
       Anjum.F=Erg Saddaf.F=Dat letter.M=Nom write-Inf.Obl=Acc say-
       Perf.M.Sg
       'Anjum told Saddaf to write the letter'

(3)   a. raad^{h}aa=nee mohan=koo   [kitaab paṛ^h-nee]=**koo**
          Radha.F=Erg Mohan.M=Dat book.F=Nom read-Inf.Obl=Acc
          majbuur ki-yaa
          force   do-Perf.M.Sg
          'Radha forced Mohan to read a book'

       b. raad^{h}aa=nee mohan=koo   [kitaab paṛ^h-nee]=**par**
          Radha.F=Erg Mohan.M=Dat book.F=Nom read-Inf.Obl=on(Loc)
          majbuur ki-yaa
          force   do-Perf.M.Sg

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[6] Note that the expression for `force' is actually a N-V complex predicate, but this fact does not make a difference for the purposes of this discussion.

       'Radha forced Mohan to read a book'

    c. raad^haa=nee mohan=koo   [kitaab paṛ^h-nee]=**kee liiyee**
       Radha.F=Erg Mohan.M=Dat book.F=Nom read-Inf.Obl=for
       majbuur ki-yaa
       force   do-Perf.M.Sg
       'Radha forced Mohan to read a book'

The case marker used on the V1 infinitive in the case of 'tell' is the accusative one; the case-marker when the V2 is 'force' seems to be subject to variation with little apparent difference in meaning.

2.2   Type 2: V1_Infinitive.Oblique V2

In Type 2 constructions, inflected infinitives in combination with another verb, but no case marker, give rise to inceptive (4a), and permissive (4b) readings.

(4)   a.   vo   **ro-nee   lag-ii**
           Pron.Nom cry-Inf.Obl be.attached-Perf.F.Sg
           'She began to cry'

      b.   kis=nee   kuttee=koo   g^har kee andar
          who.Obl=Erg dog.M.Obl=Dat house Gen.Obl inside
          aa-nee   dii-aa
          come-Inf.Obl give-Perf.M.Sg
          'Who let the dog come into the house?'   (Glassman 1976:235)

2.3   Type 1: V1_Stem V2

Type 1 constructions are possibly the most difficult to characterise semantically. Traditionally, the addition of the light verb has been said to contribute a range of meanings such as completion, inception, benefaction, force, suddenness, etc. (see Hook 1974 for a detailed study).

(5)   a.   naadyaa=nee xat   **lik^h lii-yaa**
           Nadya.F=Erg letter.M.Nom write take-Perf.M.Sg

'Nadya wrote a letter (completely)'

b.   naadyaa=nee makaan   banaa   **dii-yaa**
       Nadya.F=Erg house.M.Nom   make   give-Perf.M.Sg
       'Nadya built a house (completely, for somebody else)'

The common denominator of all these different types of meanings is the bounded or telic event that the construction seems to describe. Indeed, it is sometimes claimed that this class of light verbs is really just a class of aspectual auxiliaries giving rise to perfectives in the language (e.g., Hook 1991). However, as we show in the next section, the light verbs in question do not pattern with auxiliaries either syntactically or morphologically. While it is true that the light verb seems to create accomplishment predicates, this is crucially different from the role of an actual perfective tense form or auxiliary (see Butt and Geuder 2000 for detailed argumentation). In particular, the resulting accomplishments are not necessarily perfective, but occur in all the tense/aspect forms of the language (see (6b) for an example of the accomplishment predicate derived by a Type 1 construction occurring in the past continuous tense).

(6)   a.   mariam   iimeel   lik^h rah-ii   t^h-ii
             Miriam.F.Nom e-mail.F.Nom write PROG-F.Sg be.Past-F.Sg
             jab   vilii   kamree=mẽẽ   a-yaa
             when Willi.M.Nom room.M.Obl=in come-Perf.M.Sg
             'Miriam was writing an e-mail when Willi came into the room'

      b.   mariam   iimeel   lik^h maar   rah-ii
             Miriam.F.Nom e-mail.F.Nom write hit   PROG-F.Sg
             t^h-ii   jab vilii   kamree=mẽẽ   a-yaa
             be.Past-F.Sg when Willi.M.Nom room.M.Obl=in come-Perf.M.Sg
             'Miriam was dashing off an e-mail when Willi came into the room'

Significantly, the effect of the Type 1 construction is to create a different kind of *Aktionsart*, a distinction traditionally taken to be encoded within lexical items. This is a further factor in the impression that complex predicates of Type 1 are more tightly bound as a unit than the other two types.

3   Light Verbs Are Not Auxiliaries

Light verbs in Hindi/Urdu appear to make a functional contribution to the sentence as they signal the inception or completion of an event (among other things). For these reasons, light verbs have often been classed as a type of auxiliary. However, there is good evidence that Hindi/Urdu does possess auxiliaries, and that light verbs are syntactically and distributionally distinct from them in a number of ways. There are three uncontroversial auxiliaries in Hindi/Urdu, as shown in the table below.[7]

(7)

Form	Meaning	Inflection	Defective Cells
hoo	to be	Pres/Fut/Impf	Past
t^h-aa/ii/e/ll	be (Orig. stand)	Past	All Others
rah	Progressive	Perf	Pres/Past/Prog
	(Orig. stay)	(Fut/Impf only with special morphology	

Urdu Auxiliaries

It should be noted that the ordering within the Hindi/Urdu verbal complex is strict and requires a distinction to be made between main verbs, light verbs, the progressive auxiliary and the 'be' auxiliary.

(8)   Main Verb (Light Verb) (Progressive) (Be Auxiliary)

This is not in itself enough to argue that light verbs are not part of the subclass of auxiliaries. However, the V2 in the constructions we are examining are different from the auxiliaries above in the certain other important respects as well. Firstly, light verbs do not form a subclass of the tense/aspect system –they inflect according to all tenses and aspects, rather than forming a subclass of the possibilities. Secondly, unlike auxiliaries, light verbs do not have defective paradigms. Thirdly, auxiliaries and light verbs show distinct syntactic behaviours with regard to (at least) case marking, reduplication and topicalisation, as itemised below. For a detailed discussion, see (Butt and Geuder 2000).

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[7] Modals are ignored for the purposes of this discussion, as they function more like main verbs.

- Auxiliaries do not have an effect on the Case marking of the subject, light verbs do.

- Light verbs may be reduplicated, just like main verbs, auxiliaries may not.

- The main verb may be topicalised away from a light verb, but not from an auxiliary verb.

4   Light Verb Constructions Are Not All The Same

Light verb constructions are thus clearly differentiable from simple auxiliary cases. However, as mentioned previously, light verb constructions themselves do not form a unified class. As was already seen, even a superficial inspection of the morphology revealed that the three types of V-V construction are distinct. In this section, we describe the main syntactic and morphological properties of the three construction types and argue that simple phrase structural differences underlie those properties.

In all three types, V2 carries the inflectional morphology for the construction according to the standard inflectional paradigms of the language. Recall that **Type 1** in our classification consists of a V1 and a V2 where the form of V1 (the main verb) is the uninflected stem. In **Type 2**, the main verb V1 takes the form of the inflected infinitive. The inflected infinitive is a nominal form of the verb (see Butt 1993, 1995) for argumentation) which carries, in addition to the nominalising morphology −*n*− a suffix identical to the suffix found on masculine nouns ending in –*aa*.[8]The infinitive -*n*- generally shows agreement inflection for gender and number like other nouns in the language. **Type 3** also has a V1 in the inflected infinitival form, this time together with an actual case marker on the infinitive.

In the case of Types 2 and 3, two distinct events are more clearly distinguishable although one argument is obligatorily shared, while in Type 1 it is more difficult to see the light verb as introducing its own event at all. Further, in Type 3, the nominalised verb actually bears case suggesting that it bears a

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[8] This oblique suffix is obligatory when a masculine noun ending in -*aa* is followed by a case marker. It shows up here obligatorily on the infinitive even though there is no overt case marker present.

theta-role from the higher verb, V2. The morphology here may indeed be suggestive, but in any case it points to the nature of the questions to be asked here: we need to establish what the relationship is between the two verbal heads in the construction. Specifically, do they project independent clauses with distinct *complete functional complexes* (CFCs) or do the verbal heads in question in some way jointly determine a simplex CFC for the sentence? In investigating the monoclausal or biclausal status of these constructions in this sense, certain diagnostics from the literature can be applied, particularly for Hindi/Urdu (Butt 1995, Mohanan 1994).

Here we summarise the results based on the phenomena of anaphora, control, verb agreement, scrambling possibilities and the scope of negation to establish the syntactic patterns (further details may be found in the references cited above).[9]

(i)   Light verb constructions of **Type 1** are monoclausal from the point of view of agreement, control and anaphora, and in addition exhibit integrity with respect to scrambling and adverbial modification.

(ii)   **Type 2** constructions are monoclausal from the point of view of agreement, control and anaphora, but give evidence of separability with respect to scrambling and adverbial modification.

(iii)   **Type 3** constructions appear to be biclausal according to all of the diagnostics available in the language, without actually constituting separate tense domains.

5   The Syntax

We would like to make some very minimal assumptions about the phrase structural syntax that underlies the three different types of construction

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[9] The agreement test relies on the fact that agreement is clause bounded in this language. The anaphora test exploits the subject-oriented nature of the reflexive to probe the number of distinct subjects in the structure, and the control tests are similar in that it is well known that control is generally only possible from a subject position. Scrambling is quite free in Hindi/Urdu but certain predicate scramblings are disallowed. Adverbial modification can produce ambiguity when the two different verbs are separately modifiable.

examined here. We believe that given any articulated set of assumptions in syntactic theory, these diagnostics put some fairly unambiguous constraints on how they must be represented. The theory we will be using for the purposes of this paper is a simple binary branching phrase structural system within a generally minimalist framework (Chomsky 1993, 1995). We will also assume an articulation of the lexical syntax of the clause (generally following Hale and Keyser 1993), which involves the postulation of a main verbal head V, as well as a causative verbal head which introduces the external argument of the predication (Larson 1988, Kratzer 1996). Following current practice, we represent this causative verbal head as v (little v). vP as a whole thus represents the structuring of predicate argument relationships and is the thematic core of every complete functional complex. Sitting on top of vP we assume that there is a functional super-structure associated with the syntax of each clause (tense, external aspectual auxiliaries, Case-checking projections etc.). Since our concern will be more with the internal structuring of vP, we will not articulate the details of the functional structure associated with the sentence, but will use the catch-all projection label IP to represent each functionally complete clause in this sense, compressing all further details of articulation when convenient.

5.1   Type 3 - True Subordination

The most straightforward case is represented by the Type 3 constructions. Recall that Type 3 is unambiguously biclausal according to all of the diagnostics we examined. In addition, this is the construction where the V1 nominalised verb bears actual case-marking morphology. Thus, it seems clear that Type 3 must be treated as an instance of true subordination in which the V1 projects its own functionally complete phrase. This projection in turn then functions as the theta-marked argument of the higher verb V2. We remain agnostic here about the precise categorial nature of the V1 projection. As the projection of V1 is overtly case-marked, there is some reason to represent the projection as a DP. However, as the subordinate projection also determines its own complete functional complex and has the internal constitution of a verbal projection, a vP analysis would also be reasonable. We do not propose to resolve the naming problem with respect to this well-known issue in the treatment of gerunds/infinitives, but will stick to a vP label for concreteness.
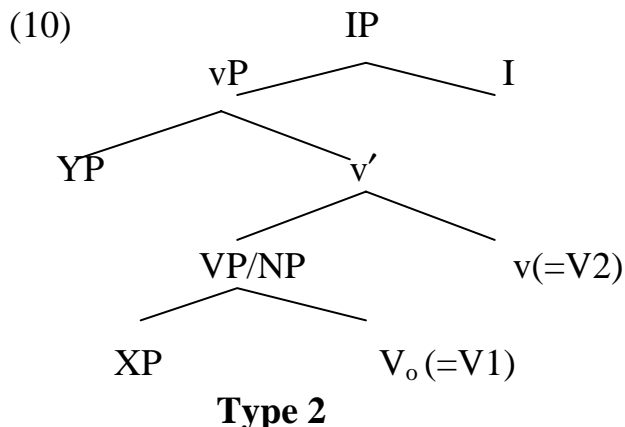
(9)

```
                    IP
                  /    \
               vP        I
            /      \
        YP          v′
              VP  /    \
            /   \        v
         vP      V_o (=V2)
        /‾\
     …V1…
```
Type 3
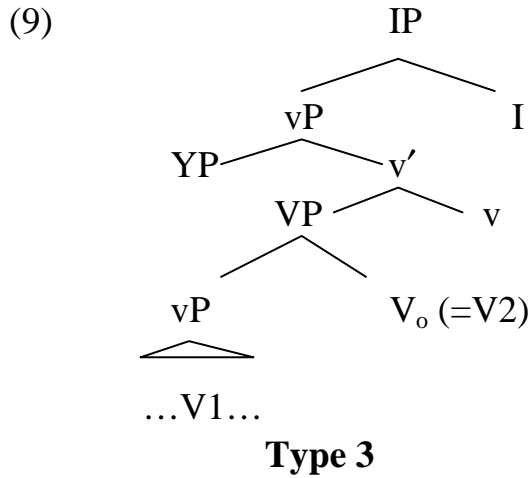
In these constructions, we will assume for concreteness that the little v head is filled by a default lexical item (causal head) in the language.[10] The other option would be for the V to possess the relevant features that would allow it to raise to the little v position. We believe this choice may vary from language to language or from verb to verb, but a decision here should not seriously affect the arguments we wish to make in this paper.

5.2 Type 2 - Head-to-Head Relationship within the same Extended Projection

Turning now to constructions of Type 2, we take seriously the facts concerning the monoclausality of these predicational structures and are therefore committed to structures which contain only one CFC in our sense. Further, because the V2 verb is the one which inflects and because it most clearly affects the interpretation and thematic status of the external argument, we assume that V2 is a hierarchically higher verbal head than V1 within the lexical structure. Indeed, it seems a plausible hypothesis to entertain that V2 in these structures is actually generated under little v and we argue later on that the semantics of V2 in Type 2 constructions is consistent with these light verbs being none other than lexically specific instantiations of a head which introduces the causer argument.
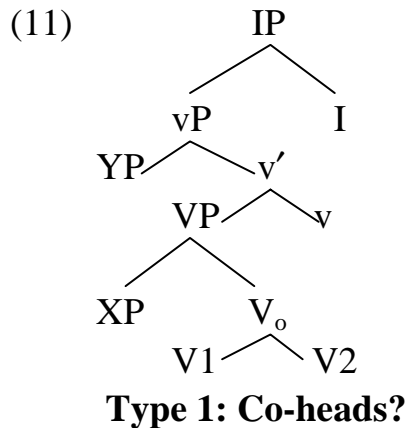
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[10] In fact there are reasons to believe that this is the case since specific light verbs may also be used in this position instead of the default causing head, but we do not have the space to go into these arguments here.

(10)

```
                            IP
              vP_____  I
                       \
       YP_____   v′
                    \
           VP/NP          v(=V2)
          /      \
      XP            V₀ (=V1)
```

$$\text{(10)}$$

Type 2

Because the V1 in these cases is inflected with the oblique infinitive suffix we assume that V1 again projects to a gerundive construction and label this as VP/NP. The VP label reflects the idea that the V1 does not project to a complete functional complex of its own, rather it must combine with the light verb in v(=V1); the NP label reflects its gerundive nature.

5.3   Type 1 - Co-Predication

With regard to constructions of Type 1, we are once again committed to only one CFC from the syntactic behaviour we have witnessed. But, in addition, the evidence from negation and adverbial modification shows that the separation of the event into subparts which we would expect to be possible if each of V1 and V2 were its own head in the predicational structure, does not seem to be possible here. The scrambling evidence too, points to a syntactic relationship between the two heads, which is not easily disrupted syntactically or semantically. On the other hand, phonologically and prosodically, V1 and V2 appear to be distinct (i.e. they are clearly not incorporated, or form one phonological word in any sense) despite being syntactically and semantically unified. A structure one might propose for this situation is that of co-heads in the same VP projection. Indeed, this is essentially the treatment proposed by (Butt 1995) for the Urdu complex predicates within an LFG analysis.

(11)

```
                IP
              /    \
            vP      I
          /   \
        YP     v′
             /    \
           VP      v
          /  \
        XP    V_o
            /     \
          V1       V2
```

Type 1: Co-heads?

From the point of view of the minimalist phrase structure we have been using so far, this is not obviously a theoretically viable alternative. However, (Baker and Stewart 1999) propose a double-headed structure very much like (11) for resultative serial verb constructions in Edo and point out that double-headed structures emerge as a natural consequence of the minimalist approach when two phrases combined by Merge are identical or nearly identical in syntactic features.

We could therefore in principle reasonably choose to adopt the co-head approach in (11). However, a consideration of further constructions crosslinguistically appears to indicate that the co-head approach disguises too many important questions concerning the structuring of events and the sharing of argument structures.[11] Verb-particle constructions in English and Scandinavian, Korean and Chinese resultatives (Geuder and Kim 2001, Scott 1996) and Scottish Gaelic verb-particle constructions (Ramchand 2000) seem to be similar to the Urdu V-V complex predicate in that they seem to project a single CFC with an attendant semantic resultative interpretation. We do not believe this to be accidental. In fact, the crosslinguistic regularity of this phenomenon will be predicted by the syntactic representation of event structure, which we believe underlies the possibilities of verbal meanings in natural language. The proposal we make for these Hindi/Urdu constructions will have obvious extensions to these other cases, although a detailed examination of the data from other languages is beyond the scope of this paper.

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[11] Note that in a framework like LFG, where argument structure relationships and the semantic interpretation of events are expressed in a separate module of the grammar, and not via hierarchical relationships, this is not an issue, and the co-head solution taken by (Butt 1995) may indeed be the most accurate and sensible one within such a theory.

While we do not specifically want to defend an analysis of verb particle constructions in this paper, the syntactic controversy surrounding them raises its head for our cases of complex predicates as well. In particular, within the verb-particle debate many researchers have favoured a small clause approach (Kayne 1985, den Dikken 1995, Svenonius 1996), while others have argued for a complex predicate approach (Neeleman 1994, Neeleman and Weerman 1993) and still others for a lexical approach (Stiebels and Wunderlich 1994). With respect to our Type 1 complex predicate, a lexical approach is clearly out of the question. The complex predicate approach of (Neeleman 1994) involved theta-role percolation to model the effect of co-predication. The small clause analysis on the other hand attempts to represent the argument structure relationships in an explicitly syntactic way. In principle, we are in agreement with the intuition behind the complex predicate approach, but find that it begs too many questions with respect to the building of events as guided by the syntax-semantics interface. For this reason, we will attempt to articulate our analysis in terms of the more explicit small clause structure. In the following section we therefore discuss our view of the syntax and semantics of events before returning to a discussion of the treatment of event building within complex predicates.

6   The Syntax and Semantics of Events

6.1   Background Assumptions

We adopt a neo-Davidsonian semantic representation (Davidson 1967, Higginbotham 1985, Parsons 1990) to tease out the differences in meaning among the different verbal collocations possible in Hindi/Urdu. Under this view, every verb contains an event position in its theta-grid, available for modification and theta-binding. Further, thematic roles are represented as separate relations connecting the event to an individual. See the representation of the simple sentence in (12).[12]

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[12] Note that we will have nothing to say about the number and type of theta roles that are available in this system, and we will also be abstracting away from the mechanisms of tense interpretation.

(12) Miriam drank 5 whiskies in the pub last night.
∃e[drinking(e, Miriam, 5 whiskies) & last-night(e) & in-the-pub(e) & Cul(e)]

In addition, we subscribe to the decompositional view of (Hale and Keyser 1993) and others, whereby the head which introduces the external argument is the implicit predicate of causation. Consider the English example below.

(13) John built the house.
∃e[building(e, John, the house) & Cul(e)]

Traditionally this is represented in a Davidsonian system with a single event position. But if Hale and Keyser are correct, then this can be potentially decomposed into two subevents related by causation where, e_1 is the causing or instigating force and e_2 is the event of house-building (we follow their notation in using → to represent the relationship between the subevents in (14)). Note that in the following representation and in the one which follows, the existential binding of the macro-event variable e should be thought of as a short-hand for the existential binding of all the subevent variables as well. We omit the extra existential quantifiers for ease of presentation.

(14) ∃e: e=(e1 → e2)[building(e, John, the house) & Cul(e)]

We assume that all events that are not unaccusative have their external argument generated in this way, with the attendant *causing event* position.[13]

In addition, we are concerned with one of the ways in which telicity is constructed in natural language since this too can involve relations between event positions. Following much recent work (see Parsons 1990 and Higginbotham 1999, Levin and Rappaport 1998 for an analysis in terms of a differing kind of lexical decomposition) we assume that accomplishment predicates (in the Vendler 1967 sense) are actually complex in that they consist

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[13] Some languages, like English, do not have an explicit morphological spell-out for this (default) causational head, giving rise to causative-inchoative alternations such as that found in break. However, some languages (like Hindi/Urdu in fact) have an overt morphological indicator of the complexity of the predicate in this case. We assume that these differences are irrelevant, and that the same underlying predicate argument architecture is present in all these languages.

of two subevents of process and telos respectively in their representation. In (15) we show a representation of the subevents process (e1) and telos (e2) as based on proposals by Higginbotham (1999).[14]

(15)   cross the street(e = <e1,e2>)
where e1 = the process of crossing the street
and e2 = the state of being on the outer side of the street

The event pair in angled brackets shown above can be called an *accomplishment event structure*, or a *telic pair*. We will only use the angled brackets when we mean that the event positions in question are related in this very specific aspectual way.

It is already known that individuals within our ontology can potentially contain sub-entities that also count as individuals, where each individual variable has exactly the same status as any other in terms of semantic type. In other words, the individual 'apple' could have systematic and relevant subparts (skin, core seeds etc.) which could be labelled as individuals in their own right, but this does not mean that 'apple' is anything other than an ordinary individual within the semantics. Similarly, the macro-event corresponding to a predication is just an event which happens to have sub-parts. For some linguistic purposes (anchoring to tense, adverbs and intersentential effects) this event is the only event variable manipulated or seen by the logical relations. However, the evidence from aspectual semantics and internal morphology of verbs indicates that eventive sub-structure is linguistically real and follows certain strict syntactic and semantic generalisations.

It is important to appreciate that unlike previous work in the literature, we are actually decomposing an event into a maximum of three potential subevents: causing event (e_1), caused process (e_2) and caused telos (e_3). The full potential decomposition of a lexical accomplishment would thus look as in (16). (We assume in addition that a macro event position e exists which interacts with external processes of modification and tense interpretation and certain higher level adverbials.)

(16) $e: e = e_1 \rightarrow < e_2, e_3 >$

---

[14] Note that we follow Bach (1986) in considering states a subtype of eventualities.

Higginbotham (1999) argues that telicity needs to be linguistically represented, and moreover that the process of telic pair formation is not just a lexical decompositional fact but can take place constructionally in the syntax. (Folli 2000) argues this process to be at work in Italian path of motion constructions. She argues that while it is possible to have verbal predicates that are lexically specified as accomplishments, it is also possible to form accomplishment interpretations by the addition of prepositional phrases in Italian, where it can be shown that neither the motion verb by itself nor the locative preposition independently have accomplishment interpretations (again, compare Levin and Rappaport 1998 who formulate a similar proposal, though not in Neo-Davidsonian terms). (Folli 2000) represents the Italian example as follows (using the Higginbotham 1999 system).

(17)   La palla rotoló sotto il tavolo
         The ball rolled under the table
         'The ball rolled under the table'
         $\exists e: e = <e1, e2>[\text{roll}(e1, \text{the ball}) \& \text{under}(e2, \text{the table})]$

In addition, (Ramchand and Svenonius 2000) argue that it is this process that is partially responsible for the distinctive syntactic and semantic properties of particle constructions in Celtic and Germanic. A Higginbothomic representation of an English particle construction would be as in (18) below.

(18)   The judges handed in the results/handed the results in
         $\exists e: = <e1, e2>[\text{hand}(e1, \text{the judges}, \text{the results}) \& \text{in}(e2)]$

Higginbotham's (1999) representation omits a full indication of argument structure in (17), and by extension an indication of the argument structure of the preposition in (18). The notation in (19) amends this and makes the identity of argument positions between the internal argument of 'hand' and the argument of the preposition explicit.

(19) $\exists e: = <e1, e2> \exists x[\text{hand}(e1, \text{the judges}, x) \& \text{in}(e2, x) \&$
         'the results'$(x)]$

We will exploit these ideas of event structure decomposition in what follows, but use the three types of Hindi/Urdu V-V constructions as a test-bed for the formulation of an explicit set of syntactic conditions on the ways that event building can occur in the grammar. We believe that causation and telic pair formation are the fundamental semantic combinatoric operations available in the grammars of natural language and that they are more primitive than other sorts of semantic relationships that can obtain between events. Other relationships between events are possible, as we will see, but they do not give rise to single (albeit complex) event structures or monoclausal predication.

The intuition behind our analysis is that verbal event positions interact in different ways in the different types of construction in Hindi/Urdu. These semantic combinatoric differences correlate with differences in morphology on the one hand and differences in syntactic structure on the other.

6.2   Type 3: Head-Complement Relationship

Recall that Type 3 is the most straightforward of the three constructions, being unambiguously biclausal by all the syntactic diagnostics. In particular, the evidence points to there being two different argument structure grids intact with two different subject positions. Thus we assume that we are dealing with two distinct complete functional complexes. In the cases that we are crucially concerned with, the infinitive, moreover, is marked with the accusative case. We take this construction to be a case of true subordination. In other words, the accusative marked infinitive really is a complement of the higher verb, containing a PRO subject, which is controlled by the dative object of the higher verb. In the representation that follows we abstract away from event decompositions which are irrelevant here and focus on the relationship between the macro event variable e' introduced by the 'write' verb and the macro event position e introduced by the 'tell' verb: here e' is simply an argument of the verb that introduces e.

(20)   anjum=nee   saddaf=koo [PRO xat   **lik^h-nee]=koo**
        Anjum.F=Erg Saddaf.F=Dat   letter.M.Nom write-Inf.Obl=Acc
        kah-aa
        say-Perf.M.Sg}
        'Anjum told Saddaf to write the letter'

(21)   V1 = write (e, x, letter) V2 = tell (e', y, z, e")
       $\exists e \exists e' \exists x$[telling(e, 'Anjum', 'Saddaf', e') & writing(e', x, the letter) \&
       Saddaf(x)]
    'Anjum is the agent of a telling event to Saddaf which brings about
     Saddaf writing the letter'

The matrix V (V2) is instantiated by the 'tell' verb, a ditransitive verb whose subject and indirect object are realized in the outer shell. It also takes an event argument, which is syntactically a vP, as shown in (22). The event e' is introduced by the 'write' verb, which also has an object and a PRO subject.[15]

(22)
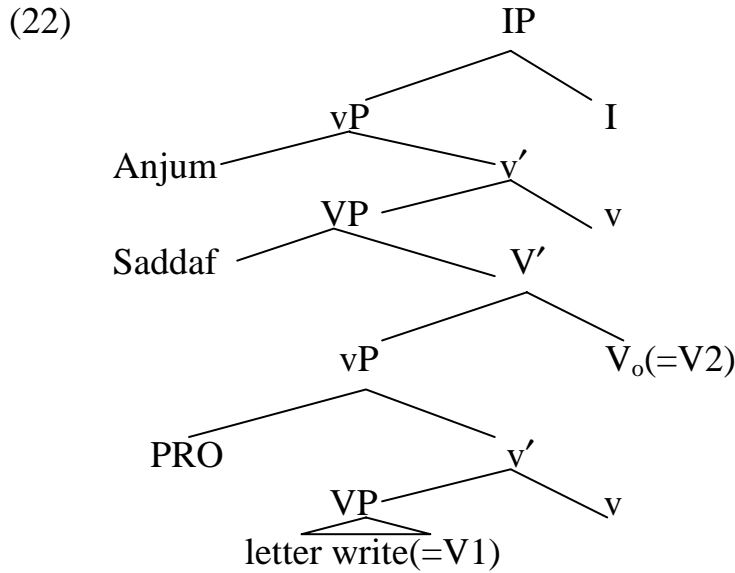
6.3   Type 2: Verbal Instantiation of v

Recall that Type 2 constructions showed syntactic evidence for monoclausality while still maintaining the two verbs as separable elements. We therefore cannot assume a direct theta-marking relationship between the event introduced by V1 and that introduced by V2 for the Type 2 constructions, since that would give rise to two distinct predicational domains. Furthermore, if we

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[15] In the semantic representations, we represent the existence of a PRO subject with a variable in the thematic grid, which is then tied by predication to the DP that controls it. This is a mere notational convention to make the relationship between the syntactic representation and our logical representations more transparent.

inspect the permissive structures in (23) closely, we can observe a number of interesting semantic characteristics.

(23) a. naadyaa=nee anjum=koo nikal-nee   dii-yaa
         nadya.F=Erg anjum.F=Dat emerge-Inf.Obl give-Perf.M.Sg
         'Nadya let Anjum get out'

     b. anjum=nee   saddaf=koo   xat   lik^h-nee
         anjum.F=Erg saddaf.F=Dar letter.M.Nom write-Inf.Obl
         dii-yaa give-Perf.M.Sg
         'Anjum let Saddaf write a letter'

In all these cases, the arguments related to V1 include everything but the subject. The subject, on the other hand, is the external agent or causer of the whole V1 event. Moreover, the specific mode of causation (facilitation in the examples above) depends on the specific choice of V2.

Interestingly, Hindu/Urdu also possesses explicit derivational morphemes (-*aa*/-*vaa*), which indicate general causation.[16] When the V1 verbs in the examples above are causativised using this morpheme, they can give rise to the same argument structure and case marking pattern as in the light verb constructions: compare (23a) with (24a) and (23b) with (24b).

---

[16] With the -*vaa* causative it is also possible to have an optional instrumental marked argument, either in addition to the -*koo* marked argument, as in (ii) below, or instead of it as in (i). This instrumental can be interpreted as a demoted agent.

(i) naadyaa=nee (anjum=see)   xat   lik^h-vaa-yaa
    nadya.F=Erg (anjum.F=Inst) letter.M.Nom   write-Caus-Perf.M.Sg
    'Nadya had the letter written (by Anjum).'

(ii) naadyaa=nee anjum=koo (yassin=see)   xat   lik^h-vaa-yaa
     nadya.F=Erg anjum.F=Acc (yassin.M=Inst) letter.M.Nom write-Caus-Perf.M.Sg
     'Nadya had the letter written for Anjum/taught Anjum to write the letter (by
     Yassin).'

We will have nothing to say about these constructions here, noting only that the case marking pattern which parallels the complex predicate can also be found with causatives. See Butt (1998) and Saksena (1980, 1982) for a more detailed discussion of causativization patterns in Hindi/Urdu.

(24)   a. naadyaa=nee anjum=koo   nikaal-aa
           nadya.F=Erg anjum.F=Acc emerge.Caus-Perf.M.Sg
           'Nadya pulled Anjum out'

       b. anjum=nee   saddaf=koo   xat   lik^h-naa-yaa
           anjum.F=Erg saddaf.F=Acc letter.M.Nom write-Caus-Perf.M.Sg
           'Anjum had the letter written for Saddaf/taught Saddaf to write the
            letter'

   For these reasons, we assume that constructions of Type 2 are complex
lexical structures where the light verb (V2) is an overt instantiation of little v,
and V1 is the main verbal predicate. Following the notation of (Hale and Keyser
1993), the macro event 'write-let' is decomposed into two subevents, e_1 and e_2;
e_2, the cause, introduces an agent and implies the caused event e_1, namely, the
writing.

(25)   V1 = V = write(e, y, z) V2 = v = Cause$_{allow}$(e$'$, x, e$''$)
       $\exists$e: e = e_2 → e_1 [write(e_1, saddaf, letter) & Cause$_{allow}$(e_2, anjum, e_1)]
       'Anjum is the causer/allower of a subevent of Saddaf writing a letter.'

(26)
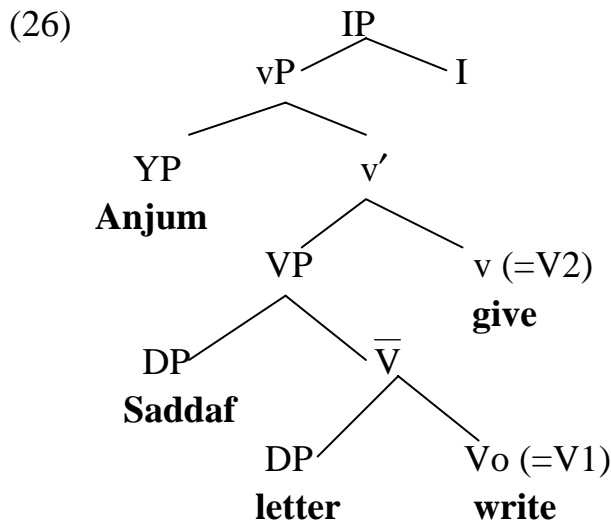
   Recall that Type 2 also exhibited some aspectual constructions whose
existence is not immediately predictable under other approaches. Under our
conception of event building via the syntax-semantics interface, however, a
more specific kind of aspectual interpretation via little v is expected, given that

more than one type of verb can plausibly appear in this position. In inceptive examples as in (27), we find two verbal heads but only one argument (as opposed to the permissive above, where the v clearly makes an independent contribution to the argument structure).

(27)   naadyaa   roo-nee   lag-ii
     nadya.F.Nom cry-Inf.Obl be.attached-Perf.F.Sg
     'Nadya began to cry'

For this case, we assume the same lexical structure as before, but posit that v is occupied by the aspectual verb lag. However, as opposed to the analysis for the permissive, and as shown in (29), v has no specifier here. This translates into the fact that there is no perceived external causer of the event, but that there is some situation e_2, as expressed by the v head, which brings about the e_1 event. The aspectual verb in v is still consistent with the general semantics of causation, but lexically provides a more specific semantics, that of inception.

(28)   V1=V=cry(e, x)   V2=v=begin(e′, e″)
     $\exists e$: e= $e_2 \rightarrow e_1$ [crying(e_1, nadya) & begin (e_2, e_1)]
     'Nadya begins to cry'

Since the specifier of vP is assigned no theta-role, the argument of `cry' raises through that position to the normal Spec position higher up in the clause and is grammatically realised as a subject.

(29)

We expect that due to Saussurean arbitrariness, there is nothing in principle which limits how specific the semantics of the light verb instantiating v can be.

The only constraint is that it be some sort of mode of causation. Only the null or default little v will have pure and maximally general causational semantics.

6.4   Type 1: Telic Pair Formation

In this section we return to the question of the representation of Type 1 constructions. Recall that these V-V sequences exhibited the greatest degree of syntactic and semantic integrity of the three types we examined. Thus, we are once again committed to a monoclausal structure. In addition, Type 1 constructions seem to construct accomplishment interpretations. Semantically, then, Type 1 is a classic example of accomplishment formation in the syntax where the event positions contributed by each predicate combine by telic pair formation to create a bounded process.[17]

(30)   a.   naadyaa=nee xat   **lik^h lii=yaa**
              nadya.F=Erg letter.M.Nom write take-Perf.M.Sg
              'Nadya wrote a letter (completely)'

        b.   naadyaa   **gir   ga-yii**
              nadya.F=Erg fall   go-Perf.F.Sg
              'Nadya fell (down)'

Recall also that the light verb (V2) determines the case marking of the subject. We take this as an indication that the SpecvP position should be theta-marked. We analyse this type of construction semantically as was represented in 6.1 and repeated here.

(31)   e: e = e$_1$ → < e$_2$, e$_3$ >

---

[17] As mentioned, light verbs in Type 1 constructions contribute many other semantic dimensions (e.g., benefaction, forcefulness, suddenness) to the predication. Butt and Geuder (2000) treat the contribution of this additional information as a type of adverbial modification, an approach that is compatible with the approach taken in this paper. However, we do not specify a treatment of these extra semantic dimensions here as our focus is on the mechanisms of event building.

The contribution of the V2 is to provide the causing and process part of the event while V1 represents the final state achieved. A sample analysis of (30a) in terms of this notation would look as in (32).

(32)   V1 = written(e, y) V2 = CAUSE-PROCESS (e′ (=$e_1 \rightarrow e_2$), x, y)
         $\exists e: e = e_1 \rightarrow < e_2, e_3>$ [Cause-Process ($e_1 \rightarrow e_2$, nadya, letter) & written(e_3, letter)]
         'Nadya instigates a process affecting a letter which has the result that the letter comes to be written'

Once again we assume that the light verb is generated in V but either raises to v, or that a default null v is inserted.

Note that as opposed to the analysis for Type 3, there is only one macro event involved, reflecting the tighter relationship between V1 and V2 in Type 1 as compared with Type 3. The question here is how this kind of semantic interpretation maps on to the syntax in such a way as to explain the tightly knit behaviour of this collocation (and indeed other accomplishment inducing pairs such as V-particle in Germanic for example).

To represent the accomplishment decomposition into process and telos, we propose a further articulation of the lexical syntax as follows, where $R_v P$ stands for ResultPhrase.

(33)

```
                                vP
              DP_____        _
                            \          v̄
              /\              \      /    \
           causer             \    /      \
                             VP          v
                          /      \       cause
                       DPᵢ        V̄
                      /    \     /    \
        object of change  RᵥP      V (=V2)
                        /    \      change
                     DPᵢ      Rᵥ′
                    /    \      |
         object of result   Rᵥ (=V1)
                           result state
```
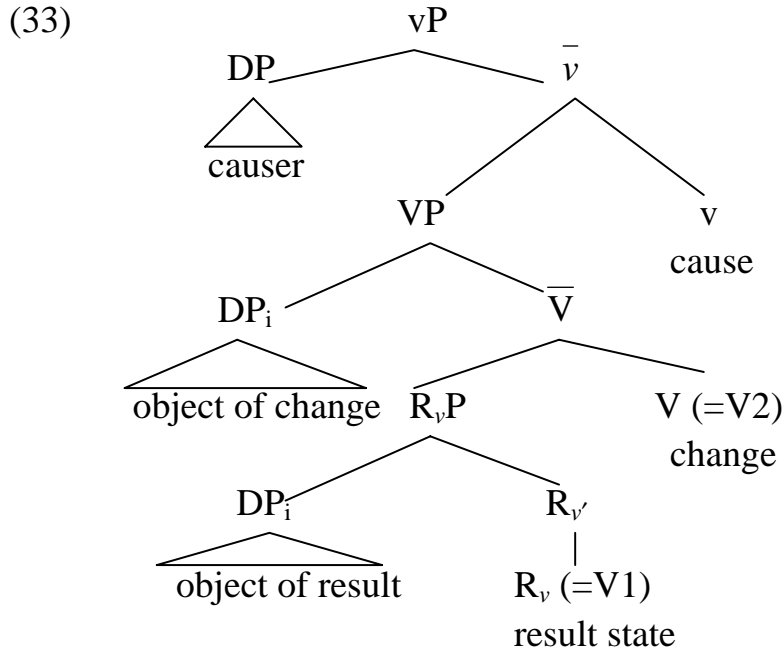
The accomplishment reading of complex predicates of this type can be described by saying that the agent causes some change that brings about the letter achieving the resultant *written state*. Indeed, in a closely related language, Bengali, the very same class of accomplishment complex predicates is found but in this language the V1 in the combination shows up with explicit perfect participle morphology (34).

(34)   Ruma cithi-ṭa   **lekh-e**   **phello**
       Ruma letter-DEF write-PERFPART threw-3RDPAST
       'Ruma wrote the letter (completely)'

The important thing about the semantics of this construction is that the argument that is said to undergo the change is the very same as the argument that achieves the final state, and this identification is obligatory. We surmise that the identification of the specifier positions of R_VP and VP is a pre-condition for the semantic combinatoric operation of telic pair formation.

     Thus, we represent the lexical structure for example (30a) as shown below:.

(35)

```
                    vP
         DP ——————————— v̄
        Nadya            |
                    VP ————————— v
                   /    \      (cause)
                DPᵢ      V̄
                /\      /   \
            letter   RᵥP     V
                    /  \    take (process)
                 DPᵢ    R′
                 /\    /  \
             letter    Rᵥ
                     write (telos)
```
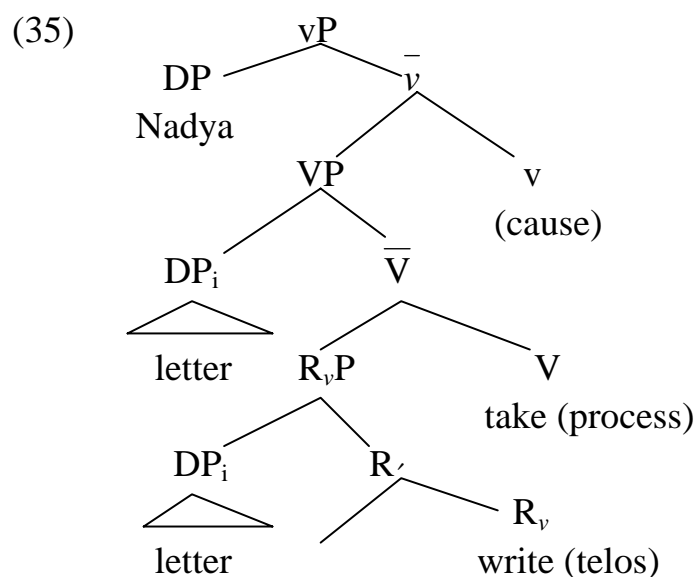
Under this view, the V2 verb *liyaa* -take is the spell out of the head which is base generated in V and moves up to v, while the V1 verb *likh*-write is base generated under R_v. We remain agnostic at the point of writing this paper as to the correct way of representing the specifier identity of R_vP and VP: it does not seem to us to be equivalent to any of the relations already given in the standard framework. The word order facts of the language also make it impossible to show exactly where the DP in question is located at S-structure, since in principle either location would be consistent with preverbal order.[18]

This analysis is like the small clause analysis of particle constructions in that it explicitly represents the arguments of the preposition in a full predicational structure. It is similar to the complex predicate analysis of these constructions in that it argues that the two argument structures are unified within the same CFC within one verbal projection. Crucial to our proposal is that idea that verbal predication decomposes (maximally) into these three distinct heads with very specific semantic and argument structure connections. In some languages, with some verbs, this full articulation of lexical semantic structure can be projected by a single listed item in the lexicon (e.g. *build* in English). For other languages, the separate heads in the structure can be separately and productively lexically

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[18] Under the complex head analysis available in LFG, the argument structure identity of the object of the result predicate and the object of the dynamic predicate would have to be stated in a separate module of argument structure. The aspectual facts would be stated in semantic structure, with correspondences stipulated among the three levels of representation. We do not pursue this type of analysis any further in this paper.

instantiated. We have seen this to be case for both v and V, and v/V and R in Hindi/Urdu; particle constructions are another example in Germanic languages where V and R can be separately and productively expressed.[19]

7   Conclusion

In this paper, we have argued that there are three distinct types of V1-V2 collocation in Hindi/Urdu. Using the syntactic diagnostics made available by the language, we argued that one type, Type 3, was a case of genuine syntactic and semantic subordination. The other two types are what we would call *complex predicates* in the sense that V1 and V2 combine to form a single CFC. In Type 2, we argued that V1 and V2 were lexical instantiations of V and v in the lexical structure respectively. In Type 3, we found that V1 and V2 instantiate R_V and V/v respectively, where R_V was the head of the projection representing the final state achieved by the direct object. We were able to account for the (sometimes surprising) aspectual readings within the Type 1 and Type 2 constructions precisely because our view of event building allows us to posit a more complex interaction between parts of the syntax and the semantics.

If our analysis is correct, complex constructions in Hindi/Urdu therefore offer striking syntactic, semantic and morphological evidence in favour of an event structure decomposition of the form 'causation $\rightarrow$ < process, telos >', which can be seen to underlie verbal predication in natural language. We have also suggested that the same basic event building structures might underlie superficially dissimilar constructions in other languages, such as resultatives in Korean and particle-shift constructions in English and Scandinavian. We leave these extensions to further research.

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[19] There is (at least) one obvious semantic difference between particle constructions and the Type 1 constructions in Hindi/Urdu. In particle constructions the result state is expressed with a highly underspecified predicate, giving a very general and contextually sensitive meaning for the final state achieved. In accomplishment complex predicates of Type 1 in Hindi/Urdu, the final state achieved is very specific, while the action that brings it about is expressed by the light verb and is highly underspecified. We don't think that this makes a difference to the structural and aspectual relations involved, or militates against the similarity of structure that we have argued for.

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Grammar learning using Inductive Logic Programming

STEPHEN PULMAN & JAMES CUSSENS

Abstract

This paper gives a brief introduction to a particular machine learning method known as inductive logic programming. It is argued that this method, unlike many current statistically based machine learning methods, implies a view of grammar learning that bears close affinity to the views linguists have of the *logical problem of language acquisition*.

Two experiments in grammar learning using this technique are described, using a unification grammar formalism, and positive-only data.

What is Inductive Logic Programming?

Inductive Logic Programming (Muggleton & DeRaedt 1994:629-679) is a machine learning technique that builds logical theories —here, (full) first order logic— to explain observations. 'Explain' here means that it is possible to deduce the evidence from the axioms of the theory (and not be able to deduce negative evidence). ILP is best introduced via the following schema and consequent derivation:

(1)   Background & Hypothesis ⊨ Evidence

We do not assume a tabula rasa: for reasons that every linguist will be familiar with, it is necessary to assume a fairly rich set of background assumptions to constrain the space of possible hypotheses. Given this background, and the evidence, the task is to come up with a hypothesis such that when it is conjoined with the background, the evidence can be deduced from it.

Each of the components in the above schema is represented as a set of logical statements.

Notice that schema 1 is logically equivalent to 2, since if $P \models Q$ then $P \to Q$ (the deduction theorem), and $P \to Q \equiv \neg Q \to \neg P$ (contraposition):

(2)   Background & $\overline{\text{Evidence}} \models \overline{\text{Hypothesis}}$

(where the overline indicates negation.)
Since Background & $\overline{\text{Evidence}}$ is by hypothesis, consistent, it will be the case by Herbrand's theorem[1] (provided that we restrict the form of H and E) that there is some finite set of ground clauses that are true in every model of that expression.
Step 3 of the derivation is:

(3)   Find set of clauses $\overline{C}$ true in every model of:

Background & $\overline{\text{Evidence}}$.

Notice that we represent this set of clauses as a negation, to make succeeding steps tidier. Since this set of clauses is true in every model of Background & $\overline{\text{Evidence}}$, then the following step of the derivation holds:

(4)   Background & $\overline{\text{Evidence}} \models \overline{C} \models \overline{\text{Hypothesis}}$

Note that $\overline{\text{Hypothesis}}$ will be a subset of $\overline{C}$.
The remaining two steps of the derivation follow simply:

(5) $\overline{C} \models \overline{\text{Hypothesis}}$

(6)   Hypothesis $\models C$

From step 6 we can now *invert entailment* to work out candidate hypotheses. Clearly C is one such candidate; generalisations of C constitute others.

---

[1] Herbrand's theorem states that a formula has a model iff it has a Herbrand model, where this is artifically constructed from the constants occurring in the formula itself. In the case where there are no functions in the formula, the model will be finite. See e.g. ChangLee73, Chapter 4.

(Muggleton 1995:245-286) gives an algorithm for enumerating likely candidates, which can then be subject to various preference measures (simplicity, coverage etc.)

Chart Parsing

Chart parsing (Winograd 1983) is a well known technique for finding all possible parses of a sentence with respect to a particular grammar: usually one with a context-free backbone, although richer formalisms can also be accommodated. Constituents are represented as predicates relating positions *vertices* between words in the input sentence; thus a parsed sentence like `Joe sneezed' could be represented as:

Id	Constituent	From	To	Containing
c1	Name	0	1	Joe
c2	V	1	2	sneezed
c3	NP	0	1	c1
c4	VP	1	2	c2
c5	S	0	2	c3,c4

The equivalent tree representation would be:

```
            S
          /‾‾\
       NP      VP
       |       |

      Name     V
      Joe     sneezed
```
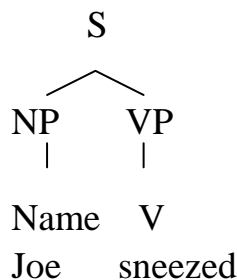
The advantage of a representation like this is that ambiguity can be represented economically, as can incomplete constituents, by the addition of an extra column indicating which components are still needed.

Abstracting away from details of data structures and control regimes, we can represent chart parsing as a deductive operation. The *rules of inference* can be

represented as follows, where the first line represents the required input premises and the second line represents the conclusion:

Propose:

$$\frac{C_1 \text{ from X to Y and Rule } A \rightarrow C_1 \ C_2\dots C_n}{A \rightarrow C_1 \bullet C_2 \dots C_n \text{ from X to Y}}$$

Propose is the rule that hypothesises a new constituent based on the existence of its leftmost daughter. It says: "if there is a constituent C_1 from position X to position Y, and there is a grammar rule which builds an A from a series of constituents beginning with a C_1, then begin a new constituent, an incomplete A, consisting solely of the recognised C_1, but expecting to find the remainder of the constituents".

The notation $A \rightarrow C_1 \bullet C_2 \dots C_n$ from X to Y is to be read as 'something which will be an A when we have found $C_2 \dots C_n$'. We can picture this as:
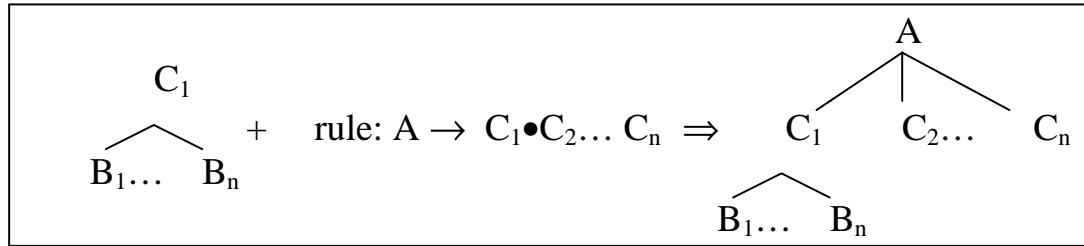
Other formulations of Propose are possible, reflecting different parsing strategies: e.g. right to left (the version above is left to right), head-driven etc.

The other main rule is *Combine* which combines an existing incomplete constituent with an existing complete one.

Combine:

$$\frac{A \rightarrow C_1 \ \bullet C_i \dots C_m \text{ from X to Y and } C_i \dots \text{from Y to Z}}{A \rightarrow C_1 \dots C_i \bullet C_{i+1} \dots C_m \text{ from X to Y}}$$
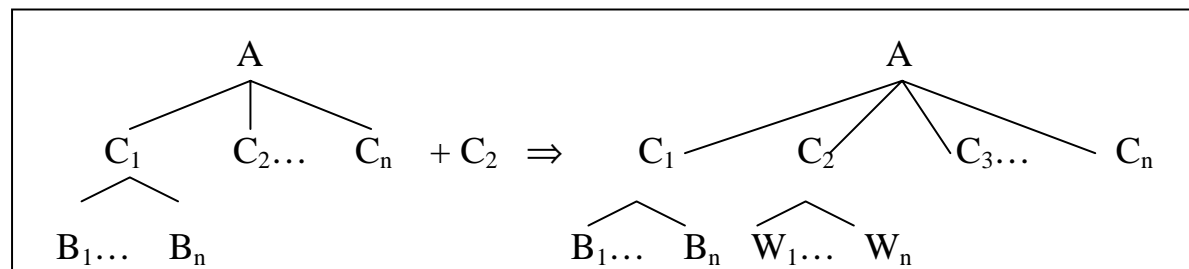
If we initialise by substituting in constituents for each lexical entry for each word, and apply the above two rules repeatedly in any order as many times as possible, then we will find all the parses for the input sentence according to the given grammar. Even if there is no complete parse for the sentence, we will find all the complete subconstituents, and as many incomplete subconstituents as can be recognised given the current formulation of Propose.

The deductive formulation of chart parsing (Shieber et al 1995) makes clear that we are reasoning from an initial set of axioms (lexical entries for a sequence of words, and some grammar rules) to a particular conclusion (i.e. that the sequence of words is a sentence). Different derivations of this conclusion represent alternative syntactic structures for the sentence.

Hypothesising missing rules

The basis of the grammar learning algorithm is as follows. We assume an initial small grammar, which will correctly parse some sentences. We then try to parse a corpus of sentences, which may contain constructs not covered in the original grammar. The chart parsing algorithm gives us the constituents of the sentence that can be analysed. Using the information in the grammar and the record of constituents in the chart, we then try to hypothesise which rules could be added to obtain a complete parse.

We can formulate this process as a deductive one. The first rule below propagates *Needs*, i.e. hypotheses about what type of constituents are missing.

Needs:

$$\frac{\text{rule: } A \rightarrow B\ C,\ X<Y<Z,\ \text{need A from X to Z, got B from X to Y}}{\text{need C from Y to Z}}$$

We start off the process of propagating needs (in the simplest case) by assuming that the sentence in question is grammatical, and that we therefore need an S from the initial to the final vertex. Applying the Needs rule will tell us what constituents we are lacking in order to make a completely parsed sentence.

The second rule uses 'the needs' to make hypotheses about possible missing rules:

Hypothesise:

rule: A → B C, need A from X to Z, got B from X to Y, got $D_i...D_n$ from Y to Z
hypothesize C → $D_i...D_n$

Note that both Needs and Hypothesise actually should be formulated in a more general way to account for the possibility of rules with varying numbers of daughters, and for the varying positions of already parsed subconstituents with respect to the hypothesised needs and rules.

We can illustrate the operation of Need and Hypothesise with respect to the following simple grammar:

Example

S	→ NP VP
VP	→ V
V	→ snores
V	→ sees
NP	→ John, Mary

This grammar contains a transitive verb but has no rule for the corresponding verb phrase. After trying to parse *John sees Mary* we will have a chart that contains (among others) the following complete and incomplete constituents, which will give rise to the needs and hypotheses indicated:

```
          S                    Need S from 1 to 4...
         / \
        /    VP                so need VP from 2 to 4.
       /                       got V from 2 to 3,
     NP     V    NP            got NP from 3 to 4,
     |      |    |             so hypothesise (1) VP -> V NP
   1 John  2 sees 3 Mary 4
```

Note that there will be several other logically possible hypothesised rules arising from the application of Needs and Hypothesise, including:

(2) S → NP V NP
(3) S → NP VP NP, etc.

Hypothesis 2 builds a sentence without a VP constituent, and hypothesis 3 builds a sentence with an intransitive VP followed by an object. Nothing in what we have done so far says that these are in some sense unlikely candidates compared to hypothesis 1.

Can we cast what we have done so far within the ILP schema? Our evidence is the observation that some sequence of words forms a sentence. Our background is the existing grammar, and the subconstituents that have been found in the chart. To arrive at our hypotheses, we are essentially reasoning backwards (inverting entailment) from the evidence, to find candidate rules such that if we added them to the grammar, the conclusion that the sequence of words constituted a sentence would follow.

So far, any logically possible hypothesis will count as a valid one. As every linguist knows, this is too unconstraining a position. We need to enrich our background knowledge with a notion of a *humanly possible rule* so as to favour natural candidates and eliminate logically possible but linguistically impossible ones. In order to do this we need a precise definition of the linguistic formalism in which our grammars are couched. Recent theories of grammar within the Chomskyan tradition unfortunately do not provide —definitions or even examples— at the level of formal detail necessary for computational implementation. Instead we turn to a simple form of unification grammar (Shieber 1986, Pulman 1996:295-328) which has proved itself rich enough to serve as the basis for large scale grammatical descriptions in its own right, as well as serving as a target language for the compilation of many current feature-based formalisms like HPSG (Carpenter 1995).

Meta-grammar of rules

In our experiments syntax rules consist of a mother category and zero or more daughter categories. A category consists of a label like S, NP, etc. with a set of feature-value equations. Values can be atomic, boolean combinations of atomic values, categories, lists of categories, or variables. A typical rule in this formalism is:

s_np_vp s:[gaps=A,mor=B,type=C,inv=n] ==>
            [np:[gaps=[ng:[],ng:[]],mor=B,type=C,case=subj],
              vp:[gaps=A,mor=B,aux=_]].

This rule says, roughly speaking, that a non-inverted sentence (of various types: main, relative etc.) consists of an NP and VP, which must agree in their relevant morphological features (mor). The sentence node also inherits these values: B is a variable which must have the same value wherever it occurs. The value of mor is a boolean combination of number, person, and verbal features. The type of the sentence is determined by the type of the subject noun phrase (wh, relative, normal, etc.). The gaps feature implements movement via a threading mechanism (Pereira 1981:243-256) which has the same ancestor as the slash feature of GPSG (Gazdar et al 1985) and HPSG (Pollard and Sag 1987). The subject NP must not contain a gap.

A linguistically possible rule in this formalism must obey various conventions. We assume rules have no more than three daughters. We axiomatise a head relation: thus verbs are the heads of verb phrases, and verb phrases are the heads of sentences, and so on. We prefer rules that conform to something similar to X-bar conventions. Various features like morphology are constrained by a version of head feature convention. Gap features are rather heavily constrained, since their logic is very complex (Cussens & Pulman 2000:143-156). 'Useless' rules are declared illegal: a useless rule is one that could lead to a non-terminating unary tree derivation: e.g $A \rightarrow B$ where we already have $B \rightarrow A$.

The above-mentioned extra components of our background knowledge about natural or possible rules can be used to filter out impossible hypothesised rules and to rank the remaining ones in order of preference.

However, we are still not in a position to produce completely natural rule candidates. Recall that our Needs and Hypothesise rules act only on a single sentence. This has two disadvantages: firstly, since the partially parsed sentence will contain information from particular lexical entries, the hypotheses produced will be too specific, including information about agreement or other properties that are dependent on particular lexical items and not an essential part of the the rule that is being learned. Secondly, and this is a rather more subtle and possibly serious point, we will not produce sensible hypotheses for sentences that would require multiple recursive applications of the rule(s) that are being

hypothesised. To illustrate this latter point, imagine that we have a sentence NP V PP PP PP, which should have the structure indicated:

```
              S
           /     \
         NP       VP
                 /   \
               VP     PP
              /   \
            VP     PP
           /  \
          V    PP
```
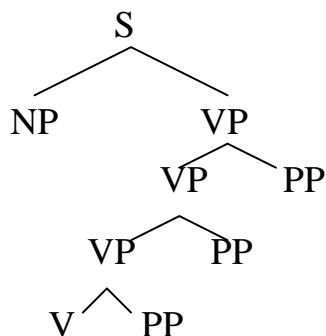
We have the partial grammar S → NP VP, and VP → V PP. A linguistically natural rule to produce the desired parse would be VP → VP PP, but this will not be hypothesised by our procedure; instead, we will postulate rules like VP → VP PP PP, or VP → V PP PP PP.

To attempt to overcome both of these problems, we run our learning algorithm over a corpus of sentences twice. The first time we produce candidate rules, filtered and ranked according to the criteria above. Then we carry out two further operations: firstly, we collect together candidates that have the same phrasal skeleton, and produce their *least general generalisation*. This is another simple means of inverting entailment: we are producing from sentence-specific candidates a more general candidate, which implies all its more specialised versions. The aim here is to be able to abstract away from information which is specific to particular words and which varies across different instances of what our algorithm regards as constituents built by the same rule. We find the *least general generalisation* because we want to retain information that stays constant across the candidates.

Secondly, we reparse the corpus having added the hypothesised rules to the grammar and rank the hypotheses according to the number of previously unparsed sentences that are parsed successfully by means of the hypothesised rules. In order to solve the second problem referred to above, we have to hope that any reasonably sized corpus would contain examples requiring only one application of a missing rule and that these might be more numerous than those that require more than one. Under these circumstances we ought to find that the correct rule is hypothesised on the basis of the examples requiring only one application, and this hypothesis should become highly valued because it will

occur multiple times in the analyses of the more complex examples. However, the inaccurate multiple-application hypotheses will only apply once to each such complex case and thus should be ranked lower.

Some preliminary experiments

In order to test the feasibility of this method we conducted an experiment (Cussens & Pulman 2000:143-156), (Cussens & Pulman 2000:184-193). We took an existing unification grammar, originally developed with the approximate coverage of the fragment of English described in Montague's PTQ fragment (Montague 1974), and generated sentences of various lengths randomly with this grammar to form a corpus of several hundred sentences. Since the grammar contained no selectional restriction mechanism these sentences were frequently strange, but that that was not important for the task:

[a,heavy,manual,wont,have,continued].
[slowly,the,person,with,nlpcom,starts].
[the,smooth,new,computers,dropped,under,the,things].

Next we removed selected rules from the grammar, one at a time, and using the generated corpus applied the procedure described above to try to hypothesise candidates to replace the missing rules that would enable all of the sentences to be parsed.

Here are some examples of rules removed and learned:

Removed: VP → VP Modifier (ran quickly,ran in the park etc.)

vp:[gaps=[A,B],mor=C,aux=n] ==>
                [vp:[gaps=[A,D],mor=C,aux=n],
                 mod:[gaps=[D,B],of=or(s,vp),type=_]].

Learned:

vp:[gaps=[_286,ng:[]],mor=or(inf,pl),aux=n] ==>

[vp:[gaps=[_286,_270],mor=or(inf,pl),aux=n],
  mod:[gaps=[_270,ng:[]],of=or(nom,vp),type=n]]

The rule learned here is too specialized, since it will not pass on a gap, only accepting VPs with no gap, or where a gap is found, not VPs which are daughters of other VPs containing a gap elsewhere. Similarly, the agreement features are too refined, presumably reflecting the nature of the corpus. The 'of' feature, which specifies the kind of modifier that is possible, has also been incorrectly learned: the rule would allow an 'of NP prepositional phrase' as a VP modifier and would not allow sentential adverbs.

Removed: Nom → Nom Modifier (man in a car etc. Nom=N')

nom:[mor=A] ==>
    [nom:[mor=A],
     mod:[gaps=[ng:[],ng:[]],of=nom,type=or(n,q)]].

Learned:

nom:[mor=or(pl,s3)] ==>
        [nom:[mor=or(pl,s3)],
         mod:[gaps=[_339,_339],of=or(nom,vp),type=or(n,q)]]

The rule for postnominal modifiers is learned quite successfully: in one respect it is better than the original, for that would allow a first or second person singular nom, if there was such a thing, to be postmodified, whereas the learned form requires the nom to be 3rd singular, or plural.

Removed: VP → V NP (transitive verb phrases)

vp:[gaps=A,mor=B,aux=C] ==>
    [v:[mor=B,aux=C,inv=n,subc=[np:[gaps=_,mor=_,type=_,case=_]]],
     np:[gaps=A,mor=_,type=or(n,q),case=nonsubj]].

Learned:

vp:[gaps=[_418,_420],mor=or(inf,or(ing,s3)),aux=n]==>
    [v:[mor=or(inf,or(ing,s3)),aux=n,inv=n,
            subc=[np:[gaps=_,mor=_,type=or(n,q),case=nonsubj]]],
     np:[gaps=[_418,_420],mor=or(pl,s3),type=n,case=_]]

This rule gets the gap threading correct, but is not general enough in some of the features, again presumably reflecting the fact that the corpus did not contain examples with other feature specifications. Nevertheless, we feel that all three examples are quite impressively close to correct given that only a few dozen relevant examples were contained in the corpus.

In a second experiment a mini-corpus was concocted, containing examples of two constructions not covered in the original grammar:

[smith,owns,a,computer,company].
[jones,read,some,client,company,reports].
[jones,owned,a,big,telephone,machine].
[computer,machines,stopped].
[no,car,telephone,computer,failed].
[the,telephone,cars,have,stopped].
[computer,machines,are,stopping].
[jones,owns,all,car,telephones].
[computers,fail].
[jones,likes,telephones].

Compound nominals 'client company reports' are not covered, and nor are bare plural NPs 'Computers fail'.

After running the algorithm, the most highly valued candidate rules (rewritten in a more readable format) are:

r217 nom:[mor=or(pl,s3),mor=X] ===>
    nom:[mor=s3]
    nom:[mor=X]

r810 np:[gaps=[ng:[],ng:[]],mor=pl,type=or(n,q),case=X] ===>
   nom:[mor=pl]

These are very similar to the rules that we would have written by hand for these cases. Alternatives that were not so highly valued included things like

   NP → Nom Nom
   NP → Det Nom Nom
   S → Nom Nom VP
   NP → NP Nom

which have much less intuitive plausibility.

Conclusion

We have demonstrated that the inductive chart parsing approach is capable of generating natural rule hypotheses. However, we do not yet have a fully automatic unsupervised learning method. In the current state of the system it is more plausibly seen as a tool for helping with rapid grammar development, suggesting first-cut hypotheses, which the linguist can then test and refine further by hand. Our next step will be to try out the system in this mode by adapting the current small grammar to some more realistic corpus, such as one of the well known air travel inquiry domains. If it proves possible to get the grammar to an acceptable degree of coverage with less effort than the traditional hand-crafted (although corpus supported) methods, then we will have constructed a useful practical tool.

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Two strategies to construct Telicity: A comparative analysis of English and Italian*

RAFFAELLA FOLLI

1.   Introduction.

In this paper I analyse two kinds of constructions concerning the representation and construction of telicity, path of motion and resultative constructions in English and Italian:

(1)   a.   The ball rolled under the table
       b.   La palla rotolò sotto il tavolo

(2)   a.   John hammered the metal flat
       b.   *Gianni ha martella to il metallo piatto

(3)   a.   John beat his dog to death
       b.   'Gianni picchiò il suo cane a morte'

The analysis of these phenomena started with the work of Talmy (1975, 1985) who identifies three groups of languages with respect to the representation of motion:

(i)   Chinese and Indo-European languages (except post Latin Romance), which present a lexicalization pattern for motion showing conflation of

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Manner/Cause with the verbal root, while the Path of motion is expressed independently by the adjunction of prepositional phrases as in (4),

(4)   The boat floated under the bridge

(ii)   Semitic, Polynesian and Romance languages, in which the verbal root contains at once *Motion+Path*, while *Manner* and *Cause* is added separately,

(5)   La botella entrò a la cueva (flotando)
        'The bottle entered the cave (floating)'

(iii)   and a third group of languages (exemplified by Atsugewi, a Hokean language of northern California) in which the conflated verbal root expresses *Motion+Figure*, while *Path, Manner* and *Cause* are lexicalized separately.

Leaving aside the third group, we can see that according to this classification, English and Romance languages differ, in that English but not Romance languages, allows the formation of path of motion interpretation for sentences (1). On the contrary, Romance languages would lexicalise motion on the verb itself and express the manner by means of an adjunct as we can see in (5). Moreover, Talmy ascribes the availability in English of both a telic and an atelic interpretation of (1) to the existence in the English Lexicon of two instances of *roll*: *roll₁* an activity verb and *roll₂* an accomplishment.

In this paper, I will argue first, that the classification given by Talmy does not correctly describe the behaviour of Italian, which forms path of motion constructions in the same way as English. That is, Italian is able to express motion on the preposition. I will also show that the explanation of English ambiguity in terms of lexical ambiguity is unmotivated since the absence/presence of ambiguity in Italian is sensitive to the syntactic context. Once I have eliminated lexical ambiguity as a possible explanation for the phenomenon, I will argue that the phenomena ought to be analysed in terms of combinatorial parametric variation. Moreover, I will show that the formation of path of motion constructions and resultatives is correlated and in fact dependent upon the setting of the relevant parameter.

2.   Accomplishment prepositions and telic pairs

In this section, I briefly discuss two semantic facts that are crucial in understanding the semantic representation of telicity.

Higginbotham (1995, 2000) proposes that Donald Davidson's telic example in (8) is analysed as opposed to the atelic (6), with the main predicate *to* having the status of what he calls *Accomplishment preposition* (we will henceforth refer to this as **strategy 1**) where the first event variable identifies with the event position of the verb and the second spells out the notion of endpoint:

(6)   I flew my spaceship   (atelic)

(7)   fly (I, my spaceship, e)

(8)   I flew my spaceship to the morning star   (telic)

(9)   fly (I, my spaceship, e) & to (the morning star, <e, e'>)[1]

This idea was developed by Higginbotham (1995) relatively to the possibility of a sentence such as *John walked to the store* to be followed by '*in-phrases*', but not '*for-phrases*'. He argues that this fact follows from the event structure of '*in* and *for* adverbials' themselves, where on this account *in X* is analysed as containing two event positions and measure the temporal distance between a given starting point and a result, while *for X* has only one event position because it can only measure the temporal duration of a state or an activity:

(10)   ∃ (e1, e2) [walk (John, to the shop) (e1, e2) & in five minutes (e1, e2)]

Now, the second fact. There is a second way to form telic interpretations and that happens by means of a combinatorial process of *telic pair formation* **(strategy 2)**, which occurs at the syntax/semantics interface and by which the

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[1] Note that in (7),(9) and (10) below I give a neo-Davidsonian semantic representation where nothing is said about the number or kind of theta roles present in the system.

event position of the verb and the event position of the preposition (locative this time!) combine to construct a derived *Accomplishment*. We can see this in (11):

(11)   The boat floated under the bridge

(12)   ‖ [float-under x] ‖ = λy λe λe' (float (y,e), & under (y,x,e') & telic pair (e,e'))

3.   Path of motion constructions in English

In this section I turn to English to see how the language forms path of motion constructions. In particular, I investigate the question as to which strategy(ies) English employs.

Higginbotham (1999) argues that English employs both **strategy 1** and **strategy 2**, that is to say, in some cases, a telic interpretation is achieved through Accomplishment prepositions, and in other cases through telic pair formation. Let us look briefly at an example of each case:

(13)   I walked to the shop

(14) $\exists e$: $e=$ $<e_1,$ $e_2,$ $e_3>$ [walk (I, e_1), to the shop $(<e_2,$ $e_3>)]^2$
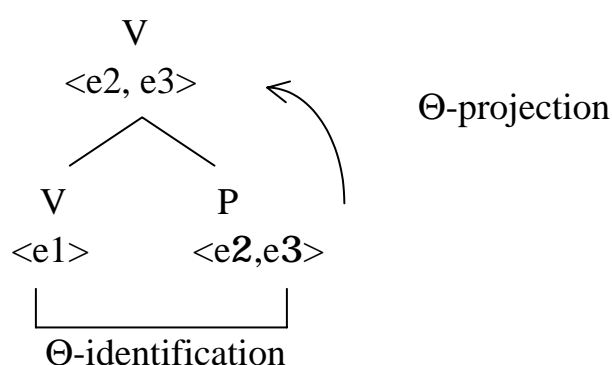
In (14) we have an activity verb *walk* with one event position and what I have called an Accomplishment preposition *to* which, as Accomplishments normally do, has two event positions, one for the processual component and one

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[2] Note that as above we give a simplified representation of the thematic role involved in the semantic representation

for the endpoint. Theta-identification arises between the event position of the verb and the first event position of the preposition. But importantly it is the preposition itself that projects its theta structure at the level of V projection.

The second strategy to construct telicity is exemplified below:

(15)   The boat floated under the bridge

(16) $\exists e$: $e=<e1, e2,>$ [float (the boat, e1), under the bridge(e2)]
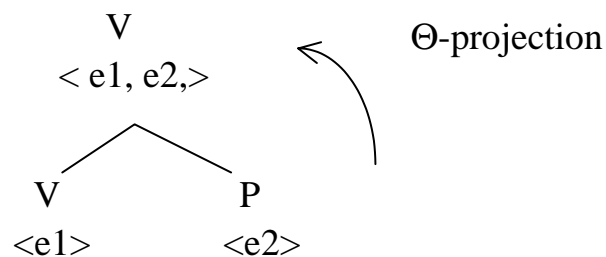
In (16) on the other hand, the preposition and the verb have only one event position each. Telicity is derived by constructional telic pair formation at V projection, when the two event positions unify to form an ordered pair of events with the structure of a telic pair.

On the basis of what has been discussed so far, Higginbotham proposes a distinction of prepositions in three classes:

type (i)   prepositions that have two event positions $<e_1, e_2>$, which are by themselves accomplishment predicates and that need verbal support to specify the notion of motion encoded in the first event variable ,

type (ii)   prepositions which have only one event position $<e>$ but which combine with the verb to form a telic pair, because they furnish the verb the indication of the 'telos', that is the second co-ordinate of a telic pair,

type (iii)   prepositions which have a locative interpretation only and therefore have only one event position $<e>$ that theta-identifies with the event position of the verb to specify the location of the Object (any language has prepositions of this kind, as any language is able to locate events).

Although I believe that the distinction between the two strategies to construct telicity is linguistically real, Higginbotham's analysis seems to give rise to a number of problems. I list a number of them below:

- We have seen that English lexicalises Accomplishment Prepositions. Why should it also allow telic pair formation (which as I will argue is an expensive procedure for a language, and in general a very marked one), if it can do everything in the lexicon?
- The telic meaning of (15) *The boat floated under the bridge* seems to indicate that the boat ends up on the other side of the bridge. This is what we would expect if the meaning is derived via Accomplishment *under,* but not if it is derived thorough telic pair formation.
- If telic pair formation is an option, we would expect it to take place every time an activity verb is followed by a locative preposition:

(17)   *The boat floated beneath/underneath the bridge *(in its telic interpretation)*

No straightforward explanation for the following minimal pair would be available if both Lexical Accomplishment PP and telic pair formation were possible in English:

(18)   John pounded the metal into pieces

(19)   *John pounded the metal in pieces

The solution I propose to the above puzzle is the following: English does not have a process of telic pair formation **(strategy 2)**. It forms telic interpretations for motion situations only through Lexical Accomplishment Prepositions **(strategy 1)**.

As a consequence, the division of prepositions into three classes is reduced to a distinction between two classes.

4.   Italian path of motion constructions: the case of *rotolare (roll)* and *galleggiare (float)*

The first thing to be noted about Italian is that it differs from English in that it never allows the formation of telic interpretations through **strategy 1**:

(20)   John walked to the shop

(21)   *Gianni camminò al negozio

On the other hand, I argue that telic interpretations can be achieved through **strategy 2** (contrary to what is argued by Talmy) as is shown by the following examples:

(22)   La palla rotolò sotto il tavolo in un secondo
         The ball rolled under the table in one second

(23)   Gianni corse in casa
         'John ran into the house'

Even more interestingly, there are verbs such as *galleggiare (float)* which normally do not allow the formation of telic pairs, as they do not encode in their lexical meaning any notion of motion[3]. For them, telic pair formation is difficult unless the syntactic context furnishes the right event configuration:

(24)   La barca galleggio' sotto il ponte
         'The boat floated under the bridge'

---

[3] It is important to notice that the class of verbs that gives rise to a path of motion interpretation as well as a locative one are semantically unpredictable, as some verbs of sound emission and *cut* enter the construction too:
    Mary cut the vegetables in the pot
    The train rattled in the station.
    The problem to find a more constrained lexical semantic definition of the verbs that allow a telic/path of motion interpretation is still open.

(24) normally only has an atelic interpretation. But there are syntactic contexts in which the ambiguity typical of the English construction also becomes available in Italian, because the process of telic pair formation is made possible for some reason that will have to be understood in the derivation of the meaning of two constructions: explicit causatives and progressive sentences. In the interest of space, only the first case will be discussed here.

I said that (24) has only an atelic interpretation. If the sentence is embedded under *fare (make)*:

(25)   Il bambino fece galleggiare la barca sotto il ponte
       'The child made the boat float under the bridge'

   The sentence has both the following meanings:
(a)   'The child made the boat float in the area beneath the bridge'   (locative)
(b)   'The child made the boat go under the bridge (by floating)'   (p.o.m)

   The same applies to *rotolare*, so that

(26)   Il bambino fece rotolare la palla sotto il tavolo

   means:
(a)   'The child made the ball roll in the area beneath the table'   (locative)
(b)   'The child made the ball go under the table (by rolling)'   (p.o.m)

   The very interesting fact about explicit causatives is that if we consider the form without the prepositional phrase, as in (27)

(27)   Il bambino fa rotolare la palla
       'The child makes the ball roll'

   The sentence has only the activity reading, suggesting that it is only when the PP *sotto il tavolo (under the table)* is added that a telic predicate is formed.

   To understand what happens with the explicit causatives, I have to articulate the event structure of the *cause* predicates.

   Consider the example:

(28)   John made Mary happy

Here, as there is no clausal connection between the AP predicate *happy* and the causative verb *make*, the sentence can be analysed as meaning: *John did something e_1 – e_1 causes e_2 – e_2 is Mary being happy.* This shows that causation has to be analysed as a complex event which itself contains two event positions $<e_1\ e_2>$[4]. More specifically, e_1 is the causation element in the pair, the part that describes the bringing about of *the happiness*, while e_2 would be the transition to the resultant state of *Mary being happy*[5].

Now consider,

(29)   John made Mary cross the street

The second event position of the complex event e_2 can also be analysed as being composed of two bits $<e_3,\ e_4>$, where e_3 is the development part and e_4 the telos.

Keeping this in mind, let us look at the semantic representation of both the telic and atelic interpretation of (25):

In the case of the atelic interpretation (30), it is simply a matter of cyclic theta-identification:

atelic interpretation

(30)   make <e1, <e2,e3>>   boat float under the bridge
                    e4   e5   e6
                                                        └──────┘
                                                    Θ-identification

                    Θ-identification

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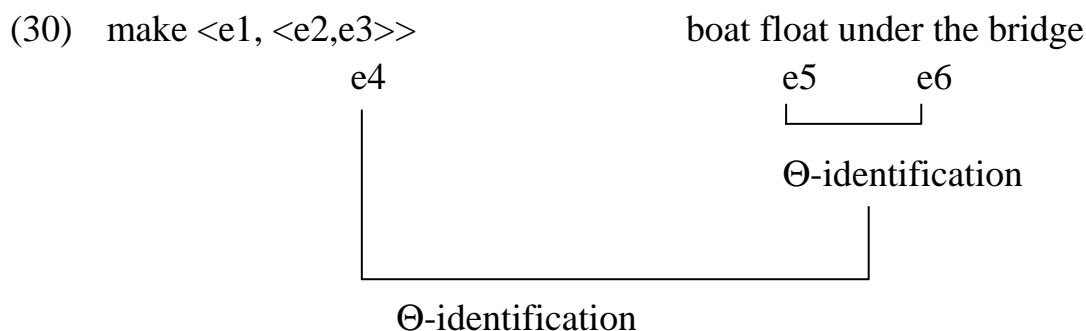
[4] This refers to a problem that has been the object of many discussions in the literature. See Hale and Keyser (1993) for a defence of lexical decomposition and in particular of an analysis of causative sentences in terms of a causing sub event and Fodor and Lepore (1997) for an attack of this same position.

[5] See also Butt and Ramchand (current volume) for a development of this same idea.

In the case of the telic interpretation (which, it is important to remember, is not normally available with the VP *galleggiare sotto il ponte*) *fare* is itself a telic pair and therefore allows the telic interpretation:

telic interpretation

(31)   make <e1,<e2, e3>>   boat float under the bridge
                                                                       e4   e5

Θ-identification

Θ-identification
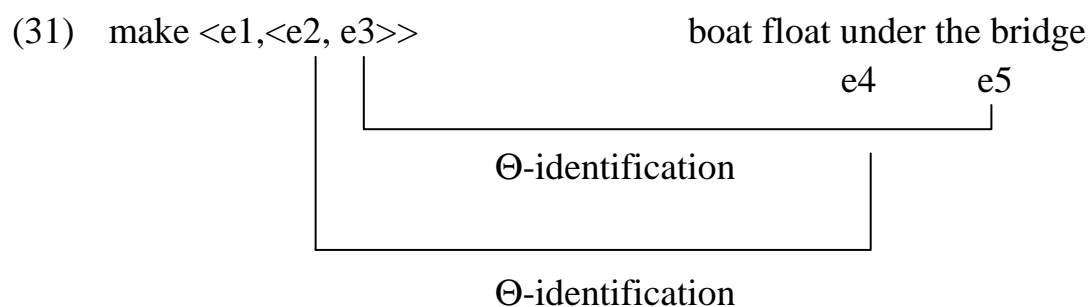
These two phenomena show two things:

(i)   Lexical ambiguity is even less plausible.
(ii)   Italian forms path of motion construction by telic pair formation.

5.   The parameter

The hypothesis is that the variation between English and Italian can be explained in terms of the following parameter:

(32)   (i)   +/ − strategy 1
       (ii)   +/ − strategy 2

English has lexical Accomplishment Prepositions, but not compositional telic pair formation, while Italian does not have prepositions as telic pairs, but allows telic pairs to be formed compositionally, when the verb has the feature [+motion] in its lexical semantic meaning.

Therefore the parameter has the following values:

(33)

Language	(i) +/-strategy 1	(ii) +/- strategy 2
English	+	-
Italian/French	-	+
Spanish[6]	-	-

6.   Resultative constructions

6.1.   Introduction

Now that I have formulated the hypothesis for formation of path of motion constructions, let us see what happens with resultatives. Resultatives are semantically very similar to path of motion constructions: in both cases an activity verb is transformed into an accomplishment predicate:

(34)   a.   John walked for one hour (atelic)
$\exists$ (e1) [walked (John) (e1) & for an hour (e1)]

b.   John walked to the shop in one hour (telic)
$\exists$ (e1, e2) [walked (John) & to (the store (e1, e2)) & in one hour (e1, e2)]

(35)   a.   John hammered the metal for one hour (atelic)
$\exists$ (e1) [hammer (John, the metal) (e1) & for an hour (e1)]

b.   John hammered the metal flat in one hour (telic)
$\exists$ (e1, e2) [hammer (John) (e1) & flat (the metal, (e1, e2)) & in one hour (e1,e2)]

The first prediction then is that
(I)   If a language has (I), it will have (II).

---

[6] Again, in the interest of space I do not refer explicitly to the data regarding French and Spanish, but the reference to the relevant examples can be found in my DPhil thesis.

I argued that languages which have (I) can do it either via Lexical Accomplishment prepositions **(strategy 1)**, or via telic pair formation **(strategy 2)**.

The second prediction is that

(II) (i)   If a language uses **strategy 1** to form path of motion constructions, then it will use **strategy 1** to form resultatives,

(ii)   If a language uses **strategy 2** to form path of motion constructions, then it will use **strategy 2** to form resultatives.

The first condition of the second prediction is borne out: English forms path of motion by means of Lexical Accomplishment PP and it forms resultatives in the same way as we can se from the examples below:

(36) a.   John hammered the metal *into* pieces
      b.   *John hammered the metal *in* pieces

If telic pair formation were at stake here we would expect (36)b. to be grammatical.

Now consider Italian. Italian uses **strategy 2** to form path of motion constructions. At the same time the examples below show that, surprisingly, it does not seem to form resultatives in the same way, suggesting that **strategy 2** is unavailable with these constructions:

(37) *Gianni ha martellato il metallo piatto
      'John hammered the metal flat'

(38) Il fiume é gelato solido
      'The river froze solid'

6.2.   Strategy 2 and Resultatives in Italian

How can one explain the fact that strategy 2, although available in Italian, cannot be used to form resultatives in this language?

The answer to this puzzle lies in the analysis of the syntactic structure of resultatives. We have already seen how resultatives and path of motion constructions are very similar from a semantic point of view. The crucial point is that they differ with respect to their syntactic structure in a very important respect: path of motion constructions involve sisterhood between the verb and

the locative complement, as the PP is an adjunct selected by the verb. Resultatives on the other hand, are Small Clauses (the Small Clause analysis is independently motivated, see Kayne 1985 *et al.*[7]) and therefore they do not present the right event configuration for telic pair formation to take place, as telic pair formation has to occur in a configuration involving sisterhood, that is, it has to take place at the point of Merge[8]. Merge is responsible for the formation of the theta-structure and theta-role assignment must happen under sisterhood or at least inside the maximal projection, a configuration which I argue does not obtain in resultative constructions.

Consequently, even if Italian allowed the derived formation of telic constructions, resultative formation would be impossible because of the absence of the necessary syntactic configuration.

(39)a.   (39)b.*

```
        VP                                    V'
       /  \                                  /  \
     VP    PP                              V    FP
     /\                                   martellò  / \
    /  \   sotto il tavolo                <e1>  il metallo  F'
   rotolò     <e2>                                         / \
   <e1>                                                   F   AP
                                                              piatto
                                                              <e2>
```
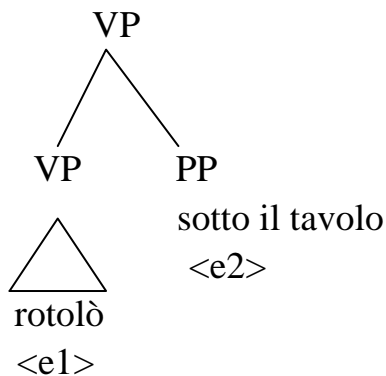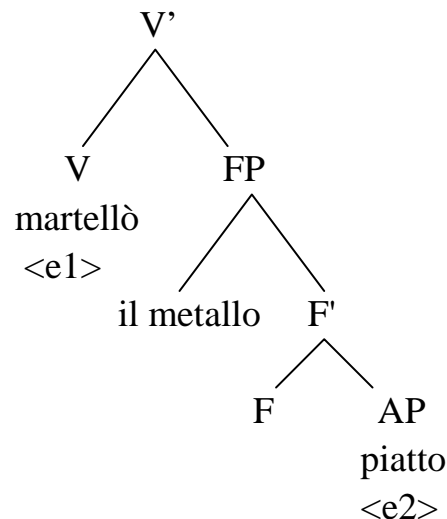
The analysis now provides extra indirect evidence in favour of the SC analysis of resultatives (and against the Complex VP analysis), since the

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[7] The debate between the Small Clause analysis and the Complex Verb analysis of resultative constructions is very interesting. I do not have the space here to address the matter in detail. Nonetheless, I believe that the comparative analysis of Italian and English regarding the formation of Path of motion and resultative construction is able to shed light on the debate and clarify the nature of the distinction. More specifically, I will argue that in the literature much confusion has arisen with respect to what has to be classified as a resultative clause. The current analysis of Italian will provide further indirect support to the Small Clause analysis of this kind of structure.

[8] See Folli (in print) for a deeper discussion of this point.

absence of resultatives and the presence of path motion in Italian is now explained in a unitary fashion: **by telic pair formation.**

Moreover, it sheds light on two important issues:

- The general idea (found in much of the literature on resultatives) that Italian does not have resultatives, which at first would seem quite problematic given the availability of path of motion,
- The intuition that Italian has some constructions that are similar in meaning to resultatives[9], but that are really cases of complex VP constructions:

(40)   Gianni ha picchiato il suo cane a morte
       'John beat his dog to death'

(41)   Gianni ha fatto il vaso in pezzi
       John made the vase in pieces
       'John broke the vase into pieces'

At first glance, Italian does not seem to be able to form resultatives freely, as many of the examples of English resultatives are ungrammatical in this language. Accordingly, in the literature, it is generally agreed that Italian, like Spanish, does not form resultative constructions.

Nonetheless, the language contains examples such as (40)-(41), but contains no examples of AP resultatives (see the ungrammatical (39b). All these facts about Italian might seem problematic, but in fact they represent a very important instance of the way in which the syntax and semantics interact. From a semantic point of view, it is true that the existence of path of motion constructions in a language should point to the existence of resultatives. The parameter that regulates the formation of the former would be expected to regulate the existence of the latter. The problem is to be found at the interface between syntax and semantics. If a language (e.g. English) has lexical AP[10] and PP Accomplishments, and can therefore simply project the event structure of these predicates to integrate the event structure of the activity verb, resultatives

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[9] See Napoli (1992) for a defence of the existence of resultatives in Italian.

[10] The idea of providing certain APs with two event positions is justified by the intuition that the adjectives that enter this kind of construction express stages and therefore can be seen as encoding a transition between sub-events.

will be formed freely. On the other hand, if a language (e.g. Italian) lacks lexical AP[11] and PP Accomplishment and has to form them through telic pair formation, the impossibility of forming them at the point of Merge will cause the absence of these constructions in a language.

6.3. Complex predicates versus resultatives

Examples (40) and (41) show that even if resultatives were not available in Italian, the language is still able to form sentences where an activity verb is supplied with a PP indicating the end of a process. That is, Italian does not have resultatives, but it can form complex VPs where an activity is provided with a telos. The distinction can be seen in English:

(42)   John beat the dog to death

(43)   *John killed the dog to death

In (42) *beat* is an activity verb and the PP *to death* simply denotes the limit reached by a process. The sentence can be translated as *John beat his dog up to the point of death.* This of course is possible in Italian too (see (40)), as the PP is really selected by the verb and indicates the end of a process. Conversely in (43) there is no process to which the PP can add an end to, so the sentence is ungrammatical.

On the other hand, resultatives modify the semantics of the main predicate and transform the activity verb itself into an accomplishment predicate. English allows this process, while Italian does not. As a consequence, the following pattern obtains:

(44)   *Gianni ha picchiato il suo cane morto

(45)   John beat his dog dead

---

[11] On the same note, the idea that in Italian adjectives cannot be analysed so freely in terms of sub events can be supported by the absence in this language of zero de-adjectival verbs. In Italian, as opposed to English the transition between sub events has to be explicitly marked with morphological prefixation:

   turn yellow/<u>in</u>giallire.

Then the idea is that while (44) is a case of complex verb construction, (45) is a resultative. Further evidence for this hypothesis comes from the following considerations:

(i) Nominalisation:
Kayne (1985) shows that nominalisation of Small Clauses gives rise to ungrammaticality. (48) shows that so does nominalisation of AP resultatives:

(46)   *John's consideration of Bill honest is unjustifiable

(47)   *?The wiping of the table clean is boring

On the other hand , nominalising a case of complex VP construction is possible:

(48)   The beating of the dog to death was despicable

(ii) Wh-extraction of the left part of a Small Clause:
Again Kayne shows that (49b) is impossible:

(49)   a.   The weather got the sister of John quite depressed
        b.   *Who$_i$ has the cold weather gotten the sister of t$_i$ quite depressed?

(50)   a.   John wiped the table in the kitchen clean
        b.   *What$_i$ did John wipe the table in t$_i$ clean?

However,

(51)   a.   John beat the mother of the dog to death
        b.   Who$_i$ did John beat the mother of t$_i$ to death?

(iii) Control:
In the case of PPs such as *to death* which, as I argued above, simply expresses the idea of a limit reached by a process, Control can be exercised by the subject so that *I love you to death* can mean that the subject is willing to die

for love. This is never true of resultatives as it is well known that the fundamental property of resultatives is the restriction on the direct object modification.

(iv) Literal use versus hyperbole:

It seems that in the case of *John beat the dog dead* the literal meaning is the only one available, so that the sentence really means that *the dog ended up dead as a result of John beating him*. On the other hand, in the case of *John beat the dog to death* it is possible to imagine a case where John did indeed beat the dog badly, but he did not really kill it. The sentence could still be used, whereas *John beat the dog dead* is only uttered, when the dog ends up dead.

(v) Co-occurrence of two resultatives:

The Small Clause analysis of resultatives is able to account for the impossibility of co-occurrence of two resultative phrases, as the two SCs would compete for the role of the verb's ECMed object. As we have seen, in Italian there are no AP resultatives, **Gianni ha martellato il metallo piatto (John hammered the metal flat)*, but *Gianni ha martellato il metallo piatto piatto (John hammered the meta flat flat)* is grammatical and has the meaning *the metal ended up being flat as a result of John hammering it*. The APs *piatto piatto (flat flat)* can only have the role of verb modifiers, as the two adjectives can co-occur. Their structural positions as sisters of the V' allow telic pair formation to take place.

(vi) Stress phenomena:

It seems that while in the case of *John beat the dog to death*, both the PP and the VP can carry prominent stress, in the case of *John beat the dog dead*, the stress falls necessarily on the resultative predicate so that the sentence is pronounced *John beat the dog DEAD*, but never **John BEAT the dog dead*.

(vii) semantic evidence:

It seems that in the *to death* constructions, the verb has to be a real, repetitive activity as can be seen from the following examples:

(52)   They smothered/squeezed/kicked him to death

(53)   *They suffocated/strangled/hit him to death[12]

7.   **Conclusion**

I conclude that Talmy's classification is not correct and that English and Italian do show some overlap in the formation of motion meaning. More specifically the ambiguity of sentences such as *The ball rolled under the table* cannot be simply a lexical matter.

On the contrary, a classification of prepositions seems to be the correct way to distinguish between the different possibilities languages show in the lexicalization of motion. In particular the availability in a given language of path of motion and resultative constructions seems to be interrelated and directly dependent upon the setting of a relevant combinatorial parameter.

The analysis of the syntax/semantics interface allow a more constrained definition of resultatives and at the same time a clarification of the debate between Complex Verb analysis and Small Clause analysis of these constructions.

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[12] Once more, I express my gratitude to Jim Higginbotham for providing me with clear examples to confirm my non native speaker intuitions!

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Why is Sequence of Tense obligatory?

JAMES HIGGINBOTHAM

The tenses of human languages are indexical expressions in the sense of Yehoshua Bar-Hillel (1954), in that repetitions of the same sentence may differ in truth value simply because of tense. They are not indexical, however, in the sense of the context-dependent temporal adverbials *now*, *yesterday*, and others. These are always interpreted with respect to the speaker's current temporal position. The interpretation of the tenses is not so fixed. In particular, a relative clause or complement clause tense may be interpreted as if the speaker had used it at a position in time different from the one she actually occupies. Thus the Italian (1), with the complement clause in the Imperfect, can, like the English below it with the complement in the past, constitute a past-tense report of a past, present-oriented utterance:

(1)   Gianni ha detto che Maria era malata
        'Gianni said   that Maria was ill'

What would make an utterance of (1) true, if it is true, is that Gianni, somewhere in the past, said something to the effect that Maria was ill at the time. The English in (1) can also constitute a report of a past, *past*-oriented utterance. For Italian, this latter interpretation is available when, contextually or in virtue of further linguistic information, the complement clause is firmly anchored to a prior time, as for example in (2):

(2)   L'anno scorso, Gianni ha detto che Maria era malata due anni fa
        'Last year, Gianni said that Maria was ill two years ago'

Research from various points of view has converged on the conclusion that the reason for these phenomena is that the tenses may be anaphoric in some or all of their uses. Sequence of tense, insofar as it has semantic effects, obtains them through anaphora.

There is an important difference, however, between the interpretation of tenses in complement clauses and their interpretation in object relative clauses. Compare (1) with (3):

(3)   Gianni ha visto [una donna che era malata]
       'Gianni saw [a woman who was ill]'

An English speaker may say the English (3) intending to assert that Gianni saw a woman who was ill at the time he saw her; or intending to assert that Gianni saw a woman who was ill some time before he saw her; or intending to assert neither of these, but merely that Gianni saw a woman who was, at some previous time, ill; and similarly for the Italian. The existence of the last intention, for both Italian and English, is underscored by the acceptability, e.g., of (4):

(4)   Two years ago, Gianni saw a woman who was ill last year
       'Due anni fa, Gianni ha visto una donna che era malata l'anno scorso'

The difference between complement clauses and object relative clauses shows up when we contrast (4) with (5):

(5)   *Due anni fa, Gianni ha detto che Maria era malata l'anno scorso
       * 'Two years ago, Gianni said that Maria was ill last year'

Interpreting sequence of tense as an anaphoric phenomenon, we may put the contrast this way: the tenses of the object relative clauses in (3) and (4) may be taken independently, and no particular relation between them intended; but the tenses of the complement relative clauses in (1) and (5) may not be taken independently, or as ranging over arbitrary past times, for if they could then we would expect (1) to be three ways ambiguous, and (5) to be fully grammatical. Thus sequence of tense is obligatory in (1), but optional in (3); and the question is why.

This paper proposes an explanation for the contrast between (1) and (3), and similar cases. There is also a contrast between the English past tense and the Italian imperfect, illustrated by the fact that the Italian (1) apparently requires a contextual or linguistic background such as that provided in (2) to be taken as a

report of an utterance about the then past, whereas the English does not; but this contrast will not figure in what follows.

My subject has been the target of considerable contemporary research, going back (for English) at least to Ladusaw (1977). I will refer to other, more recent material as I proceed.

Some work is required to set up the background against which I propose to formulate and test hypotheses, and section 1 below is devoted in part to that. I then show how, given very simple semantic principles, the basic semantic phenomena associated with sequence of tense will follow. In section 2 I take up the fundamental question of this paper, the asymmetry between complement clauses and object relatives, and argue that an answer that I have proposed off and on since 1993, indebted to the proposal of Ogihara (1989) (later sharpened in Ogihara (1996)), is not correct. Section 3, finally, provides an alternative answer, and remarks some questions that remain open.

1.   The Interpretation of Tense

The inflectional and periphrastic tenses of human languages are expressions of generality involving time. An important tradition, identified first of all with the work of Arthur Prior (Prior (1957) and (1967)), but continuing to the present day, has examined and elaborated the view that the tenses are operators, and truth relative to time. This view gains prima facie plausibility from the fact that the tenses, whether inflectional or periphrastic, do not occupy quantifiable places. Of course, we have reference to times in elementary language: "He went there at that time," "After some not too distant time I shall return to London," and so forth. But the thought is that there is a fundamental part of our language whose logical syntax does not involve quantification over times, even if, in the meta-language, the action of the tenses is explained in terms of quantification. The tenses then become a species of modality. Model-theoretic studies, including Dowty (1982) and much later work, assumed this point of view.

However, an important result of the research of recent years is that the modal theory of the tenses is inadequate: there is no basic part of our language for which it is correct. The reason is that modal theories are unable to express temporal cross-reference: see, for example, Ogihara (1995:20 ff.), Kamp and Reyle (1993: Chapter 5) and references cited there. If so, then we may locate temporal reference and temporal relations within the tenses themselves. In

English, these will be associated with the inflectional feature ±past, the periphrastic *will*, and others.

Going a step further, I will suppose that temporal relations and reference as expressed in the tenses are relations between events, in a sense of that notion derived from Donald Davidson (1967). A position for events (in a general sense, thus including states; I will sometimes use the word *situation* as covering both) is to be found in every ordinary predicative head, or so I assume. An utterance of a sentence is itself an event, and I will suppose that in an utterance of a simple sentence, say (6), one says that there is an event *e* prior to one's own utterance which is a journey to London by John:

(6)   Gianni went to London

The semantics indicated may be derived in elementary steps as follows. We associate with the head *go* two argument positions, one of which will ultimately be filled by the reference of the subject and the other, the event position, a target of existential quantification. The adjunct *to London* is a predicate of the event position of the head. The inflection, or inflectional feature, +past, expressing the relation '<' of temporal anteriority between events, has two argument positions, the first of which is again identified with the event position of the head, and the second of which is filled by the speaker's utterance itself. As we build the sentence syntactically, the argument positions enter into the relations indicated. There is also syntactic movement, bringing the tense affix into construction with the verb; and, if the "VP-internal subject" hypothesis is correct, syntactic movement of the subject *Gianni* to a position to the left of and higher than the tense. These movements are semantically vacuous.

Abstracting from syntactic movement, we may depict the construction of (6) as shown in (7):

(7)   [+past <E,E'> [go(Gianni,E'') & to(London(E''))]]

where the open positions in the tense are as indicated by the letters within angled brackets. These open positions, the elements of what is customarily called the *theta-grid* of the expressions to which they belong, are akin to free variables, but must be sharply distinguished from the free variables '*x*', '*y*', etc. of logical theory. The latter are expressions of a language, in fact terms,

whereas open positions are not expressions at all, but simply information about the number, sequence, and nature of their predicates. Following customary usage, I will call them *implicit arguments*. In computing the interpretation of (7), we speak of the conditions on satisfaction of these implicit arguments by assignments of values to them, and give the conditions on complex expressions in terms of the conditions on their parts.

Eventually, we have a theorem giving what the native speaker of English knows about the truth conditions of a potential utterance of (6), as follows:

(8)   If *u* is an utterance of (6) by speaker *s*, then *u* is true if and only if [**E***e*<*u*] [go(Gianni,*e*) & to(London,*e*)]

We can go much farther with the formalisation of the semantics whose basic ingredients I have just sketched; but the formalisation would add nothing to the purpose. What is critical is that the semantics aims for an account of the native speaker's knowledge of truth conditions, something that is evidently necessary if the theory is to be one that actually applies to human beings. (There is no "translation" into an auxiliary language, for which anyway a theory of truth would have to be provided.) Also, the account eschews the use of higher types and the lambda-calculus, confining itself to the simple notion of satisfaction; there may be uses for these other devices, but the semantics of these examples is not one of them.

For the purposes of this paper, the crucial feature of the semantics sketched above is that it takes the tenses, like other predicative heads, as expressing properties of, or relations between, implicit arguments. We can now propose that implicit arguments can enter into anaphoric relations; i.e., the relation of anaphor to antecedent, with the usual interpretation, that the value of the anaphor is constrained to be the value of the antecedent. The relation between the event position of the PP and the event-position of the verb in (6) is already an example of such a relation.

The proposal that there are anaphoric relations between implicit arguments goes back to Thomas Roeper (1987), and has been pursued in Williams (1994) and Higginbotham (1997), among others. Simple examples include the relation between the implicit argument of passive forms and the subjects of certain adverbials, as in (9):

(9)   The books were thrown away intentionally

where the semantics must have the outcome that whoever threw the books away intended to do so. Also, there are anaphoric relations between implicit arguments and actual formatives, what we might call *mixed* anaphora, as in one interpretation of (10), that in which each participant is an *x* who is required to defeat an enemy of *x*.

(10)   Each participant is required to defeat an enemy

Ippolito (1998) argues that the Italian Imperfect shows mixed anaphora, from the implicit argument to an explicit antecedent.

2.   Tense Anaphora

Supposing that the tenses express relations between implicit arguments, consider how the principles of sequence of tense, assumed to involve anaphoric relations between these arguments, will operate in the syntax, and deliver appropriate semantic interpretations. For the object relative clauses as in (3), reproduced here, the operative parts of the structure will be as in (11):

(3)   Gianni saw [a woman who was ill]
        Gianni ha visto [una donna che era malata]

(11)   [...[+past <E,E'>] ... [$_{NP}$... [+past <E'',E'''>]]] ...

We suppose that E' is *anchored* (to use the terminology of Enc (1987)) to the utterance itself, and that E and E'' are targets of existential quantification, so that an assertion of (3) is an assertion of the existence of a state of illness, and of an event of Gianni's seeing the woman who suffered from that state. The position E''' might then be taken in either of two ways: (i) as anchored, like E', to the utterance, or (ii) as anaphoric to E, hence bound to the quantifier that binds it. Assuming that the embedded past expresses temporal anteriority, we have two interpretations of (3), as shown in (12):

(12)   [**E**$e<u$] [**E**$e'<u/e$] [**E**x: woman(x) & ill(x,e')] see(John,x,e)

For the third interpretation, where John's seeing the woman in question occurred when she was ill, we adopt the suggestion of Ippolito (1998), that the feature +past has only the role of facilitating anaphora, and that the relative clause is in fact -past, expressing temporal overlap *O* or coincidence between the seeing *e* and the being ill *e'*. (This suggestion does the work, in the present connection, of a rule of tense deletion as in Ogihara (1996), but it is not a deletion rule; in fact, tense deletion is incompatible with the system proposed here.) That yields the third interpretation of (3), represented by (13):

(13)   [**E***e<u*] [**E***e'Oe*] [**E***x*: woman(*x*) & ill(*x,e'*)] see(John,*x,e*)

Returning to (1) our problem will be why the interpretation in which the embedded past tense is not anaphoric is impossible. The exact rendition of the semantics of (1), on any interpretation, requires us to adopt a view of the semantics of indirect discourse, and of complement clauses generally. For indirect discourse I will assume, but will not argue here, that the relevant notion is that of the speaker's *matching in content* an utterance of the person whose speech is reported (or predicted). I do not assume that the parameters of content matching can be settled in any notation-free way; rather, it seems to me that indirect discourse, and other contexts, are to be understood in terms of our reporting practice, and that embedded clauses have for their reference themselves, understood as they would be if uttered in isolation by the speaker. This last statement (in a formulation I take from Tyler Burge (1978)), about how embedded clauses are to be understood, guarantees that the reference of *today*, *now* and the like will be fixed, the tenses being exceptional in that they may undergo anaphora. With this much said, I will mark the exceptional reference of embedded clauses with the familiar '^' of intensional abstraction, but only as a notational device. With this convention, the data concerning (1) are as in (14):

(14)   [**E***e<u*] say(Gianni,^[**E***e'<e/Oe/*Ou*] ill(Maria,*e'*),*e*)

where the asterisk on '*Ou*' records the obligatoriness of anaphora.

We could, perhaps, simply record the distinction between (1) and (3) if it were sometimes the case that tense anaphora were obligatory in other contexts. One possibility, suggested by Abusch (1988) and (1991), and Ogihara (1994), is

that the English present tense, which must be interpreted relative to the speech time (or, in our terms, always expresses that an event of some kind overlaps the utterance *u*), is deleted within the immediate scope of a higher present tense. As noted above, the system proposed here cannot literally incorporate tense deletion. But it can deploy an empirical equivalent, namely the obligatoriness of present-tense anaphora whenever possible. There are, then, two possibilities for (15) below: either the indefinite description *a woman who is ill* takes wide scope, in which case there is no anaphora; or it stays within the scope of the auxiliary *will*, which carries the -past tense feature, in which case anaphora are forced, so that the speaker is predicting that Gianni will meet a woman whose illness temporally coincides with the time of meeting.

(15)   Gianni will meet a woman who is ill

This proposal faces counterexamples, however, of which (16) is a typical instance:

(16)   Gianni will often meet someone who studies with him

Besides the interpretation with the object NP taking wide scope, meaning that someone who (now) studies with Gianni is an *x* such that Gianni will often meet *x*, there are two interpretations in which it is within the scope of the adverbial quantifier *often*. These interpretations are rendered by:

[Often *e*>*u*] [**E***x*: [**E***e'*: ...*e'*...] studies with John(*x*,*e'*)] meets(John,*x*,*e*)

where the restriction '...*e'*...' on *e'* may be '*e'Ou*' (non-anaphoric) or '*e'Oe*' (anaphoric). The non-anaphoric interpretation, which allows that Gianni will have frequent future individual meetings, each of which is with one or another of his current students, each of whom however he meets only infrequently, will not be available if anaphora are obligatory. The point of (16), and any number of similar examples, is that the quantifiers *often* and *someone* do not commute. Inversely, the thesis that anaphora are obligatory if the object in (15) takes narrow scope survives that example only because the quantifiers (over time or events on the one hand, and using the indefinite description on the other) are

both existential, hence do commute. I conclude that tense-deletion, or anaphora, cannot be obligatory.

Ogihara (1989, 1996) and Higginbotham (1993) suggested in different ways that the asymmetry between complement clauses and object relatives follows from a restriction to the effect that the temporal orientation of a complement clause must match that of the content that it conveys with respect to the predicate whose complement it is. Thus a speaker cannot use (1) to report speech of Gianni's whose content lay in Gianni's future at the time he made it, but now lies in the speaker's past. Suppose Gianni in February utters words translatable as "Maria will be ill in March" and the speaker says the following April, "Maria was ill in March". Gianni's words and the speaker's match in truth conditions, but not in orientation. Hence the speaker cannot report Gianni's speech by saying "Gianni said that Maria was ill in March". The obligatoriness of anaphora in complement clauses then reflects the fact that the temporal orientation of the content said by Gianni must match that of the speaker. And, under anaphora, it does match. In the interpretation of (1) as reporting a past, past-oriented utterance, the orientations are both past (i.e., prior to Gianni's utterance), and in the interpretation as reporting a past, present-oriented utterance, they are both non-past, since as we have seen the +past feature only serves to license anaphora, and the embedded clause carries a present tense.

I have put the above account in my own terminology, rather than Ogihara's, which diverges (and is in fact more adequate) in various respects. We may also follow Ogihara, with some adjustments, in observing that the condition (the *Temporal Directionality Isomorphism* condition of Ogihara (1996: 210)) applies to the so-called *double-access* cases, as in (17):

(17)   Gianni ha detto che Maria e incinta
        'Gianni said that Maria is pregnant'

Since the non-past (in English or Italian) cannot be anaphoric to the past, the complement clause is interpreted as if the speaker had said it, that is, as in (18):

(18)   [**E***eOu*] pregnant(Maria,*e*)

where *u* is the speaker's utterance. But this clause cannot match in content any speech of Gianni's in which the (alleged) situation of Maria's pregnancy is future to that speech: for in that case Gianni's speech, but not the speaker's, would be future-oriented. It follows that Gianni's speech must have been present-oriented; and since the speaker has said something that is present-oriented also with respect to her, it must be that in Gianni's speech the range of the situation-variable '*e*' takes in the time of the speaker's report as well. Such is the deduction of the properties of the double-access sentences.

How, then, is the speaker to report from her later perspective Gianni's past prediction? The answer is that the future-orientation of Gianni's speech is preserved by using the periphrastic future, combined with a +past affix whose role is to allow the anaphora that would not otherwise be possible, as in (19):

(19)   Gianni said that Maria would be pregnant

(Italian deploys the conditional to the same effect.) Again, to omit the +past affix, leaving a present-tensed *will*, is to disallow anaphora, as in (20):

(20)   Gianni said that Maria will be pregnant
        'Gianni ha detto che Maria sara incinta'

There is no problem about temporal orientation, since what is future to the speaker must also be future to Gianni as of the time of his past speech.

In sum, the account of sequence of tense in both object relatives and complement clauses in English and Italian is derived from the following premises:

(i)   -past cannot be anaphoric to +past; all other combinations are allowed;

(ii) The +past feature can be interpreted either as expressing anteriority <, or as merely triggering anaphora;

(iii) The temporal orientation of a complement said by a speaker must match that of the content it conveys with respect to the predicate whose complement it is.

It is (iii) that explains the asymmetry for instance between (1) and (3), and the fact that it applies also to the double-access cases is further evidence for this premise.

I turn now to difficulties for this account. There are two, more nearly conceptual, problems that do not threaten its empirical adequacy, but make it difficult to support on the intuitive basis to which we have so far helped ourselves, using reported speech. The first is that the prohibition in (iii) is global, applying to all complements whatever. The second is that the interpretation of what I have called future-orientation is obscure, and it seems to be restricted to certain morphemes. Thus compare the examples in (21):

(21)   (a)   Last week, they predicted rain today
       (b)   Last week, they predicted that it is raining

(21)(b) shows double-access, hence is absurd, since the prediction must have been future-oriented. But (21)(a) is fine. Also, notice that (22) can be a faithful report on Sunday of Gianni's saying on Friday, "Maria will be in London tomorrow":

(22)   Gianni said that Maria was to be in London yesterday

These examples suggest that the restriction on temporal orientations, whatever it is, is tied to the feature -past, and that it cannot be expressed in the metaphysical terms of (iii). But besides these more conceptual issues, there are severe empirical difficulties as well.

Giorgi and Pianesi (1998) have shown that the possibility of double-access interpretations in Italian is correlated with the presence of a higher complementiser, and that in those cases where the complementiser is omitted (as in some dialects) one has, not double access, but ungrammaticality. This observation suggests that, after all, the double-access interpretations are syntactically represented. But more than this, investigation of some more complex cases reveals that temporal restrictions apply even independently of the question of future-orientation. The simplest examples are somewhat complex, but the evidence seems clear enough. Consider (23) and (24):

(23)   Maria will say on Sunday that Mario was here on Saturday [said on Friday]

(24)   Gianni will say on Sunday that Maria said on Saturday that Mario *is/was here today [said on Friday]

In (23) Maria's speech is past-oriented, but the speaker's complement is not. (24) has the same property. That (24) with present-tense *is* represents a case of (failed) double-access is shown by the acceptable (25):

(25)   Gianni will say on Sunday that Maria said on Saturday that Mario is here these days [said on Friday]

As I understand him, Ogihara would treat (24) by deleting the past tense in the most deeply embedded complement clause, making it tenseless. The embedded present tense would not delete, with the result that the past-orientation of Maria's speech would conflict with the formal tense information in the innermost clause. (Ogihara does not actually consider these cases in 1996)

I have already noted that literal tense deletion is not possible on the system that I am assuming. In a system where it is possible, something further must be said to derive the conclusion, for example, that in saying (1) the speaker may report Gianni as having said something that is true just in case Maria was ill at the time he, Gianni, spoke. With tense deletion, moreover, we do not obtain what could be thought a requirement, namely that the belief that Gianni expressed when he said, "Maria is ill" or "Maria e' malata" is the very belief that I attribute to him when I say, "Gianni believed that Maria was ill". However the technical discussion may go, I am inclined to think that the sacrifice here is very great.

3.   A Reanalysis

Having rejected as a basis for the asymmetry between object relative clauses and complement clauses any account along the lines of (iii), we may as a last resort simply stipulate the obligatoriness of tense anaphora for complements, thus abandoning the solution to the double-access cases discussed above. There

is another way to view matters, however. Consider (17), repeated here, and what we obtained at the first pass, namely (18):

(17)   Gianni ha detto che Maria e incinta
        'Gianni said that Maria is pregnant'

(18)   [**E***eOu*] pregnant(Maria,*e*)

The data are that, besides the restriction on the quantifier given as '*eOu*' in (18), there is a further restriction, namely that the (alleged) state of Maria's being pregnant overlaps Gianni's speech *e'*, or its time. The full interpretation incorporates both restrictions, and may be written as (26):

(26)   [**E***e*: *eOu* & *eOe'*] pregnant(Maria,*e*)

But this suggests that what is peculiar about the English (or Italian) present tense is not that it cannot be anaphoric at all, but rather that, even when anaphoric, it cannot abandon its link to the speaker's utterance; in other words, that it is interpreted twice over, once as anaphoric and once as it would have been used by the speaker alone. (This suggestion, and part of its implementation below, I owe to Tim Stowell, from a remark of his at the Bergamo conference, 1998.)

To make this suggestion effective in syntactic representation and attendant semantics, we require a conception where the tense is represented twice. Now, such a conception is available on the assumption that (a) Tenses may move at the level LF of Logical Form, and (b) that movement is copying. Recall Giorgi and Pianesi's observation that double-access is mediated by a complementiser, and suppose, what is commonly assumed for example for Verb-Second phenomena, that there is movement of inflection (I) into the complementiser position (C). Then if, as they too suggest, one copy of I relates the alleged pregnancy *e* to the utterance *u*, and the other copy relates it to the event *e'* of Gianni's speaking, the semantics being obtained by conjunction of the quantifier restrictions, we obtain following existential closure just the interpretation shown in (26) of the complement clause of (17).

We have noted Giorgi and Pianesi's observation that for matrix V allowing (with some degree of marginality) complementiser deletion, the result of

embedding below a matrix past a simple present-tense complement (whether indicative or subjunctive) is ungrammatical; however, the expected meaning is, I am told, intuitively obtained, even if "forced" Thus the ungrammatical or at least highly marginal (27) is interpreted as a case of double-access:

(27)   ??Gianni credeva (che) Maria sia incinta
       'Gianni believed (that) Maria is   pregnant'

Conversely, those V that disallow complementiser deletion (with a pre-verbal complement subject; these are, generally speaking, verbs of saying or other forms of communicative behaviour) do allow present-tense complements embedded under the past. To account for this correlation, they propose that the complement I is copied into C of the complement clause, the anaphoric copy being the one *in situ*, and the non-anaphoric copy, anchored to the speech time, is in C, indeed in a "higher" C, which cannot be deleted: hence the first part of their correlation, that verbs not allowing complementiser deletion show typical double-access effects. For the other part, the hypothesis is that V allowing complementiser deletion have only a "lower", deleteable C, into which I cannot move; hence, on the assumption that the present-tense inflection in the complement clause shown in (27), for example, must move to a higher C but cannot, ungrammaticality results, at least in the Italian case.

There are a number of details of Giorgi and Pianesi's proposal that I will not review here. it is somewhat unclear where the "forced" interpretation of (27) comes from, since on their view the relevant structure for interpreting it is not available. Zagona (2000) also raises a number of critical points, some with cross-linguistic reference to Spanish. More significantly for the purposes of this article, however, there is no pursuit of the question why sequence of tense, or tense anaphora, should be obligatory in complement clauses but optional elsewhere. In the spirit of trying to deduce this phenomenon, rather than positing it as primitive, I explore an alternative below.

Having rejected any metaphysical basis (as in Ogihara's and Abusch's discussions, and in my own earlier work) for the obligatoriness of tense anaphora in complement clauses, we turn first of all to the simpler case of object relatives, which show less restrictive behaviour, on the assumption that what is in force in that case will apply also to complements, although not conversely. In this respect, two facts stand out: first, –past (an embedded

present) can never be anaphoric to a superordinate +past; and second, the +past feature that, following Ippolito, I suggested serves only to trigger anaphora can be anaphoric only to a superordinate +past. Apart from these restrictions, anaphora are entirely optional (recall that we have already rejected, in view of examples such as (16), the suggestion that scopal phenomena are involved). The English paradigm will have superordinate past, present, or future *will*, and subordinate forms including besides these the form *would*, which constitutes the anaphoric past of *will*. To illustrate the first point, observe that (28), unlike (29), requires for its truth that the unicorn Mary found be walking : as of the time of utterance:

(28) Mary found a unicorn that is walking
(29) Mary found a unicorn that was walking

Inversely, (29) is triply ambiguous, since the finding could have been simultaneous with the walking (the merely anaphoric past), or following the walking (the true past tense under anaphora), or simply in the speaker's past (no anaphora). To illustrate the second point, note that in (30), if the merely anaphoric past were permitted, we would expect that it could be equivalent to the present-tense (31), which it is not:

(30) Mary loves a man who was crying

(31) Mary loves a man who is crying

For the merely anaphoric past in the form *would*, we may contrast (32) and (33):

(32) Mary found a unicorn that would run away

(33) Mary found a unicorn that will run away

The embedded *will* of (33), being -past, cannot be anaphoric; so if (33) is true then the running away lies in the speaker's future; but the embedded *would* of (32) is necessarily anaphoric, so that the running away could take place any

time after the finding (with a strong pragmatic preference for a time between the finding and the time of speech).

I said above that, apart from the restrictions just scouted, tense anaphora in object relative clauses were entirely optional, independently of any issues of scope. Besides the need to make this case by spelling out the examples in detail, the paradigms in question would in a complete story be expanded to include the perfect tenses, and so as to take account of aspectual phenomena. For want of space I omit these details, but invite the reader to verify at leisure the thesis advanced.

Turning now from object relatives to complement clauses, we assume that whatever principles restricted anaphora in the former case restrict them also in the latter, and also that whatever anaphoric relations are allowed from the *in situ* position of the relative clause inflection are allowed in the complement inflection. These assumptions imply that, apart from those restrictions, anaphora are entirely optional, and also that it is the *in situ* position that cannot be anaphoric when it is a present embedded under a past, as in the double-access cases. Hence, they imply that the way in which the double-access interpretation arises is the reverse of that suggested by Giorgi and Pianesi; i.e., that it is the copy of I that moves to C, and not the *in situ* copy that is anaphoric. Suppose so, and suppose further that movement from I to C is obligatory (at least if the +past feature in the embedded clause is not merely triggering anaphora), and that the copy of I there deposited must be anaphoric, independently of the anaphoricity of its source. The properties of the classic double-access cases follow at once. But we obtain also a syntactic/semantic (rather than metaphysical, or stipulative) deduction of the obligatoriness of tense anaphora in complements generally, as follows:

Consider again the English (1), repeated here:

(1)   Gianni said that Maria was ill

We have the following possibilities:

   (a) The embedded past is merely anaphoric. Then the interpretation of the complement is:

   ^[**E***e'Oe*] ill(Maria,*e'*)

where *e* is Gianni's (alleged) utterance. Note that, since the embedded past is already anaphoric, any copying into C will not change the interpretation, since it will have the effect merely of adding a redundant conjunct to the quantifier restriction.

(b) The embedded past expresses temporal anteriority $<$. If it is anaphoric, it reduces to:

$$^\wedge[\mathbf{E}e'{<}e]\ \mathrm{ill}(\mathrm{Maria},e')$$

and again any copying is redundant. If not, then after copying and anaphora we have:

$$^\wedge[\mathbf{E}e'\colon e'{<}u\ \&\ e'{<}e]\ \mathrm{ill}(\mathrm{Maria},e')$$

where the non-anaphoric copy is after all redundant, since $e{<}u$ (Giorgi and Pianesi note this equivalence as well). So the cases of past embedded below past behave as expected.

I turn now to other embeddings below the past. Evidently, the double-access case (34) will yield the interpretation of the complement (35), as desired:

(34)   Gianni said that Maria is ill

(35) $^\wedge[\mathbf{E}e'\colon e'Ou\ \&\ e'Oe]\ \mathrm{ill}(\mathrm{Maria},e')$

There is also the embedded future (36):

(36)   Gianni said that Maria will be ill

Here anaphora *in situ* are impossible, because *will* is –past. After copying and the establishment of anaphora in C we have for the complement clause

$$^\wedge[\mathbf{E}e'\colon e'{>}u\ \&\ e'{>}e]\ \mathrm{ill}(\mathrm{Maria},e')$$

where this time it is the anaphoric copy that is redundant, because $e<u$. Finally, there is embedded anaphoric *would* as in (37):

(37) Gianni said that Maria would be ill

where, since anaphora are obligatory *in situ*, copying changes nothing, as in (1)(a).

The last paragraph completes the cases I will consider here where the superordinate tense is +past. If it is

present, as in "Gianni is saying that Maria was ill," there is of course nothing to discuss, because we are given that *e* (the saying) and *u* (the speaker's utterance) are temporally coincident; also, I will pass over the case where *would* is licensed by a different relation from tense anaphora, as in (38):

(38)   Gianni is saying that Maria would be ill (if she were to fail to get a flu shot)

We are left with the cases where the superordinate tense is future, as in (39):

(39)   Gianni will say that Maria is ill

From the case of object relatives we expect anaphora to be optional, and so it is: evidently, both (40) and (41) are fine:

(40)   Gianni will say tomorrow that Maria is ill now

(41)   Gianni will say tomorrow that Maria is ill then

(41) raises no new issues: if the embedded present is anaphoric (as it must be, given the temporal adverb *then)* we obtain

^[**E***e'*: *e'Oe*] ill(Maria,*e'*)

If the adverb is omitted from (41), we could have no anaphora *in situ*, but only in the copy in C, obtaining

^[**E***e'*: *e'Ou* & *e'Oe*] ill(Maria,*e'*)

something that can evidently be intended by the speaker. (40), however, is of interest in conspicuously failing to show double-access. This case appears, in fact, to be subject to a further curious restriction, upon which I will speculate in closing.

I remarked above that object relative clauses carrying past tense embedded under a non-past could not merely serve to trigger anaphora. The same is true in complement clauses, as in (42):

(42)   Gianni will say that Maria was ill

That is, we cannot have an interpretation in which Gianni is predicted to say, "Maria is ill," or the content

^[**E***e'*: *e'Oe*] ill(Maria,*e'*)

With the disappearance of that option, there remains only the case where the embedded past expresses anteriority, and is anaphoric or not. If it is anaphoric, we have

^[**E***e'*: *e'<e*] ill(Maria,*e'*)

and if not

^[**E***e'*: *e'<u* & *e'<e*] ill(Maria,*e'*)

in which the anaphoric conjunct is redundant, because *u<e*, and which allows, correctly, for both of (43) and (44):

(43)   Gianni will say in two days that Maria was ill the day before

(44)   Gianni will say tomorrow that Maria was ill yesterday

To complete the data to be presented here, we may embed the future under a future, as in (45):

(45)   Gianni will say that Maria will be ill

   (the case of embedded *would* being ruled out as above, where the superordinate tense was present). Here again anaphora are obligatory: I cannot use (45) to predict on Friday that Gianni will say on Sunday that Maria was ill on Saturday. This consequence follows, because where the embedded future is not anaphoric we will obtain

$$\wedge[\mathbf{E}e': e'>u \ \& \ e'>e] \ \text{ill}(\text{Maria},e')$$

where the non-anaphoric conjunct in the quantifier restriction is again redundant. This completes the discussion of the English case, for the core examples given here.

   We have shown (*modulo* the example (40), discussed below) that the English data, and the asymmetry between object relative clauses and complement clauses with respect to temporal anaphora, follow from principles (i')-(iii') below, which now replace those given in section 2:

(i')   -Past *in situ* cannot be anaphoric to +past;

(ii')   The +past feature can be interpreted either as expressing anteriority <, or as merely triggering anaphora, in the latter case anaphora to a superordinate past;

(iii')   In complement clauses, I must move to C, and anaphora from C are obligatory; not so in relatives, where, apart from the restrictions above, they are always *in situ* and optional.

   We have now abandoned any orientation-condition on complement clauses, and the observations that led to it fall out purely from the syntactic conditions given, together with the particular principle (iii').

   Supposing that the perspective of Giorgi and Pianesi is reversed in the manner suggested, we retain the consequence, and indeed on just their grounds, that there is a correlation in Italian between the possibility of double-access readings and the absence of complementiser deletion. Thus, in cases like (27),

repeated here, the embedded tense cannot move to the higher C, and the result is ungrammaticality:

(27)   ??Gianni ha creduto che Maria sia incinta
       'Gianni believed   (that) Maria is   pregnant'

   (Even the English example in (27) is marginal for some speakers I have consulted; hence the explanation, if correct, may apply cross-linguistically as well.) Further discussion here would take us far afield, both because Italian shows a formal distinction between the imperfect and the past (and distinctions of mood) not found in standard English, and because of other comparative Romance phenomena, as in Zagona's recent work. With respect to the examples we have considered, note that doubling the quantifier restriction wherever the embedded tense is not anaphoric *in situ* is redundant (or, in the case of (41), something that must anyway be allowed), except for the classic double-access case (34) and the entirely non-anaphoric case (40).

   I will close with two remarks. The first concerns the difference between tense systems like English and Italian, which show double-access interpretation and have sequence of tense in the classical sense (that is, where an embedded past is not interpreted as a relative past, but as a relative present), and systems like Japanese or Hebrew, which do not. The second considers the example (40).

   Again, we owe to Ogihara the careful observation of the Japanese phenomena, where non-past does not show double-access, but indeed can be a relative or anaphoric present by itself; and, correlatively, where the past of a complement clause is always a relative past. The resulting system may be taken to obey (iii') above, but abandons (i'), instead imposing no restriction at all; does not exhibit the ambiguity of interpretation of the +past feature (if, indeed, that is what it is in Japanese; it may be that the formative, or its features, are unlike those of English); and never interprets any but the higher copy of a tense. Evidently, systems that have richer morphology may be the source of interpretations that combine the Japanese with the English features.

   Smith (1978) and others have considered the possibility of double-access interpretations with a present tense as complement of a future. Examples include (46):

(46)   Gianni will announce next week that Maria is pregnant now

Such examples are not excluded on the present account; indeed, given I-to-C movement, they are to be expected. But matters are not so clear for (40) and the like. Consider an action-sentence analogue to (40), such as (47):

(47)   Gianni will say (next week) that Maria is dancing well (right now)

where the speaker is making a prediction about what Gianni will say later about the quality of Maria's current dancing, then long since over. In my judgement, the speaker (who knows perfectly well, let us say, that Maria is not dancing well) can say (47) if she thinks that Gianni, who is in the studio watching Maria dance, is now of the opinion that Maria is dancing well; but she cannot say it if she knows that Gianni is asleep at home, and only later will watch a videotape of Maria's current performance. In the latter case, I believe, the past progressive must be used in the complement clause. The grammaticality of (40) and (47) shows that the complement present tense need not be anaphoric; there is no question here of double-access. But it suggests that, while we can sometimes take the complement present just as it is, the circumstances must be exceptional. Thus, it is proper to predict what Gianni will *say* using the present tense if that is what he *now* thinks, even if, when he does say it, it must be with the past tense. In some other cases, I believe, the result of taking the embedded clause as it stands (without anaphora) is highly questionable. Thus suppose that Maria is known to be touring the United States, one city a day, and that Gianni, who keeps track of her whereabouts, announces each day where she was the day before. Consider the prediction (48):

(48)   Gianni will announce tomorrow that Maria ??is/was in New York today

The example seems highly questionable, as noted. If so, then although the acceptability of (47), under the circumstances described, is problematic for the view presented here (as it is for Giorgi and Pianesi), there may be a dimension of reporting and predicting speech behaviour that is not covered by the formal syntactic and semantic conditions under investigation in this article.[1]

to note that, although I have come to disagree with the views of Toshi Ogihara (as well as the closely related views of my former self), I am much indebted to his research.

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On the Information-Structural effects of Scrambling in German

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1. Introduction

Languages with free or relatively unrestricted word order have posed a problem for linguistic theory since the Minimalist attempt to construct them around a limited number of economy principles such as the Fewest Steps, Shortest Move or Last Resort condition. Such conditions do not leave room for free word order phenomena, not only one derivation is permitted by the system but several, equally grammatical, order variants. Various paths can be explored to resolve the tension: It is possible to say that Minimalism is wrong, i.e. there are no economy principles, and free word order languages exhibit a true, intrinsic aspect of natural language that runs counter the idea of highly economy-driven derivations. On the other hand, we might try to fit free word order into a Minimalist theory: there is no such thing as *free* word order, but each order is in a specific sense a maximally economical derivation. Movement is caused by the requirement to check features, so if we consider ”free” word order phenomena as results of movement – a position we shall henceforth adopt – we would have to identify these features, specify their nature and effects and thereby assimilate the phenomena to other types of movement such as *wh-* or NP-movement. How can this aim be achieved? It is natural to assume that the reason for the existence of a phenomenon is closely tied to its function or functions in a larger system. Applied to our problem, this means: we have to identify what free word order accomplishes. From that, we can go back and characterise the features which form the starting point and basis for an incorporation of free word order phenomena into a Minimalist theory.

In this paper, we discuss some aspects of scrambling, as Ross (1968) labelled the existence of word order freedom in languages such as German, Russian, Korean and several Scandinavian languages, in the light of the above remarks.

Focusing on scrambling of full argument DPs in the German middle-field[1], we argue that scrambling is a primarily information-structurally driven phenomenon. On the basis of an underlying partitioning of the middle-field, scrambling functions as a re-ordering mechanism, bringing constituent order in accordance with the information-structural make-up of the clause. We then discuss a possibility as to how German scrambling can be incorporated into a framework based on concepts such as economy and feature-driven movement.

2. Information structure and its components

Together with Lambrecht (1994: 5) we take information structure as an independent level of sentence grammar, 'in which propositions as conceptual representations of states of affairs are paired with lexicogrammatical structures in accordance with the mental states of interlocutors who use and interpret these structures as units of information in given discourse contexts.' Thus, one and the same state of affairs can be encoded in different ways depending on how relevant certain element thereof are for the speaker or are assumed to be for the hearer. On these grounds, adjustments can be made in order to maximise communicative success. Vallduví (1993: 2) refers to this *tailoring* of utterances as *information packaging*. He (1992, 1993) proposes a tripartite segmentation according to which a sentence is divided into a focus and a ground with the latter consisting of a link and a tail, exemplified in (1) and the respective answer (2):

(1)   What does John drink?

(2)   [Ground [Link John] [Tail drinks]][Focus \BEER]

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[1] The middle-field, a term I use for descriptive purposes only, is the area between C, occupied by the finite verb in V2-clauses or a complementiser in verb-final sentences, and the end of the clause, excluding non-finite verbal forms and the finite verb in verb-final sentence. It thus covers IP, or the functional projections subsumed under this label, and VP-internal elements, e.g.:

Ich habe *dem Bruder   das Buch*   gegeben.
I have   the brother-DAT the book-ACC given.
weil *Peter   gestern   alle Kekse*   gegessen hat.
since Peter-NOM yesterday all cookies-ACC eaten has

In the remainder of this section, we will define the components proposed by Vallduví within a frame provided by Discourse Representation Theory (DRT; e.g. Kamp & Reyle 1993), thus setting the scene for our discussion of scrambling under an information-structural point of view.

Vallduví conceives the hearer's knowledge store as a collection of file cards (1993: 9). Each file card is associated with a discourse entity and contains all the information about this entity.

Links represent known or presupposed information; their corresponding cards are updated with the new information given in a sentence. They function as anchors because they indicate to which file card information will be added. For (2) above, a file card exists for the discourse entity *John* at the moment of utterance. The card is activated through the question, and new information is added to it.

Tails, on the other hand, specify the way in which new information is to be incorporated into the knowledge store. As ground elements, they depend on links for the domain of their operation. In our example (2), the subject is the link, marking the file card to which the new information − the focus − is added. The verb is the tail; it directs the incorporation of the focus into the existing body of knowledge, namely that John and beer stand in a DRINK-relation. There can be only one link but more than one tail element per clause. This is straightforward under the information structure and information packaging view adopted: there is one *pointer*, indicating where the new information contained in the sentence has to go, but elements may be related in different ways.

The main distinction Vallduví makes is between ground and focus. Focus is defined as "the part of the sentence that encodes the actual information of the sentence" (Vallduví 1993: 8). Vallduví does not specify further what "actual information" means. One might want to equate "actual" with "new"; however, the following example shows that "new" does not necessarily mean "new for the hearer" or "new in the discourse":

(3)   Who did you go out with last night?

(4) $_{Ground}$ [$_{Link}$ I] [$_{Tail}$ met]] [$_{Focus}$ the man I told you about – my new business

        partner!]

Here, it is reasonable to assume that the hearer's knowledge store contains a file card for the man. However, up to this moment, the hearer has not established a HAVE A DATE-relation between the speaker and this particular man about whom she knew that he is the speaker's new business partner. Consequently, it seems appropriate to characterise foci as information which is new with respect to the link. This does not undermine the narrower definition of focus as information which is newly introduced into the discourse, because foci of this kind are a proper subset of foci which are new with respect to the link.

Choi (1997, 1999) elaborates Vallduví's proposal and distinguishes completive, i.e. purely new information from focus and contrastive focus, which evokes a set of alternatives, exemplified in (5):

(5)   I gave John [Contrastive focus a book], not [a newspaper] and not [a leaflet].

Choi arrives at the following feature system:

Completive Focus: [+New, -Prominent]
Contrastive Focus: [+New, +Prominent]
Link: [-New, +Prominent]
Tail: [-New, -Prominent]

This system does not allow a distinction between contrastive and non-contrastive ground elements in terms of features for newness and prominence although it is perfectly possible for both links and tails to receive a contrastive interpretation:

(6)   What about John and Mary? What did they do?

(7)   [Contrastive Link John [Focus went to the movies], but [Contrastive Link Mary [Focus stayed at home]

(8)   Whom did Jane send the letter and the parcel to?

(9)   [Link Jane] [Tail sent[Contrastive tail the letter]] [Focus to Al] and [Contrastive tail the parcel] [Focus to James]

In (7), John and Mary are the links. Roughly speaking, they are what the sentence is "about". However, as different information is added to their respective file cards, they are necessarily contrasted with each other. Contrastive tails as in (9) differ from links in that they do not function as anchors for the new information, rather, they modify entries on link file cards by indicating which entities are related, and what the nature of this relation is. Question (8) shows that the link, *Jane*, enters two different relations, SENT THE LETTER and SENT THE PARCEL, with yet unknown entities. This missing information is provided by the foci in (9) − *Al* and *James* respectively. However, it is still necessary to specify which relation holds for each of the focused elements. This is achieved by the contrastive tails which thus contribute information that is "new" not unlike that encoded by foci. This can be contrasted to a non-contrastive tail such as the one in (11):

(10)   Whom did Jane send the book ?

(11)   [Ground [Link Jane] [Tail sent the book]] [Focus to her \BROther]

It is already clear through question (10) that Jane stands in a SENT THE BOOK-relation to some X, whose value is the focus in (11)– no other possibility exists. By evoking a set of alternatives and specifying the outcome of the choice from among the members of this set, contrastive tails resemble foci.

3. Scrambling and information structure

Having specified the components of information structure underlying my discussion we now take a closer look at the scrambling behaviour of foci and ground elements.

3.1.   The scrambling behaviour of foci

3.1.1. Completive foci

As a starting point, let us look at positional variants of a clause with a ditransitive verb:

(12) Peter stellt selten seinem Bruder seine Freunde vor.
Peter introduces seldom his brother-DAT his friends-ACC PRT
'Peter seldom introduces his friends to his brother.'

In this V2-clause, the subject surfaces in [Spec, CP], the internal arguments are inside the VP as they appear to the right of the VP boundary-marking adverb, which is L-adjoined to the maximal projection of the verb.[2] There is an acceptability difference between the unscrambled and the scrambled version as answers to a question on the direct object (completive foci henceforth in bold print):

(13) Wen stellt Peter selten seinem Bruder vor?
Who-ACC introduces Peter seldom his brother-DAT PRT?
'To whom does Peter seldom introduce his brother?'

(14) ?Peter stellt selten seinem Bruder **seine Freunde** vor.

(15) ?? Peter stellt selten **[seine Freunde]$_i$** seinem Bruder t$_i$ vor.[3]

Sentence (14), where the arguments appear in their base order with the focus as the rightmost argument, is better than (15) where the focused direct object has scrambled across the indirect object and ends up to the left of the indirect object but still inside the VP.[4]

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[2]The position of adverbs, particles and negation is a controversial issue; in this paper, we take these elements to be VP-adjoined. Cf. Pittner (1999) for a detailed discussion of adverbs in German.

[3]   Acceptability is rated on a five-step scale:
no symbol – fully acceptable
? – acceptable but slightly awkward
?? – still acceptable but rejected in favour of ? or a fully acceptable variant
*^{A} – unacceptable in a given context
* ungrammatical because a syntactic principle is violated

[4] Better still is a sentence where the indirect object, a tail, appears to the left of the adverb, thus VP-externally.
  Peter stellt [seinem Bruder]$_i$ selten t$_i$ **seine Freunde** vor.
  However, this is related to the movement properties of tail elements which I shall examine in section 2.2.1. below.

3.1.2. Contrastive foci

Contrastive foci are equally new with respect to the link file card onto which the relevant information is added. Thus, they can be expected to pattern with completive foci, i.e. favour VP-internal positions. The following paradigm shows that this is generally true (contrastive foci in small capitals):

(16)   Peter stellt seinem Bruder seine Freunde vor? (echo question on the direct object)
Peter introduces his friends-ACC his brother-DAT PRT?

(17)   ? Peter stellt selten seinem Bruder SEINE FREUNDE vor, nicht seine Freundinnen.
Peter introduces seldom his friends-ACC his brother-DAT PRT, not his girlfriends-ACC.

(18)   Peter stellt selten [SEINE FREUNDE]$_i$ seinem Bruder t$_i$ vor, nicht seine Freundinnen.

(19)   ?? Peter stellt [SEINE FREUNDE]$_i$ selten seinem Bruder t$_i$ vor, nicht seine Freundinnen.

Sentence (18) where the contrastive focus occupies a position at the leftmost VP-periphery is the most appropriate answer. Sentence (17) is slightly worse: here, the contrastive focus appears as the rightmost argument within the VP. Worse still is (19) where the contrastive focus has left the VP. Thus, contrastive foci resemble completive foci in that they prefer a VP-internal position. However, the two kinds of foci differ with respect to the property of contrastiveness: contrastive foci evoke a set of alternatives. It is plausible to assume that the difference in position − preference of the rightmost vs. leftmost VP-position − reflects this distinction.

3.2.   The scrambling behaviour of tails

Having examined the behaviour of focused constituents, let us now turn to a characterisation of tail scrambling.[5]

3.2.1. Non-contrastive tails

Consider the following paradigm (non-contrastive tails in italics):

(20)   Wem stellt Peter selten seine Freunde vor?
        Who-DAT introduces Peter seldom his friends-ACC PRT?

(21)   ?? Peter stellt selten seinem Bruder *seine Freunde* vor.

(22)   ?Peter stellt selten *[seine Freunde]*$_i$ seinem Bruder t$_i$ vor.

(23)   Peter stellt *[seine Freunde]*$_i$ selten seinem Bruder t$_i$ vor.

(24)   *^{A} Peter stellt [seinem Bruder]$_i$ selten t$_i$ *seine Freunde* vor.

(25)   *^{A} Peter stellt [seinem Bruder]$_i$ *[seine Freunde]*$_j$ selten t$_i$ t$_j$ vor.

(26)   *^{A} Peter stellt *[seine Freunde]*$_j$ [seinem Bruder]$_i$ selten t$_i$ t$_j$ vor.

Sentence (21) with both the direct and indirect object in a VP-internal position, exhibits the base order. The sentence is of low acceptability and worse than (22) where the direct object has scrambled across the focus with the latter consequently surfacing as the rightmost argument. (23) is the best variant: *seine Freunde*, a tail, has left the VP. The focused constituent stays in the VP. The remaining sentences are unacceptable in the given context: as soon as the focus appears outside of the VP, the sentence becomes unacceptable.

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[5] We ignore links in this discussion because subjects as prototypical links can only appear in either [Spec, VP] or [Spec, AgrSP], so the number of positional variants is minimal.

Of particular interest is the slight difference between (22) and (23): in both cases, the focus appears rightmost. The difference seems to be related to the position of the direct object, the tail: the highest acceptability is the result of its scrambling into a VP-external position, thus surfacing to the left of the adverb.

3.2.2. Contrastive tails

The tails examined so far have been non-contrastive. Consider now a context involving contrastive tails. Despite the fact that these elements themselves are not new in absolute terms, they are new in a relative sense. Like foci and unlike ordinary tails, they are new with respect to the link because they specify previously unknown relations between discourse entities (see section 2. above). In view of this, contrastive tails might be expected to pattern with foci and to prefer a VP-internal position (contrastive ground constituents underlined):

(27)   A: Peter und Maria waren in der Stadt. Sind sie in die Kirche oder in die Ausstellung   gegangen?
       'Peter and Mary were in town. Did they go to church or to the exhibition?'

(28)   B: <u>Peter</u> hat gestern <u>die Kirche</u> besucht und <u>Maria</u> <u>die Ausstellung</u>.
       Peter has yesterday the church-ACC visited and Mary the exhibition-ACC.

(29)   B': ?? <u>Peter</u> hat [die Kirche]$_i$ gestern t$_i$ besucht und <u>Maria</u> <u>die Ausstellung</u>.

There are two pairs of contrastive elements: the links, which correspond to the subjects, and the object tails. Despite the fact that they are both elements of the ground and share the property of contrastiveness, they differ fundamentally in that the links set the scene for new information whereas the tails fulfil a different function: that of establishing and specifying constellations of discourse entities.

The file cards for *Peter* and *Mary* are activated and thus signal that information be added to them. What is this new information? By virtue of (27) it is known that Peter and Mary went to church or visited the exhibition. The

knowledge gap triggering the question is related to the fact that it is unclear who went where. This information is provided by the contrastive tails, which are thus similar to foci in that they provide the links with previously unknown information. Consequently, they may be considered to be new with respect to these links. Therefore, it is reasonable to expect their scrambling behaviour to resemble that of foci, as a result of the common property of relative newness. The answers confirm this expectation in that contrastive tails, just as contrastive and completive foci, stay within the VP. Hence the difference between (28) and (29) above.

Given that contrastive tails prefer a VP-internal position as a result of sharing the feature of relative newness with foci, it can moreover be assumed that they resemble contrastive foci in their preference for a position at the left VP-periphery by virtue of being contrastive. Let us examine this hypothesis by looking at the positional variants of arguments of a ditransitive verb:

(30)   A: Hat Peter oder Maria dem Bruder das Buch gegeben? Und wer hat der Schwester das Kleid geschenkt?
       Has Peter or Mary given the book to the brother? And who gave the dress to the sister?

(31)   B: ? Peter hat gestern <u>dem Bruder</u> <u>das Buch</u> gegeben, und Maria hat dann <u>der Schwester</u> <u>das Kleid</u> geschenkt.
       Peter has yesterday the brother-DAT the book-ACC given and Mary has then the sister-DAT the dress-ACC given.

(32)   B': ? Peter hat gestern [das Buch]$_i$ <u>dem Bruder</u> t$_i$ gegeben, und Maria hat dann [das Kleid]$_j$ <u>der Schwester</u> t$_j$ geschenkt.

(33)   B'': Peter hat [dem Bruder]$_i$ gestern t$_i$ <u>das Buch</u> gegeben, und Maria hat [der Schwester]$_j$ dann t$_j$ <u>das Kleid</u> geschenkt.

(34)   B$^{(3)}$: Peter hat [das Buch]$_i$ gestern <u>dem Bruder</u> t$_i$ gegeben, und Maria hat [das Kleid]$_j$ dann <u>der Schwester</u> t$_j$ geschenkt.

(35)   B$^{(4)}$: ?? Peter hat [das Buch]$_i$ gestern <u>dem Bruder</u> t$_i$ gegeben, und Maria hat [der Schwester]$_j$ dann t$_j$ <u>das Kleid</u> geschenkt.

(36)   B[(5)]: *[A] Peter hat [dem Bruder]$_i$ [das Buch]$_j$ gestern t_i t_j gegeben, und Maria hat [der Schwester]$_i$ [das Kleid]$_j$ dann t_i t_j geschenkt.

There are three pairs of ground elements: the subjects *Peter* and *Maria*, and both the direct and indirect object of each clause. We shall only be concerned with the objects, which are contrastive tails. The data allow the following generalisations: ideally, only one contrastive tail remains in the VP with the other tail leaving the VP ((33)/(34) vs. (31)/(32)). The VP-internal argument is more strongly contrasted and prominently stressed: *das Buch* and *dem Bruder* in the first clause of (33) and (34) respectively. If these two sentences are compared to the less acceptable (35), it becomes obvious that there is a tendency for contrasting elements to occupy the same position in each clause: in the first clause of (35), *dem Bruder*, the indirect object, is contrasted more strongly, whereas the direct object *das Kleid* occupies the corresponding second clause position of (35).

The slight awkwardness of (31) and (32) where both contrastive tails remain in the VP furthermore points to the fact that there is apparently only one position available for contrastive elements in the left periphery. (36) is completely unacceptable, multiple scrambling of contrastive tails into a VP-external position not being permitted.

3.3.   Acceptability and information-structural status

Obviously, there is a difference in the nature of the movement processes that ground elements can undergo and from which the movement completive foci are prohibited: whereas a completive focus is required to stay within the VP, ground elements can leave the VP. If they do not, the result is not complete unacceptability as is the case with instances of illegitimate focus movement. Contrastive foci occupy an intermediate position: they cause a stronger violation when leaving the VP than VP-internal ground elements, but this is still a weaker deviation than that brought about by movement of a completive focus to a VP-external position.

The following table summarises the previous discussion of the scrambling behaviour of foci and ground elements in terms of acceptability in different positions:

Information-structural status	VP-rightmost	VP-leftmost	VP-external
completive focus	OK	??	*[A]
contrastive focus/ contrastive tail	??	OK	??
non-contrastive tail	??	??	OK

Table 1

The degrees of acceptability as given in the table are not absolute but need to be considered relative to one another. If, for example, a VP-internal non-contrastive tail yields "??" but the focus is the rightmost element within the VP, the sentence improves:

(37)   ? Peter stellt selten [seine Freunde]$_{i(??)}$ seinem Bruder$_{(OK)}$ t$_i$ vor.

Moreover, returning to sentences (25) and (26), both the completive focus and the tail have left the VP: The ungrammaticality of these sentences indicates that it is not possible to "stack up" elements outside the VP if they are not the same kind of information-structural unit. However, if they are identical in this respect, multiple movement is possible:

(38)   Wie oft hat Peter seinem Bruder seine Freunde vorgestellt?
        How often has Peter his brother-DAT his friends-ACC introduced?

(39)   Peter hat [seinem Bruder]$_i$ [seine Freunde]$_j$ selten t$_i$ t$_j$ vorgestellt.

(40)   Peter hat [seine Freunde]$_j$ [seinem Bruder]$_i$ selten t$_i$ t$_j$ vorgestellt.

Both the direct and indirect objects are tails, so they can move past the adverb into the domain to its left.
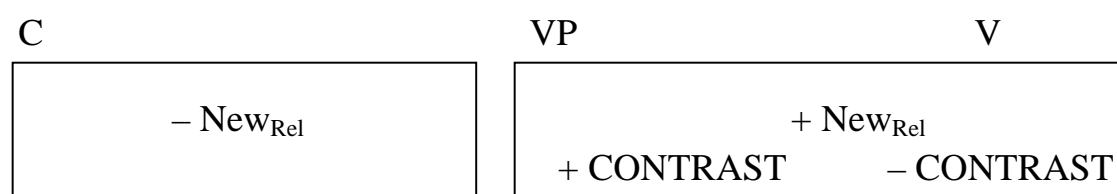
3.4.   The domains of the middle-field

From the data presented so far, we can deduce the following fundamental dichotomy: there is a group of elements which prefer a VP-internal position: completive foci, contrastive foci and contrastive tails. This preference can be seen as the result of a property common to all three types of elements: namely

newness relative to the link. However, non-contrastive tails lack this quality; they neither represent new information as foci do, nor are they the outcome of a choice from among the members of an alternative set as are contrastive foci and tails, which makes them new in the sense specified above. On this basis, we propose a division of the middle-field of the German clause into two domains: first, there is the VP as a domain for elements representing information which is new relative to a discourse entity: [+New$_{Rel}$]. Within this domain, there is a subdivision with respect to contrastiveness: a [+New$_{Rel}$] element which is contrastive tends to move to the left periphery of the domain whereas a non-contrastive [+New$_{Rel}$] argument surfaces rightmost. The other domain, demarcated by the complementiser to the left and the VP-boundary to the right, hosts elements which are

[–New$_{Rel}$].

The following schema represents the division:

C		VP	V
– New$_{Rel}$		+ New$_{Rel}$	
		+ CONTRAST	– CONTRAST

If one conceives of these two domains as constituting the middle-field, it is clear why elements differing in referential status behave as they do and why VP-internal subjects in German are infrequent and slightly awkward unless contrastively or completively focused:

(41)   ??Weil gestern Hugo das Buch gelesen hat
       because yesterday Hugo the book-ACC read has

vs.

(42)   Weil gestern \HUGO das Buch gelesen hat, nicht Char\LOTte
       because yesterday Hugo the book-ACC read has, not Charlotte

Subjects are a prototypical links, hence they favour a position in the [-New$_{Rel}$]-domain, i.e. [Spec, Agr$_S$P], or in [Spec, CP] in V2-sentences. In (42), the subject is contrastive and thus acceptable in a VP-internal position.

Finally, based on the domain partitioning, feature matrices can be developed for the information-structural units discussed:

	NewRel	Contrastiveness	Ground	Prominence
completive focus	+	–	–	–
contrastive focus	+	+	–	+
non-contrastive tail	–	–	+	–
contrastive tail	+	+	+	+
link	–	–	+	+

Table 2

4. Towards an incorporation of scrambling into a Minimalist framework

The characterisation of scrambling as a primarily discourse-related phenomenon opens a promising path in the attempt to fit scrambling into a linguistic theory based on Minimalist principles. Our remarks on this problem are just introductory, further research is required in order to test our hypotheses by studying larger bodies of data and widening the scope of theoretical as well as experimental work.

As a starting point, let us assume the basic correctness of the +/–New$_{Rel}$-partitioning. A constituent enters the derivation with a certain information-structural (IS-) value, e.g. *focus* or *link*.[6] The process Merge is theta-related (Chomsky 1995: 313), so a constituent might be initially positioned in a domain which does not match its IS-value. Suppose, for example, the object of a monotransitive verb with an IS-value *non-contrastive tail* initially occurs within the VP as the result of Merge, however, its IS-value requires the element to appear outside the VP in the –New$_{Rel}$-domain. The mismatch would cause the derivation to crash in the respective context unless scrambling occurs and, by rearranging constituents, brings their order in accordance with the IS-structure of the clause.[7]

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[6] This value might result from the ascribing of values for the features "relative newness", "contrastiveness", "part of ground" and "prominence" (see table 2 above) Cf. also Frey (2000), who encodes information-structural properties in functional projections: topics obligatorily move to the spec of a TopP in the middle-field.

[7] In other words, scrambling is something like a Last Resort mechanism on the information structural level.

How can such a conception be incorporated into a theory which posits features and checking positions as central properties? We might want to conceive of the constituents' +/–New$_{Rel}$ features as elements requiring checking. This, however, can only happen in the relevant domain – for the moment, let us leave untouched the questions concerning the nature of the heads and respective projections relevant for such checking operations. Looking back at the data, it is apparent that such an approach based on checking provides a fairly good account of scrambling processes. Let us now examine each case separately.

4.1. Non-contrastive tails

Non-contrastive tail elements, which are –New$_{Rel}$, must move into their checking domain, namely the VP-external functional projections formerly subsumed under the label IP. The IS feature is strong, so that movement into the matching domain happens overtly. In the following example:

(43)   Weil Barbara [das Buch]$_i$ gestern der Mutter t$_i$ gegeben hat

the direct object, a tail, must leave the VP – the +New$_{Rel}$-domain – and move overtly to [Spec, Agr$_{DO}$P] where it checks its IS-feature against the head of the phrase in a Spec-head relation:[8]

---

[8] Jäger (1995) argues that all scrambling processes can be conceived of as early, i.e. overt movement to [Spec, AgrP]. This, however, necessitates a complex account of the syntax of adverbs, moreover, an incorporated explanation of the information structural effects of scrambling is impossible.
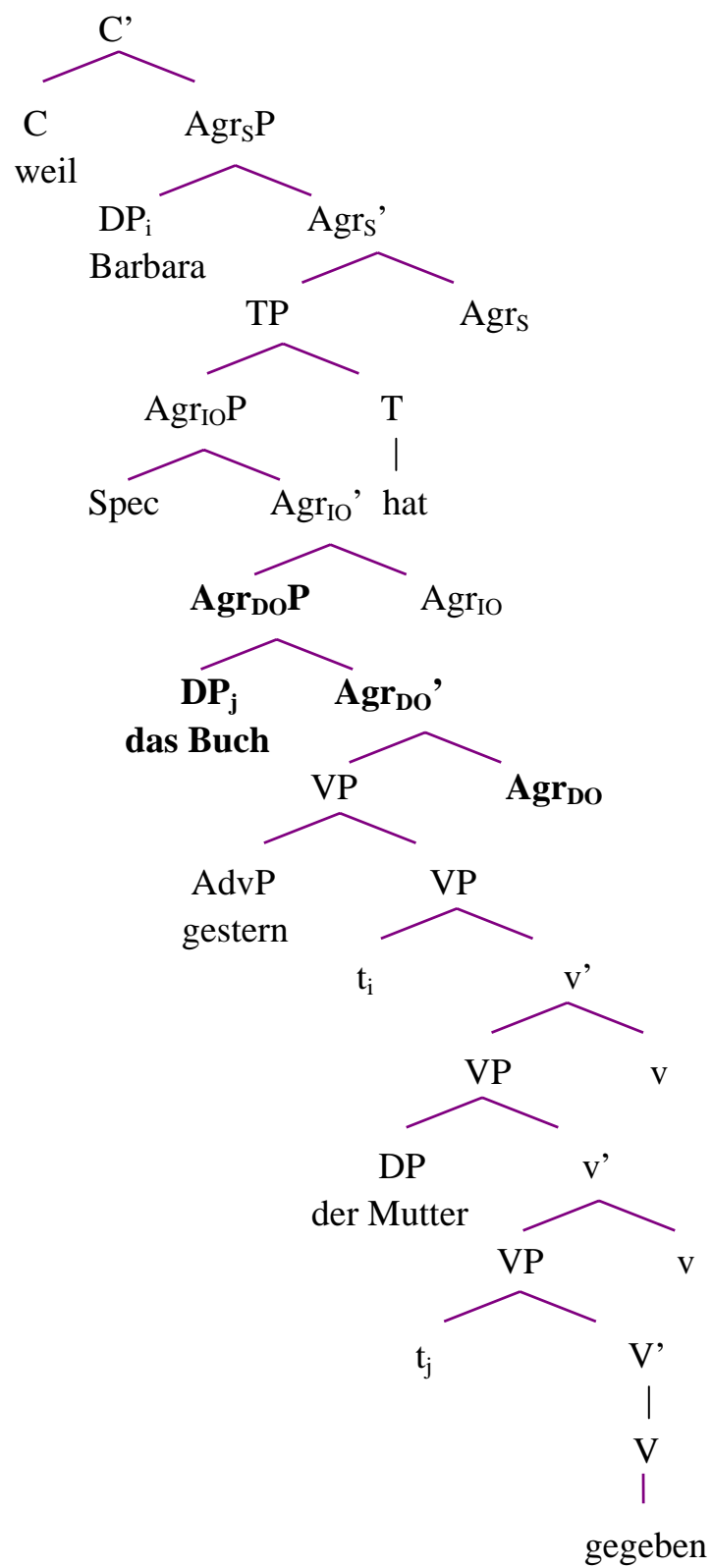
4.2. Scrambling of +New_{Rel} elements

Let us now turn to cases where there is either movement to the left VP-periphery, as with contrastive tails and foci, as well as instances where the respective element apparently stays *in situ*, as with completive foci. It is straightforward to account for movement to the left periphery of VP; as only contrastive elements move there, it can be assumed that this movement is triggered by the requirement to check a contrastiveness feature. According to our line of thought, this feature is responsible for the assignment of a pitch accent to the contrastively focused constituent.[9] Contrastive elements immediately follow VP-boundary markers and precede VP-internal subjects, as in:

(44)   Weil gestern das Buch Barbara der Mutter t gegeben hat, nicht die Zeitung
       since yesterday the book-ACC Barbara the mother-DAT given has, not the paper-ACC

It follows that contrastive elements move to a position between the adjunction-site of the adverb; i.e. VP, and the minimal argument complex (MAC, cf. Haider & Rosengren 1998, 10, fn. 9 and p. 52) which contains all argument positions and whose upper boundary is the VP whose Spec-position hosts the subject or its trace. In proceeding, we make use of a categorisation of A-positions by Hubert Haider (1997), according to which A-positions are projection positions, resulting from the application of theta-related Merge, and linking, i.e. Case-checking, positions. The important point is that these need not coincide: projection and Case-checking can happen in different positions, such a *split* is employed in scrambling languages for IS-related constituent re-arrangement. Returning to (44), we propose the following structure:

---

[9] An explanation radically different from the one proposed here might be to relate this fact to the underlying prosodic make-up of the clause, so that in effect, scrambling is parasitic on and derivable from that.

```
                    [...]
                   Agr_DO'
              _____
             VP          Agr_DO
          _____
       AdvP    VP
      gestern  _____
            DP_j          v'
          das Buch      _____
        [+Contrast ] VP        v
                  _____
                 DP       v'
               Barbara  _____
                       VP       v
                     _____
                    DP        v'
                der Mutter  _____
                          VP       v
                        _____
                       t_j      V'
                                 |
                                 V
                                 |
                              gegeben
```
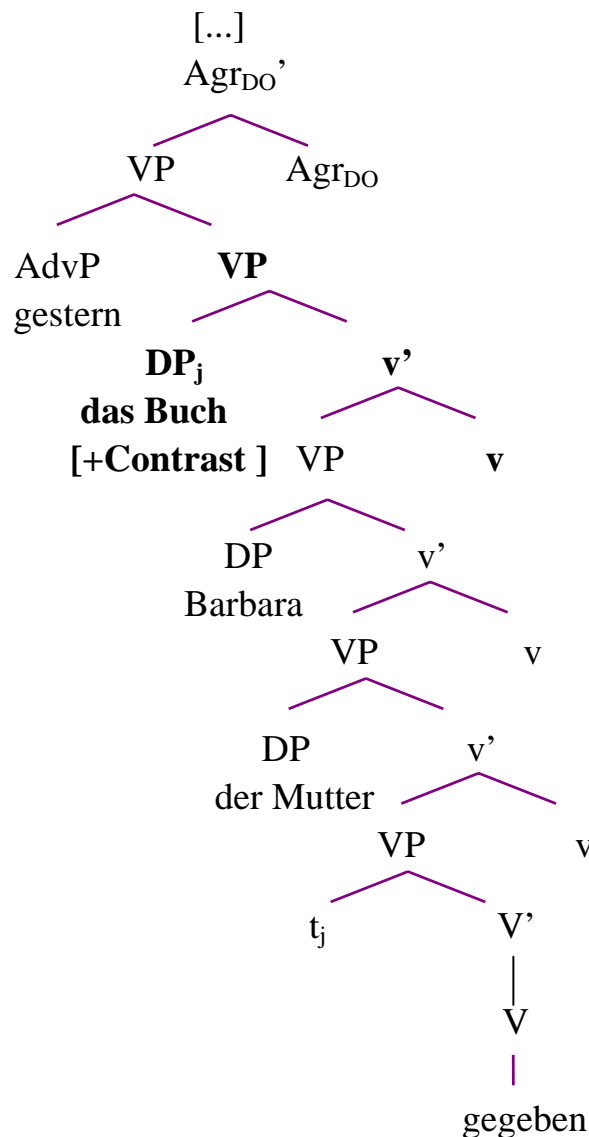
The contrastive element bears a feature [+Contrastive] which prohibits this element – even though it is already in the right +New$_{Rel}$ domain – from staying in its base-position and requires checking. Let us therefore assume that the head of VP positioned above the MAC can check the feature, thus triggering movement to [Spec, VP]. Note that in the case of monotransitive verbs, there is no way of identifying stress on the rightmost element as an indicator for completive or contrastive focus in the absence of context. In both of the following sentences, *ein Lied* receives stress but this is related to a completive focus in (46) and a contrastive focus in (48).

(45)   Was hat Henry geschrieben?
       What-ACC has Henry written?

(46)   Henry hat ein \LIED geschrieben.
        Henry has a song-ACC written.

(47)   Henry hat ein Lied geschrieben? (echo question after the object)
        Henry has a song-ACC written?

(48)   Henry hat ein \LIED geschrieben, kein Gedicht
        Henry has a song-ACC written, not a poem.

In (48), there is invisible movement out of the MAC, and the direct object is contrastively stressed:

(48') Henry hat [$_{VP}$ [EIN LIED] [$_{MAC}$ t geschrieben, kein Gedicht]]

What about (46)? It is necessary to distinguish somehow completive foci from contrastive ones – let us try to resolve the problem at the structural level: There are several possibilities: First, the fact that completive foci obligatorily appear rightmost could be taken as evidence for the involvement of checking processes; completive foci bear a particular IS-feature and accordingly move to the Spec-position of a functional projection whose head hosts a relevant matching feature. Such an approach would be coherent with the other types of scrambling because in all cases, there would be movement to Spec-positions triggered by the requirement to check information-structural features. The problem with this analysis is to clearly identify the landing site of such movement and to justify it on independent grounds. An alternative would be to state that completive foci do not move and are therefore identified according to an exclusion principle: they are neither contrastive, as they do not appear at the left VP-periphery, nor are they non-contrastive tail elements, as these usually leave the VP. We will assume the latter, hence, in (46), there is no movement involved and sentence stress is assigned by default (Cinque 1993).

Finally, consider a case where a [–New$_{Rel}$] element scrambles VP-internally as in (49)

(49)   ? Barbara hat gestern [das Buch]$_i$ der Mutter t$_i$ gegeben.
        Barbara has yesterday the book-ACC the mother-DAT given

This may happen when the indirect object, *der Mutter*, is a completive focus and is thus required to appear rightmost. Sentence (49) is slightly worse than (50):

(50)   Barbara hat [das Buch]$_i$ gestern der Mutter t$_i$ gegeben.

The reason is that in (49), there is a mismatch between the status of the direct object as [–New$_{Rel}$] and the domain in which it appears – the VP – which is [+New$_{Rel}$].

It might be that the direct object in (50) has the same landing-site as a contrastive element, namely the Spec-position of an MAC-external VP. However, it is not immediately clear why this should happen, given that a non-contrastive tail does not require feature checking of a contrastiveness feature and will also lack intonational prominence. In light of this, it seems plausible to assume that there are differences between VP-internal scrambling of contrastive and non-contrastive elements. One way of implementing this idea is to say that the direct object only *appears* to have scrambled out of the MAC to a position at the left VP-periphery but in fact has scrambled within the MAC:

(49') Barbara hat gestern [$_{MAC}$ t$_{Subject}$ [das Buch]$_i$ der Mutter t$_i$ gegeben]]

```
                    [...]
                   Agr_DO'
                 /        \
             VP            Agr_DO
           /    \
        AdvP     VP
        Gester  t_Subject    v'
                          /     \
                      VP            v
                    /    \
               DP_j        v'
             das Buch    /    \
                      VP        v
                    /    \
                 DP        v'
              der Mutter  /   \
                        VP      v
                      /   \
                    t_j    V'
                           |
                           V
                           |
                         gegeben
```
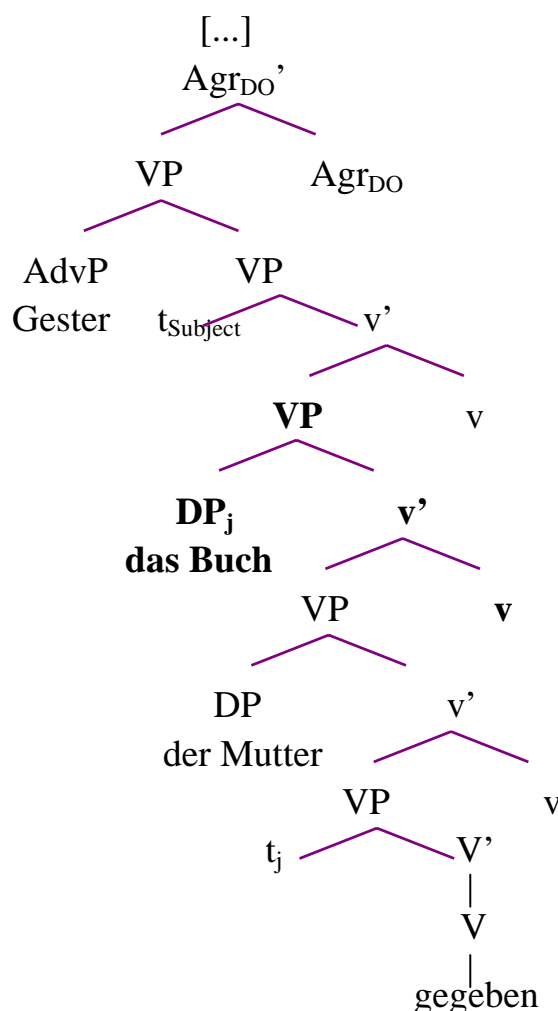
   A v-head and its projection are inserted inside the MAC. The question remains: what triggers this movement? The most obvious reason why the tail should move is to make the completive focus appear rightmost. This, however, would be a violation of GREED according to which an element never moves except to satisfy its own needs, and not those of some other constituent. In order to avoid such a violation, it is necessary to posit that VP-internal scrambling of non-contrastive tails is also triggered by the need to check a feature. It is not clear in what way this should be conceived; assuming that tails of any kind are not allowed as rightmost arguments does not capture the fact that they are acceptable in sentences where a contrastive element has moved to the left VP-

periphery.[10] This requirement would have to be made sensitive to different information-structural constellations, making a simple formulation (e.g. saying that feature-checking is involved here too) hard to achieve.

Further investigation is needed into the effects of scrambling on the information-structural segmentation of a sentence. The syntactic and semantic effects have already received a considerable amount of attention (Frey 1993, Diesing 1992), but to date, no comprehensive study of the relationship between scrambling and information structure has been carried out. Most importantly, this entails the acquisition of a body of reliable data which can be used for theory building. For example, there is no clear borderline between what counts as unacceptable in a certain context and what is ungrammatical, for example due to a violation of a principle of the Binding Theory. These problems need to be dealt with in order to get a clearer idea of the true nature of scrambling and its place in a Minimalist theory.

Moreover, one has to rethink the notion of optionality, which repeatedly surfaces in attempts to make free word order phenomena fit into a Minimalist concept (e.g. Müller 1997). However, such explanations remain circular so long as the assumption of an optional appearance of a scrambling feature is employed simply to justify the existence of order variants within a Minimalist framework. The main requirement for a Minimalist account of scrambling is to demonstrate that movement bringing about "variants" is obligatory in some sense, and our aim has been to show that looking at the interaction between scrambling and information structure offers a response to this demand.

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[10]Sentences where a contrastive element has scrambled across a VP-internal tail are completely acceptable, see for example

Peter stellt selten [SEINE FREUNDE] *seinem Bruder* vor, nicht seine Freundinnen.

Perhaps the presence of the tail is necessary to indicate that the element to the immediate right of the adverb is contrastive: If the tail leaves the VP, the contrastive constituent will be the argument surfacing rightmost, which would give rise to an ambiguity not unlike that in (46) and (48) where the order alone does not indicate whether the rightmost argument is a completive focus or a contrastive element.

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On sentential negation in the Mainland Scandinavian languages*

BRITTA JENSEN

0.   Introduction

This paper is concerned with the structure of NegP and its position in the clausal architecture of the Mainland Scandinavian (MSc) languages: Swedish, Danish and Norwegian. Following Pollock (1989) we assume that NegP is projected in negative sentences. NegP may be instantiated in human language in one of three ways: (i) with an overt head, (ii) with an overt specifier or (iii) with both an overt head and specifier. In the first section we argue that NegP in the MSc languages is type (ii). That is, MSc correlates of English 'not' (Danish *ikke*, Norwegian *ikke* and Swedish *inte*) are phrasal items generated in [Spec,NegP].

The position of NegP in the phrase structure has been shown to vary across languages (Zanuttini 1997). Accordingly, the second section of this paper aims to determine the constraints on the structural position of NegP in the MSc languages. Danish is shown to be more restricted than Norwegian or Swedish, and two possible accounts are put forward.

The final section provides a closer look at Danish constructions with nonveridical complementisers which further complicate the generalization established in section 2. The constraints on the distribution of NegP are not straightforward. An information structure account of the observed differences is suggested.

1.   The categorical status of negative items

On the basis of their adverb-like properties, we argue that Danish *ikke*, Norwegian *ikke* and Swedish *inte* (henceforth the MSc *negative items*) are best analysed as XPs. Sections 1.1 and 1.2 show that adverbs and negative items have the same distribution in main and embedded clauses. Sections 1.3, 1.4, and 1.5 revisit previous X^0 analyses and show that the data used to support these analyses is better accounted for in other ways. Section 1.6 provides a summary.

1.1   MSc main clauses

Main clauses in the MSc languages adhere to the V2 constraint. This is to say that the verb obtains in the second position in all main clauses. Though V2 is not well understood, the constraint is robust. Thus, MSc negative items in main clauses are typically post-verbal, as are adverbs. This is shown in (1).

(1)   Hun spiste heldigvis/ikke/faktisk/ofte fisk
         'She ate fortunately/not/actually/often fish'

A negative item may also be couched between two or more adverbs. This option is shown in the Danish example (2). Norwegian and Swedish correlates have the same word order.

(2)   Hun spiste heldigvis ikke nogensinde fisk
         She ate fortunately not ever fish
         'She fortunately didn't ever eat fish'

In order not to interfere with the Head Movement Constraint (HMC) - the constraint which dictates the verb's movement though intervening head positions - we propose that a MSc negative item is a specifier of a NegP with a null head. The structure of MSc NegP is thus as follows:

(3)

```
                    NegP
                   /    \
              ikke       Neg'
              inte       /
                        Ø
```
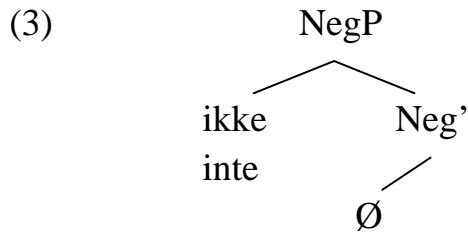
1.2   MSc embedded clauses

The V2 constraint does not hold in MSc embedded clauses. The observed word order, Adv-V, is used as evidence that an embedded verb does not raise out of VP. As before, negative items have the same distribution as adverbs. This is demonstrated in the Danish example (4).

(4)　　… at John ofte/ikke/faktisk spiste fisk
　　　　'…that John often/not/actually ate fish'

Insofar as they pattern with adverbs, negative items can be analysed as adverbs. Cinque (1999) argues that adverbs are located in specifier positions of functional heads and he includes negative items in this analysis as well. (See section 2.1)

1.3   Cliticization

French is the sort of language which projects a NegP with both an overt specifier and head. The two French negative items *ne* and *pas* are argued by Pollock (1989), Haegeman and Zanuttini (1991) and others to project NegP as shown in (5).

(5)

```
                    NegP
                   /    \
              pas        Neg'
                         /
                        ne
```
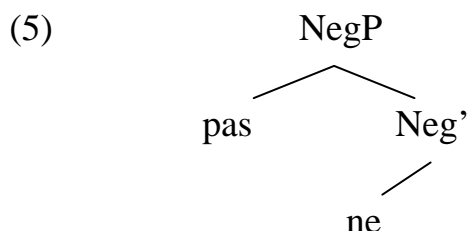
Ne is argued to be the head of NegP because it obligatorily cliticizes on to the (highest) verb, as in (6), below.

(6)   Je n'ai pas d'argent
        I neg-have neg any money
        'I don't have any money'

This sentence is base generated as in (7).

(7)   [$_{NegP}$ pas [$_{Neg}$ ne [$_{VP}$ Je [$_{V'}$ ai   d'argent]]]]

Since French is a language with strong Agreement, the verb must move up to Infl. On its way, it cycles through the Neg head where *ne* cliticizes on to it before the neg+verb complex continues on to I.[1] The derivation of (6) is shown in (8).

(8)   [$_{IP}$ Je$_i$ [$_I$ n'ai$_j$ [$_{NegP}$ pas [$_{Neg}$ t$_j$ [$_{VP}$ t$_i$ [$_{V'}$ t$_j$ d'argent]]]]]]

Two arguments can be put forward that Norwegian *ikke* is a head. The first is that it is a clitic and the second relies on the fact that it is phonologically weak, a common feature of heads. These are detailed below.

Christensen (1986) claims that Norwegian *ikke* can cliticize on to finite verbs. Her example (54) is shown below in (9).

(9)   Du så ikke/så'kke Jon
        You saw not Jon
        'You didn't see Jon'

Johannessen (1997) elaborates this observation and documents many possible *complexes* of verb+*ikke*, some of which are repeated in (10), below (her example (4)). Importantly, the verb+*ikke* strings shown below aim to capture the pronunciation of these complexes in spoken Norwegian; they are not accepted written forms.

(10)   a.   har ikke   -   hakke   'have not'
        b.   trenger ikke -   trengke   'needs not'
        c.   kan ikke   -   kangke   'can not'
        d.   skulle ikke   -   skukke   'should not'

---

[1] This analysis, originally proposed by Pollock (1989), is now commonly accepted for French.

e.	er ikke	-	ekke	'is not'
f.	står ikke	-	ståkke	'stands not'
g.	får ikke	-	fåkke	'gets not'

However, as Johannessen herself points out, it is not possible to generalise these verb+*ikke* complexes with all Norwegian verbs. Her example (6) is repeated here as (11).

(11)	a.	før ikke	-	?føkke	'feeds not'
	b.	trær ikke	-	?trække	'threads not'
	c.	ter ikke	-	?tekke	'behaves not'

Johannessen claims that verbs and *ikke* can merge because *ikke* is a head. To support the idea that *ikke* is a head she notes that, "only heads are phonologically weak."[2] *Ikke*'s phonological weakness is therefore taken to be evidence that the item is a head.

However, the reasoning presented above does not substantiate the claim that *ikke* is a head. While it is true that *ikke* is phonologically weak, this does not necessarily determine its categorical status. In addition, *ikke* is certainly not a clitic. Addressing the latter problem first, recall that French *ne* is (obligatorily) a clitic. That Norwegian *verb*+ikke complexes are not obligatory casts doubt on the clitic analysis of *ikke*. If *ikke* is a clitic, it is unclear why it should be sensitive to the phonological form of a verb. Nevertheless the possibility remains that *ikke* could be a head, even if it is not a clitic.

Consider however, the conjunction of English *I* plus *am* to form *I'm*. The process which forms *I'm* is not syntactic, since *I* is phrasal and *am* is a head. Rather, the process is phonological. Perhaps the Norwegian verb+*ikke* complexes in (10) are formed via the same phonological processes. The fact that DP-*ikke* complexes are also observed in Norwegian provides additional support for this proposal. Christensen (1986) provides an example of just this phenomena. Her example (55) is shown below as (12).

(12) Jon så du ikke/du'kke
       Jon saw you not
       'You didn't see Jon'

---

[2] Johannessen (1997: 3).

In support of the proposal that the verb+*ikke* and DP+*ikke* complexes are PF phenomena, consider the observation of Lindstad (1999). He demonstrates that morphologically complex verbs seem less able to form complexes with Norwegian *ikke*. [3] Some of his examples are repeated here as (13).

(13) a.   tar ikke   -   /take/   'takes not'
      b.   overtar ikke -   ??/o:vertakke/   'doesn't take charge of'
      c.   tar ikke over-   /take o:ver/   'doesn't take charge of'
      d.   ser ikke   -   /sekke/   'sees not'
      e.   overser ikke -   ??/o:versekke/   'ignores not'

Turning to Danish, we find that the conjoined *verb*+ikke complexes listed in (10) are impossible. According to Swedish speakers, some verb+*inte* complexes can be pronounced as single units, but it seems that the acceptable ones include frequently used verbs. In any case, fewer Swedish verb+*inte* complexes are possible than Johannessen reports for Norwegian. These facts point to different PF processes in these languages.

Given that the V+*ikke* complexes of (10) are not obligatory and given that the DP+*ikke* complexes are also possible in Norwegian, we conclude that these complexes result from a PF phenomenon. Crucially, the data presented by Johannessen do not show that Norwegian *ikke* is a head.

1.4   Topicalization

Topicalization has been used to argue for the head status of the Danish negative item, *ikke*. Holmberg and Platzack (1995) observe that Scandinavian negative items have the same distribution as other sentential adverbs. For instance, the negative item can be topicalized, as shown in the Swedish example in (14) (their 1.15 a).

(14)   Inte vet jeg var hon bor
       Not know I where she lives
       'I don't know where she lives'

---

[3] Lindstad (1999) also considers these complexes to be the result of a phonological process.

Since only phrases can topicalize (presumably to the [Spec,CP] position) Holmberg and Platzack suggest that the MSc adverbs are phrasal. They also claim that Norwegian patterns with Swedish, but the Norwegian informants consulted for this study are divided as to whether they consider the correlate of (14) grammatical or not; there may be dialectal variation.

In Danish, while sentential adverbs can be topicalized in declarative sentences, the negative item, *ikke*, may not. This contrast is shown in (15)-(16), below.[4]

(15)   Heldigvis ved jeg hvor hun bor
       Fortunately know I where she lives
       'Fortunately I know where she lives'

(16)   *Ikke ved jeg hvor hun bor
       Not know I where she lives
       'I don't know where she lives'

In recognition of these facts, Holmberg and Platzack (2001) take differences in topicalization as evidence of categorical differences in the MSc negative items. Specifically, they maintain that Norwegian *ikke* and Swedish *inte* are phrasal and suggest that Danish *ikke* cannot be topicalized because it is a head.[5]

An alternative account of these facts maintains that all MSc negative items are phrasal. As such, they are syntactic candidates for topicalization. However, successful topicalization requires that the topicalized item accord with the discourse function of the initial position. The difference in topicalization is then attributed to the fact that the MSc languages' topic positions differ in terms of their discourse functions. Specifically, the Danish topic position is incompatible with (at least) negation. This is a likely analysis since it is known that discourse functions of initial positions can vary across languages.[6] This account seems promising and will be developed in further research.

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[4] Very few exceptions exist, such as the following archaic translation of (16)
Ej ved jeg hvor hun bor.
Not know I where she lives.
[5] Holmberg and Platzack (2001) maintain that Norwegian *ikke*, like Swedish *inte* can topicalize.
[6] Thanks to Peter Svenonius for this suggestion.

1.5   Negative polarity items

The final argument that a MSc negative item is a head comes from an analysis of negative polarity items (NPIs) in Danish. Jensen (1999) argues for HEAD^0 status of the Danish *ikke* given the distribution of NPIs such as *slet,* 'at all'; *overhovedet,* 'at all' and *heller,* 'either'. Here we also consider the Norwegian correlates *slettes*, 'at all;' *overhodet,* 'at all' and *heller,* 'either.' When licensed by negation, these items precede negation, as shown in (17). Because they are NPIs, they are ungrammatical in the corresponding affirmative environments.

(17)   a. Jeg ved det slet *(ikke)   (Danish)
          I know it at all *(not)
          'I don't know it at all'

       b. Jeg ved det overhovedet *(ikke)   (Danish)
          I know it at all *(not)
          'I don't know it at all'

       c. Jeg ved det heller *(ikke)   (Danish)
          I know it either *(not)
          'I don't know it either'

       d. Jeg vet det slettes *(ikke)   (Norwegian)
          I know it at all *(not)
          'I don't know it at all'

       e. Jeg vet det overhodet *(ikke)   (Norwegian)
          I know it at all *(not)
          'I don't know it at all'

       f. Jeg vet det heller *(ikke)   (Norwegian)
          I know it either *(not)
          'I don't know it either'

Theories of NPI licensing suggest that NPIs must move to NegP at some stage in the derivation, either to satisfy the Neg-Criterion (Haegeman 1995) or to check off a neg-feature (Brown (1999), Lindstad

(1999) and others). If *ikke* is a head, as Jensen (1999) and Holmberg and Platzack (2001) suggest for Danish and Johannessen (1997) suggests for Norwegian, these NPIs could occupy [Spec,NegP].[7]

Further evidence from two of these NPIs detracts from this argument for the head analysis. Danish *slet* and Norwegian *slettes* are also licensed by negative items such as *ingen* 'no, no one' and *ingenting* 'nothing,' as shown in (18)-(19), below, with Danish examples.

(18)   Der var *slet ingen* der kom til festen
       There was at all no one that came to party-the
       'No one came to the party at all'

(19)   Hun spiste *slet ingenting*
       She ate at all nothing
       'She ate nothing at all'

Danish and Norwegian *ingen* and *ingenting* originate in their theta-related positions and then raise to [Spec,NegP] (Jónsson's (1996), Kayne (1998) and others). The problem is now clear. On the account where *ikke* is a head and NPIs obtain in [Spec,NegP], we must propose a different account of how *slet(tes) ingen* and *slet(tes) ingenting* are licensed. An analysis which provides a single account of NPI licensing would be more parsimonious.

One intuitive possibility is that *slet(tes) ikke, slet(tes) ingen*, *slet(tes) ingenting* are constituents which are base-generated in [Spec,NegP]. We can discard this analysis for two reasons. First, *slet* and *slettes* are not lexically negative. That is, these items do not contribute negative meaning to a sentence but rather they strengthen a negative marker. Thus, they ought not to originate in NegP. Second, the fact that *slettes ikke* cannot be topicalized, even in dialects of Norwegian which allow topicalization of *ikke,* suggests that *slettes ikke* is not a constituent. This impossibility is demonstrated in (20), below.[8]

(20)   *Slettes ikke vet jeg hvor hun bor

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[7] Whether or not these NPIs are base-generated in NegP will not be addresssed here.

[8] Topicalisation of Danish *slet ikke* is not possible, given that Danish *ikke* never topicalizes.

At all not know I where she lives
'I don't know where she lives at all'

We propose that *slet* and *slettes* are housed in a separate functional projection (AdvP$_{NPI}$) which selects for NegP. Other items that project this special AdvP$_{NPI}$ include Danish *overhovedet, endnu, heller*; Norwegian *overhodet, ennå*, *heller* and Swedish *overhodetaget*. NegP is headed by a null operator (as proposed in Haegeman 1995) and *ikke, ingen* and *ingenting* obtain in [Spec,NegP].[9]

NPI licensing does not provide support for a head analysis of MSc negative items. Indeed, on an account where Norwegian and Danish *ikke, ingen* and *ingenting* are phrasal, licensing of NPIs is unified.

1.6   Summary - *ikke/inte* are XPs

Section 1 offered empirical and theoretical justification for the XP analysis of MSc negative items. First we showed that negative items and adverbs have the same distribution in both main and embedded clauses. Since we know that the verb moves up to the second position in main clauses, a head analysis of negative items is not preferred since it would violate the Head Movement Constraint. In addition, a phrasal account of the negative items unifies them with existing accounts of adverbs (cf., Cinque 1999).

Three arguments for head status were considered: cliticization, topicalization and NPI licensing, but in each case the data were shown to be better accounted for in alternative ways.

Having established the internal structure of NegP, we now turn to the question of the structural position(s) of NegP within the clausal architecture.

2.   The distribution of NegP in MSc

Because negative items are adverbs, in Section 2.1 we elaborate the observation that adverbs are rigidly ordered (Cinque (1999), Nilsen (1997)). Then, in section 2.2, we discuss typical embedded clause word order in MSc, with special attention paid to the position of the subject and

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[9] The exact mechanism of NPI licensing will not be discussed here.

adverbs. Section 2.3 shows differences in the distribution of subject NPIs, and section 2.4 proposes two explanations of the observed differences.

2.1 The adverb hierarchy

Cinque (1999) observes that Italian adverbs are rigidly ordered, and Nilsen (1997) shows that Norwegian adverbs adhere to the same adverb hierarchy. To illustrate this claim consider the following sentence with multiple adverbs. The Norwegian example (21) is from Nilsen (1997) (his (1a).)[10]

(21)   Navnet ditt har jeg ærlig talt tydeligvis allerede helt glemt
       Name-the yours have I honestly spoken evidently already totally
       forgotten
       'I have truly evidently already totally forgotten your name'

That the order of adverbs is constrained is exemplified in (22)-(23) (Nilsen's 1b-c) where the adverbs in (21) are rearranged. The result is ungrammaticality.

(22)   *Navnet ditt har jeg tydeligvis allerede ærlig talt helt glemt
       Name-the yours have I evidently already honestly spoken totally
       forgotten
       'I have evidently already truly totally forgotten your name'

(23)   *Navnet ditt har jeg ærlig talt allerede helt tydeligvis glemt
       Name-the yours have I honestly spoken already totally evidently
       forgotten
       'I have truly already totally evidently forgotten your name'

On one account, the adverbs in (21)-(23) are inserted in multiple specifiers of VP (or alternatively the grammar allows multiple adjunction to VP.)[11] A second account proposes four separate AdvP functional projections, each one specialized for a different kind of adverb. Nilsen (1997), following Cinque (1999), pursues the latter option. Since other

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[10] The translations of (21)-(23) in to English are my own.

[11] Following recent developments, it is not clear whether there is any theoretic difference between multiple specifiers or multiple instances of adjunction.

functional projections are hierarchically ordered, Cinque prefers this account because it can display the rigid order of adverbs that we observe in human language.

In terms of the order of adverbs, Danish patterns like Norwegian. The interesting fact is that, though adverbs adhere to a universally fixed hierarchy, the position of negative items may not be fixed. Indeed, Cinque (1999: 126) observes that "…the evidence points to the possibility of generating a NegP on top of every adverb-related functional projection, even simultaneously, up to a certain height." To demonstrate this, we turn now to the relative order of subjects and adverbs in MSc.

2.2   Embedded negative clauses

In order to determine the structural position(s) of NegP in the phrase structure, we must avoid the V2 constraint that holds in MSc main clauses. In negative embedded clauses, where the verb remains *in situ*, Danish differs from Norwegian and Swedish in the range of word order possibilities. In Norwegian and Swedish the subject may precede or follow the negative item while Danish allows only the former word order. This difference is shown in the Swedish examples (24)-(25), below. These examples are (6b and 7b) from Holmberg (1993).

(24)   Det är märkligt att Johan inte gillar prinsesstårta   D, N, S
        It is odd   that   John not likes princess cake
        'It is odd that John doesn't like princess cake'

(25)   …att inte John gillar prinsesstårta   *D, N, S
        …that not John likes princess cake
        '…that John doesn't like princess cake'

Interestingly, the same pattern obtains with other sentential adverbs, as shown in (26)-(27) (Holmberg's 6a, 7a).

(26)   Har någon student möjligen läst boken?   D, N, S
        Has some student possibly read book-the?
        'Has some student possibly read the book?'

(27)   Har möjligen någon student läst boken?   *D, N, S

Has possibly some student read book-the?
'Has some student possibly read the book?'

Increasing the number of adverbs in a sentence increases the number of word order possibilities. Consider examples (28), example (46) from Nilsen (1997). Importantly, (28a) is the only word order possible for Danish, while Norwegian and Swedish accept (28) a-e. (Examples are given in Norwegian.)

(28) a.   …at **Per** tydeligvis ikke lenger bestandig vinner   D, N, S
             …that P evidently not any-longer always wins
             '…that P evidently no longer always wins'

      b.   …at tydeligvis **Per** ikke lenger bestandig vinner   *D, N, S

      c.   …at tydeligvis ikke **Per** lenger bestandig vinner   *D, N, S

      d.   …at tydeligvis ikke lenger **Per** bestandig vinner   *D, N, S

      e.   …at tydeligvis ikke lenger bestandig **Per** vinner   *D, N, S

Example (28) shows that in Danish embedded clauses the subject must appear before the negative item and all other adverbs. On the other hand, Norwegian and Swedish allow more variety in terms of the relative ordering of subject and adverbs. For thorough discussions of subject and adverb placement, see Nilsen (1997) and, for an alternative analysis of the facts, Svenonius (forthcoming). For the rest of this paper, we restrict our attention to the relative position of the subject and the negative item.

2.3   Subject NPIs

The possibility of the negative item preceding the subject has implications for the distribution of negative polarity items. A subject/object asymmetry has been widely observed in English NPIs (see (29), below).

(29) a. The child didn't eat any apples
      b. *Any child didn't eat an apple

This asymmetry is accounted for in English because in (29b) the subject position is not within the c-command domain of negation at the relevant level of linguistic representation. Given that Norwegian *ikke* and Swedish *inte* can obtain above the subject (cf., (28c-d)) we correctly predict that subject NPIs ought to be able to occur in these languages. The Norwegian example (30) confirms this prediction; it is grammatical in Norwegian and Swedish but ungrammatical in Danish.

(30)   At ikke noen lærer kan hjelpe deg er forbavsende   *D, N, S
        'That not any teacher can help you is surprising'
             (Only the ¬∃ reading is available)

Ikke in (30) is shown to be sentential negation and not constituent negation (part of a DP meaning 'no teachers') because other adverbs can intervene between the negation and NPI, as in (31). [12]

(31)   At ikke lengre noen lærer kan hjelpe deg er forbavsende   *D, N, S
        That not longer any teacher can help you is surprising
        'That no longer any teacher can help you is surprising'

2.3   Hypotheses

Examples (28) and (30) reveal that in negative embedded clauses, Danish word order is more constrained than Norwegian or Swedish. In order to account for the fact that Danish only allows the order 'subject-negation' we put forward two options.

The traditional analysis of subjects is that they are base generated VP-internally and move up to a certain, fixed position in order to satisfy the Extended Projection Principle (EPP). Following the traditional line of thought we might assume that NegP has one structural position in Danish and (at least) two structural positions in Norwegian and Swedish. This option can be realised in two ways: (a) Norwegian and Swedish freely insert NegP either above or below the subject position, or (b) Norwegian and Swedish have two different NegP projections, one below the subject position and one above it. Proposal (b) recalls multiple NegP projections in Romance.

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[12] Thanks to Tarald Taraldsen for providing these two examples.

A second option is to assume that NegP is fixed in the functional hierarchy of adverbs between two possible subject positions. Holmberg and Platzack (2001) propose two subject positions for MSc, [Spec,FinP] and [Spec,TP], and suggest that NegP is located between them. On their account, we could restrict Danish subjects to the higher of these two positions, [Spec,FinP], and allow Norwegian and Swedish subjects to obtain in either position. An account which proposes multiple subject positions, however, faces the challenge of defining where and how to satisfy the EPP.[13]

The debate is extensive, and we refer the interested reader to the relevant literature (cf. Holmberg (1993), Nilsen (1997), Holmberg and Platzack (2001), Svenonius (forthcoming) and references therein.) Crucially, the data from negative embedded clauses show that Norwegian and Swedish pattern together and Danish patterns differently. The Danish data is not as restricted as we have assumed thus far, however. The next section discusses negative clauses embedded under nonveridical complementisers, negative conditionals and questions, where Danish word order is less constrained.

3.   A closer look at Danish

The examples considered in section 2 employ the complementiser *at* 'that.' If we consider the full range of Danish complementisers, we find that two of them, *om* 'whether' and *hvis* 'if', afford both the C-subj-Neg and the C-Neg-subj word orders. These word order possibilities are shown to obtain as complements to verbs like *ask* and *surprise* in section 3.1. Word order in negative conditionals and negative questions is considered in section 3.2. Section 3.3 suggests that the co-existence of different word order options is best accounted for in terms of information structure.

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[13] Holmberg has recently suggested that the EPP can be fulfilled by any phonological element. For space reasons, we leave the implications of this proposal aside here.

3.1   Complements of *ask* and *surprise*

Danish sentences show both C-subj-Neg and the C-Neg-subj word orders as shown in (32)-(35).

(32)   Hun spurgte, om John ikke var hjemme
        She asked whether he not was home
        'She asked whether he wasn't home'

(33)   Hun spurgte, om ikke John var hjemme
        She asked whether not he was home
        'She asked whether he wasn't home'

(34)   Han bliver overrasket, hvis John ikke er hjemme
        He will be surprised if she not is home
        'He will be surprised if she isn't home'

(35)   Han bliver overrasket, hvis ikke John er hjemme
        He will be surprised if not she is home
        'He will be surprised if she isn't home'

Swedish and Norwegian allow these structures too, as we would expect given the data in (28). *Om* and *hvis* are different from other Danish complementisers in that they are the only nonveridical complementisers. That is, *om* and *hvis* are the only complementisers that do not have any bearing on the truth of the complement to follow.

It is possible that the presence of nonveridical elements in C can 'attract' the NegP to be inserted higher up (or perhaps the negative item moves to a higher NegP). Whatever the mechanism, it is more likely that a complementiser's semantic properties affect the placement of negation than the placement of the subject. Because it is unclear how to connect the choice of complementiser with variation in the position of the subject, this data supports the first hypothesis given in section 2.3 - the fixed subject position hypothesis.

If a language allows two different word orders, we expect to find some meaningful difference between them. The distinctions in meaning are often subtle and are therefore difficult to pinpoint. Looking carefully, we

find that the relative order of subject and negation signals different presuppositions. Consider the following Swedish examples.

(36)   Jag undrar om John inte är den rätta personen
       I wonder whether J not is the right person
       'I wonder whether John isn't the right person   … for the job'

(37)   Jag undrar om inte John är den rätta personen
       I wonder whether not J is the right person
       'I wonder whether J isn't the right person   … for the job'

(36) is ambiguous between the following two readings: (a) 'I wonder whether it is not the case that J is the right person (…for the job)' which implies that the speaker believes that he is the right person and (b) 'I wonder whether it is the case that J is not the right person (…for the job)' which implies that the speaker believes that he is not the right person. By contrast, (37) has only the (b) reading. It is likely that intonation can assist in conveying the speaker's desired meaning.[14]

Presuppositional differences distinguish Danish and Norwegian correlates as well, though it is not necessarily expected that presuppositions should pattern the same way in these languages. Further research is necessary before any claims can be formulated.

Section 3.2 Negative conditionals

In accordance with the 'non-veridical C attracts Neg' proposal suggested in the last section, we observe the C-Neg order in Danish negative conditionals. Given that C-Neg is not the word order found with other complementisers, it is not the default word order here. Consider the following pair of examples with *hvis* 'if.' Example (38) shows the default word order, C-subj-Neg. In order for *ikke* to be adjacent to C, as in (39), stress must be applied to the subject.

(38)   Hvis John ikke kommer, vil jeg spørge om jeg må låne hans cykle
       D, N
       If John not come, will I ask whether I may borrow his bicycle

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[14] Thanks to A. Holmberg for this intuition.

‘If John isn’t coming, I will ask whether I may borrow his bicycle’

(39)   Hvis ikke John kommer, vil jeg spørge om jeg må låne hans cykle
        ??D,N
        If not John come, will I ask whether I may borrow his bicycle
        ‘If John isn’t coming, I will ask whether I may borrow his bicycle’

It is interesting to note that Norwegian judgments are divided in terms of which word order is preferred. While all Danish informants require stress on the subject in (39), some Norwegian informants agree and others require stress on the subject in order to get (38). The division of Norwegian judgments probably reflects dialectal variation. The differences between Danish and Norwegian may be due to a difference in the position(s) associated with contrastive focus. Accounting for these differences will be left to further research.

The observed word orders are also seen in negative questions, as shown below.

(40)   Har John ikke lyst på en kaffe?   D, N, S
        Has John not desire for a coffee?
        ‘Doesn’t John want a coffee?’

(41)   Har ikke John lyst på en kaffe?   *D, N, S
        Has not John desire for a coffee?
        ‘Doesn’t John want a coffee?’

3.3   Summary

Section 3.1 shows that word order of subject and *ikke* is more liberal in Danish following two complementisers, *om* ‘whether’ and *hvis* ‘if’. It was suggested that the semantic properties of these complementisers interacts with negation, attracting it to a higher position (a position, crucially, above the subject position). Different word orders were shown to carry different presuppositions. Section 3.2 showed that Danish and Norwegian have different default word orders which led to the suggestion that MSc languages differ in the positions associated with contrastive focus. These differences are signalled by stress. Adding to the findings of this section, recall that in Section 1.4 we accounted for the topicalization

differences in terms of differences in the discourse function of the initial position. On these grounds, the following generalisation is justified: MSc languages differ in terms of information structure.[15]

4. Conclusion

In section 1, we focused on the internal structure of NegP in the Mainland Scandinavian languages. We proposed that NegP has a null head and that its specifier is filled by negative items Danish *ikke*, Norwegian *ikke* or Swedish *inte*. We revisited previous analyses (Johannessen (1997), Holmberg and Platzack (2001) and Jensen (1999)) which claimed that *ikke* was a head. In each case, we showed that the data used to support a head analysis was better accounted for in alternative ways. Thus, the internal structure of NegP is the same across these languages.

Section 2 focused on the observed word order differences, in terms of the relative position of subjects and adverbs, specifically the negative items. Danish is more limited in terms of word order possibilities which suggests that the distribution of NegP is more constrained in Danish than in Norwegian or Swedish.

Section 3 complicates the findings of section 2, as we showed that Danish word order is more liberal with two complementisers, *om* and *hvis*. The co-existence of different word order possibilities (in all the MSc languages) was noted and differences were accounted for in terms of differences in information structure. Exactly how these differences ought to be articulated is a question for further research.

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[15] Differences in negation in MSc languages, however, cannot be entirely reduced to information structure differences. For instance, it is not clear how an information structure account would explain differences observed in negative imperatives. The two possible orders of V and Neg in negative imperatives are represented below.

    (a)   Ikke vent på mig
              Not wait for me
              Don't wait for me
    (b)   Vent ikke på mig
              Wait not for me
              Don't wait for me

Danish and Swedish allow only the form (b) while though both structures are allowed, Norwegians prefer (a).

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*How to resolve Pronouns combining syntactic information and an induced domain theory**

MARIA LIAKATA

Abstract

This paper is part of my doctoral research work on pronoun resolution. After a brief introduction to the problem, I describe my approach and give an outline of the system I have developed, as well as indicate future goals.

Background

The resolution of anaphoric expressions (pronouns, reflexives, definite and deictic noun phrases, etc.) has been of major concern to both theoretical and computational linguistics. The actual process involves linking anaphors[1] to other expressions in the text, which have an intrinsic meaning, as opposed to the former. The stage of linguistic analysis during which this interpretation takes place is a question of debate; some linguists only acknowledge anaphoric phenomena which can be considered to be dependent on the grammar and are therefore determined by syntactic constraints (Haegeman 1994), whereas others regard anaphora resolution as a semantic phenomenon (Gawron & Peters, 1990). Several argue that some instances of anaphora rely on the grammar whereas others should be dealt by a semantic component (Fiengo & May 1996). Finally, there are pragmatic accounts of anaphora (Grosz 1995, Huang 2000).

The issue of anaphora interpretation exceeds the sheer interest of understanding the cognitive aspect of language. It gives rise to problems when

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[1] I use the terms anaphor and anaphoric expression interchangeably. The same applies to anaphor(a) resolution, anaphor(a) interpretation and pronoun resolution.

building linguistic applications on computers such as information extraction, text summarisation, and machine translation. Thus, language engineers and computational linguists have constructed systems that try to tackle anaphor interpretation. These systems are not necessarily linguistically principled but rather borrow elements from linguistic theories (e.g. syntactic constraints) and combine them with heuristic techniques. One can distinguish between syntax-based knowledge-poor approaches, focus based analyses, others relying on semantic information and finally hybrid systems.

Research Goal

In the following I consider the problem of anaphora resolution from a practical point of view, in that I do not adhere to a particular linguistic theory. My aim is to implement a system for pronoun resolution that would initially use as much low level (syntactic) information as possible to collect likely antecedents of pronouns, in a fairly language independent manner and then determine the most plausible candidate by means of higher level information. The relevant computational literature on pronoun interpretation (Hobbs 1977, Lappin & Leass 1993, Kennedy & Boguraev 1996) showed that a success rate of 80% is feasible when employing syntactic information alone. The latter includes node configuration information, grammatical roles amongst others. However, there are cases where the disambiguation cannot take place without recourse to semantic knowledge (e.g. verb subcategorisation) and/or pragmatic knowledge as well as contextual cues, as one can assume from the following example:

(1)   John hit Tom. He started crying
(2)   Jones met the new client in his office

To decide between the two candidate antecedents for *he* in (1) it would be useful to know that in general a likely result of someone being hit is them bursting into tears[2]. In (2) one would need contextual information as well as semantic knowledge to arrive to a conclusion. For example, does Jones have an

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[2] This example could be context dependent for the interpretation of the pronoun. However, one is generally fairly safe assuming the axiom:

$$hit(x,y)->cry(y)$$

office of his own where he receives clients, or is it stated in the text that he was visiting the client company, etc.

My hypothesis is then that failure to correctly interpret the remaining 20% of pronouns not captured by the syntax-based systems is attributable to the lack of pragmatic knowledge. Incorporating such information would involve developing a domain theory. The latter is non-trivial since one has to decide on the coverage of the theory, criteria on consistent selection of the axioms and ways of updating them. One would also require an inference mechanism that would make efficient use of the axioms.

This has been attempted manually in Hobbs (1993) for the resolution of interpretation problems in several types of message. However, in Pulman (2000) a method is suggested whereby a domain theory is acquired automatically from syntactically disambiguated sentences, by means of a system for Inductive Logic Programming (ILP)[3]. The theory axioms are then matched against the logical forms of ambiguous sentences using a theorem prover. Although the system in question focuses on a limited domain, the underlying principles enable tuning to different domains and could be used for larger and more variable data.

The main advantage of using ILP to form a domain theory, is that it admits inferring information from the context, that is not present in the sentence. This in turn constitutes a major drawback for statistical based systems that train on annotated corpora, since their success depends on the testing data being sufficiently similar to the training data (Pulman 2000).

Pronoun resolution can be viewed as a disambiguation problem as well, where one has to choose between various sentence meanings arising from the selection of different candidate antecedents.

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[3] ILP is a discipline between machine learning and logic programming, that enables the learning of a hypothesis in the form of clauses describing concepts and relations between them from positive and negative data.

System description

1.   General

The idea I propose is to implement a system for pronoun resolution that locates likely antecedents given syntactic information and then selects the most suitable one according to whether the corresponding logical form of the sentence would be consistent with the axioms in my domain theory. The latter I intend to acquire by training an ILP mechanism on positive and negative (implausible) instances of predicate-argument combinations stemming from pronoun-free sentences of the Wall Street Journal (WSJ) corpus. Since the main objective is to combine syntactic and pragmatic knowledge and evaluate the assistance of the latter to the selection of correct pronoun antecedents, the choice of the syntactic mechanism need not be greatly sophisticated. Therefore, I have decided to implement a version of Hobbs' naïve algorithm (Hobbs 1977) that operates on the basis of configurational prominence, by traversing the surface tree of a sentence and performing certain checks for dominance, precedence and c-command relations between the tree nodes.

2.   Technical Details

So far I have implemented a version of the Hobbs naïve algorithm[4], after having reformulated it in terms of node dominance and precedence relations. The reason I think a declarative formulation of the algorithm is necessary, is that it reveals the principles underlying its operation as opposed to the totally heuristic effect of the steps in the original algorithm. Thus, generalisation is possible so that the same concepts can be employed in other applications. Potential errors or weak points may also be spotted in this way, so that the algorithm can be improved. In the following I will be using the notions of *dominance* and *precedence* which I shall define for a better understanding.

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[4] In the paragraphes titled Algorithm in this section I present the reformulation of the Hobbs algorithm. For the original version please refer to Hobbs (1977).

Definitions

- A node X *immediately dominates* a node Y if X is the next highest node up in the tree and is connected to Y by a single branch.

- A node X *dominates* a node Y if X is higher up in the tree than Y and is connected to it by an unbroken set of solid lines.

- A node X of syntactic category Cat *most immediately dominates* a node Y if X is the Cat node dominating Y which is closer to it than any other node of category Cat.

- A node X *precedes* a node Y if X is on the left of Y and neither of the two nodes dominates the other[5].

- A node X *immediately precedes* a node Y if X precedes Y and there is no other node intervening between the two (a node dominating Y would not count as an intervening node).

Algorithm

Let **NP 1** be the NP node immediately dominating the pronoun. Let **X** be either the NP or the S node which most immediately dominates **NP 1**. In searching for the pronoun's antecedent, one can distinguish between the following cases:

(I)   If **Z** is an NP node preceding **NP 1** and **Z** is dominated by an NP or
         S node dominated by X, then **Z** is a likely antecedent of the
         pronoun [corresponds o steps 1-3 of the Hobbs algorithm]

Step(I) is formulated to resolve pronouns in sentences such as:

(3)   John's brother blamed him for the accident

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[5] This definition is given for English. At this stage I am not taking into account head-final languages.

(II)   Otherwise, if there is no NP node preceding **NP 1** dominated by an S or P node dominated by **X** and **X** is the highest S node in the sentence, then if **Y** is the leftmost positioned highest NP node in the syntactic tree of the previous sentence, **Y** is a likely antecedent of the pronoun. If there is no such NP node in the previous sentence then try the sentence before that. [corresponds to step 4 of the algorithm]

Step (II) is designed to resolve pronouns in a pair of sentences such as:

(4)   John's brother hit him
       He was punished for such violent behaviour

(III)   Otherwise, if there is not an NP node preceding **NP 1** dominated by either an NP or S node dominated by **X** and **X** is not the highest S node in the sentence, then t **X 1** be the first NP or S node dominating **X**. The rest are subcases of this instance. If none of the conditions below is met by **X 1** then let **X 1** be the first NP or S most immediately dominating the first NP or S node dominating **X** etc. [corresponds to step 5 of the algorithm].

   (a) If **X 1** is an NP that immediately dominates an NP node that takes a modifier A (e.g. PP) and A dominates the pronoun, then **X 1** is a likely antecedent of the pronoun. [corresponds to step 6]

Step(IIIa) is designed to resolve pronouns in sentences such as:

(5)   The boy with no respect for his father was punished

   (b) Otherwise, if **X 1** is either an NP node of the form (NP -> Det NP) or an S and **Z** is an NP node preceding **NP 1** dominated by **X 1**, then **Z** is a likely antecedent of the pronoun. [corresponds to step 7 of the Hobbs algorithm]

Step(IIIb) is designed to resolve 3rd person pronouns in sentences such as:

(6)   Sarah was my friend until she gave away my secrets

    (c) Otherwise, if **X 1** is an S node but does not dominate any NP preceding **NP 1** and **Z** is the first NP node encountered to the right of **X 1** so that there is no other NP or S node between **Z** and **X 1** and **Z** commands **NP 1**, then **Z** is a likely antecedent of the pronoun. [corresponds to step 8, necessary for instances of cataphora]

Step(IIIc) is designed to resolve pronouns in sentences such as:

(7)   After he robbed the bank John left town

(IV)   Otherwise, if **X 1** is the highest node S in the sentence, does not dominate any NP preceding **NP 1** and there is no NP node **Z** to the right of **X 1** so that **Z** commands **NP 1** and there is no other NP or S node between **Z** and **X 1** then consider the following. If **Y** is the leftmost positioned highest NP node in the syntactic tree of the previous sentence, **Y** is a likely antecedent of the pronoun. If there is no such NP node in the previous sentence, then try the sentence before that. [corresponds to step 9].

Step(IV) is designed to resolve pronouns in a pair of sentences such as:

(8)   Emily got drunk at the pub yesterday
      Her desire to sing loud and the resulting attention were
      embarrassing

    The input to the actual system is a surface tree structure (already available for the WSJ corpus) that is assigned different possible antecedents (intrasentential or intersentential) as it is transported across a pipeline of modules, each of which implements one of Hobbs' algorithmic steps. A basic preference mechanism is embedded in the steps, so that intrasentential and recent candidates are given a higher score. There is also a component that treats all NPs as anaphors, submits them to the Hobbs process, obtains their hypothetic intrasentential antecedents and regards all other NPs in the same sentence as non-coreferring. Thus, a list of possible and impossible NP pairs is

constructed, which helps later in ruling out implausible intersentential candidate antecedents.

Discussion of Results

The algorithm so far has been tested successfully on 15 toy sentences, formed by a grammar similar to that of the FRACAS system as well as a subcorpus of 40 sentences from the WSJ. When morphological criteria are taken into account, the algorithm makes correct predictions (the most likely candidates tend to get the highest scores). However, it is evident that the current algorithm needs some refinements and extensions such as a component for handling plurals, a module for reflexives, the possibility of tracking down pleonastic pronouns and the inclusion of some semantic information (e.g. by looking up words in a database of semantic word attributes such as WordNet).

My intention is to obtain statistics on different types of anaphoric expressions containing pronouns and evaluate the success rates qualitatively so that the weaknesses of the system can be spotted in a more precise way. I hope to confirm my initial predictions of 20% loss due to lack of semantic and pragmatic knowledge. I shall then compare my results to that of previous implementations.

Future Work

More important than refining the syntactic algorithm is actually developing the pragmatic component so that the combined contribution of the two mechanisms can be evaluated.

The initial stage of building the domain theory will be to collect a subcorpus of the WSJ annotated for syntactic tree structure. Trees of pronoun-free sentences will be converted into logical forms (quasi logical forms, QLFs), formatted as a list of predicate-arguments structures. My intention then is to transform the latter into normal First Order Logic and input them as positive data to the ILP system (Progol[6]). Negative data will be attained in a similar manner by trying all possible predicate-argument combinations within a QLF.

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[6] Progol is a system for Inductive Logic Programming. For more details please refer to the manual (Muggleton 2000)

Those pairs not encountered so far in any of the positive constructs will be considered as implausible instances and will be fed into Progol as negative data for the induction of the theory. The following step will be to check the QLFs of test sentences —that is, sentences containing pronouns to be resolved— against the axioms of the theory and spot the antecedents which give rise to the best matching QLFs. Axioms may be assigned different weights so that in the case of more than one candidates being compliant with the theory, the antecedent corresponding to the most prominent axiom is chosen.

The example below illustrates how I envisage inducing an axiom from its domain theory. Given the sentence:

(9)   Portuguese Maria de Medeiros has outraged her countrymen with
        a farcical film about the 1974 revolution

the output of the mechanism receiving the syntactic tree of the sentence and generating a quasi logical form will be a set of first order predicates such as the following:

    person(m_m).
    countrymen(sk1).
    film(sk2).
    portuguese(m_m).
    has(sk1,m_m).
    outrage(e1,m_m,sk1).
    with(e1,sk2).

The above will count as the positive data to be entered into the theory induction system. The negative data in this case will be:

with(sk1,sk2).

Then the positive theory deducable through ILP & the data would be:

country_adj(A):- has(A,B), countrymen(B).
not(with(A,B)):- person(A), film(B).

I hope to be constantly evaluating the system throughout its development. The evaluation data will consist of a portion of the WSJ subcorpus annotated for anaphora and anaphor-antecedent pairs, with a distinctive mark for different types of anaphors. A first indication of the initial syntactic algorithm performance will then be used to measure success rates for various types of anaphors and then precision and recall rates will be recalculated when the pragmatic component is added and the algorithm is further refined. I would then like to extend the system performance to include other types of anaphors such as definite and deictic noun phrases.

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Appendix

Example runs of the Algorithm

Example from the test run of version sys22.pl of the algorithm on the WSJ

```
"Battletested Japanese industrial managers here
always buck up nervous newcomers with the tale of
the first of their countrymen to visit Mexico"
```

Tree of the example sentence:
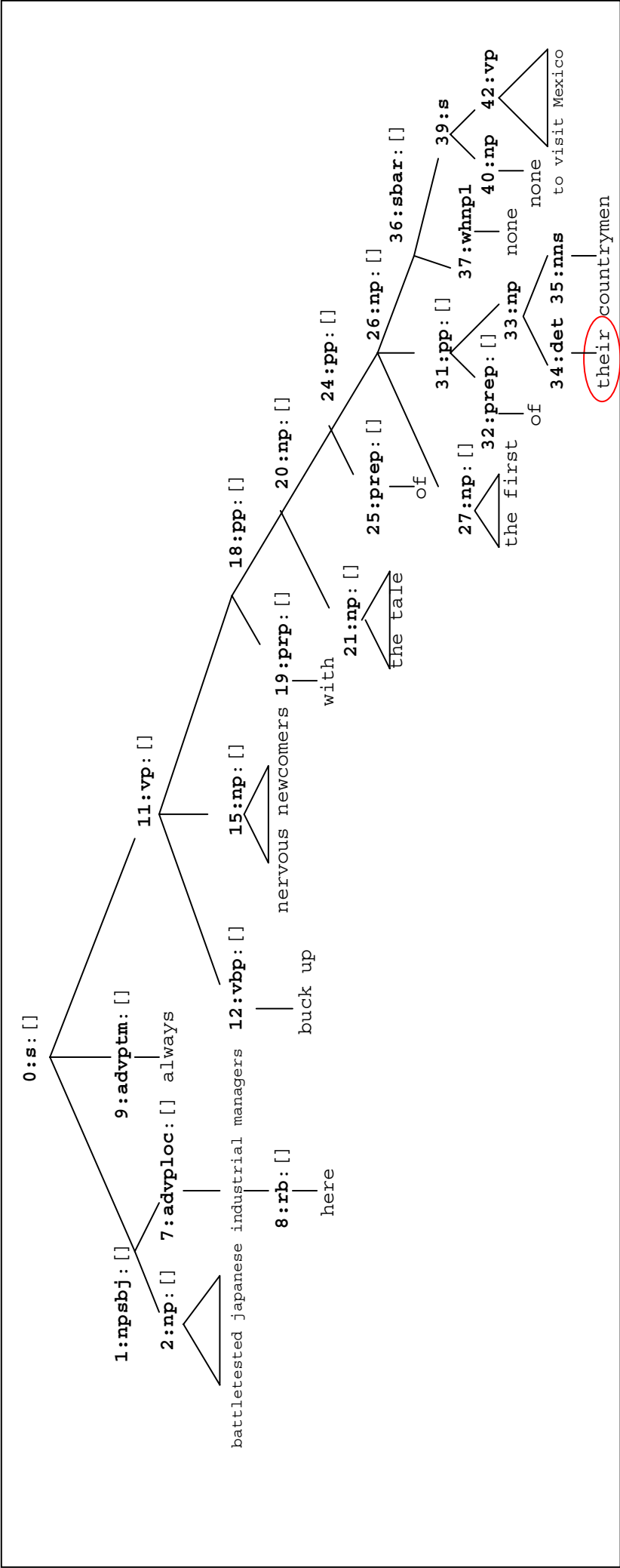
Syntactic component results for the example sentence:

AntecedentsTable: [antecedent((their,det,34),[(np,40),(np,2),(np,15),(np,21),(np,27)],[200,340,360,380,400])]

According to the output of the syntactic component, (np,27)/ *the first* is the most highly ranked pronoun. My aim is to combine the pronoun interpretations stemming from the syntactic component with the pragmatic component and discard candidates that are not consistent with the theory axioms.

Given the axiom:

country_adj(A):- has(A,B), countrymen(B). (See example (1) above)

and the candidate antecedents:

AntecedentsTable:
```
[antecedent((their,det,34),[(np,40),(np,2),(np,15
),(np,21),(np,27)],[200,340,360,380,400])]
```

Candidate (np,2)/ *battletested Japanese industrial managers* is selected as the correct antecedent, since it is the only one consistent with the available axiom. In the case of a wider selection of axioms, each of them can be assigned a different probability score so that in the event of equally plausible candidates, the one consistent with the most probable axiom would be chosen.

Which template for behind? Empirical considerations of the meaning of Directional PPs

DIDIER MAILLAT

1. Introduction

In this paper, I wish to discuss the representation of meaning for a restricted set of prepositional phrases primarily used in association with the spatial domain. In particular, the following paragraphs will address some of the well-known properties and issues related to some specific spatial deictics.

1.1. Corpus

The corpus of PPs under scrutiny in the following pages is the so-called set of directional (projective) prepositions

- To the left/right of
- In front of/behind
- Above/below
- Marginally: the set of cardinal prepositions (east/west of, etc.)

The reason for focusing on these PPs results from one of their most striking properties (at least in Indo-European languages): namely, that each of these directional expressions' extension is sensitive to the spatial framework (or spatial reference frame) within which they are interpreted. As we will soon find out, framework-sensitivity can be analysed as a type of deictic feature.

1.2. Data

As with English, languages often allow two (or three) different spatial conceptual frameworks to encode the same spatial relation (see Levinson 1996). Crucially, in Indo-European languages, sentences which involve a directional preposition, like (1) below, are ambiguous with respect to the spatial frame of reference used to interpret the sentence.

(1)   The dog is sleeping behind the car

Sentence (1) can be read as meaning that the dog is near the back of the car, by the car's boot (intrinsic reading), or it can be interpreted as meaning that the dog is on the opposite side of the car relative to the speaker's viewpoint (relative reading). It is worth mentioning here that this type of ambiguity depends on several factors, so that changing the nature of the ground object, i.e. the referent denoted by the complement of P, cancels the ambiguity. Thus, in sentence (2), only one reading is available, namely the relative interpretation.

(2)   The dog is sleeping behind the tree

2. Understanding the Nature of the Ambiguity: Frames of Reference

A first step towards a better understanding of the question at stake entails trying to define the various elements which trigger the ambiguity in (1). In the following figures, the different parameters which make up the scenes described by (1) and (2) are represented graphically, which will help us see how the meaning of a given directional preposition − in this case *behind* − interacts with the spatial framework within which it is interpreted.

Figure 1 illustrates the situation in (1) under an intrinsic reading (where a circle marks the position of the dog). In this system, the *figure object* − the dog − is said to be 'behind the car' with respect to the car's intrinsic geometrical and functional properties. Note that in such a framework the location of the

viewer/speaker does not bear on the truth value of the utterance, whereas the orientation of *ground object*, the car, does.
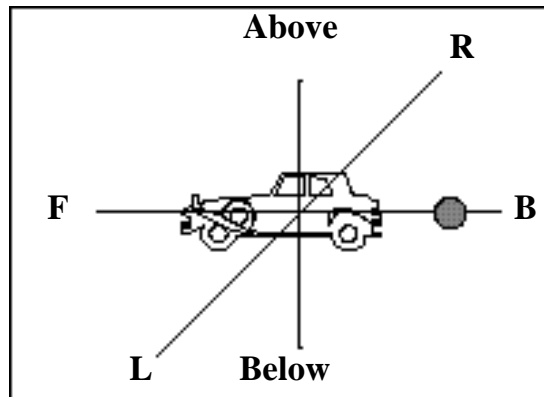
Figure 1: Intrinsic reading

Figure 2, on the other hand, displays the configuration described by sentence (2), which licenses only a relative reading. In this case, the circle – marking the dog's position – is said to be 'behind the tree' with respect to a certain viewpoint (VPT), which corresponds more or less in this instance to the reader's perspective of the picture. Contrary to what we observed in Figure 1 the location of the viewer/speaker affects the truth value of the utterance, while the orientation of the ground object does not. Notice also that the actual geometrical and functional properties of the ground object have no effect on the truth conditions which satisfy a relative reading, so that the tree can be replaced by a car and receive the appropriate relative reading of sentence (1).
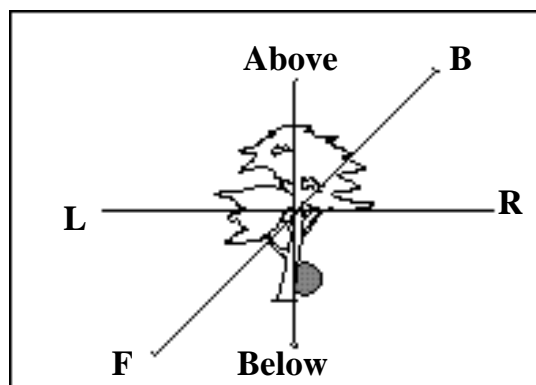

Figure 2: Relative reading

2.1   Frame Features: a comparative table

The information gathered in the previous section is presented in Table 1 below. We saw that both the intrinsic and relative frameworks are essentially the same in that they are both based on a three-dimensional Euclidean space, divided up by three orthogonally arranged axes centred on a point of origin. However, they do differ with respect to the way the axial system is oriented. So that, while both frame types are centred on the ground object (G in the table), the intrinsic frame is oriented by the ground object, whereas the relative frame is oriented *via* the location of a salient viewpoint (VPT in the table).

	Origin	*Orientation*
Intrinsic	G	G
Relative	G	VPT

Table 1

To put it differently, the two frameworks are essentially similar, except for the parametric setting which determines their orientation. As a result, a spatial framework can be fully determined by its orientation parameter.

2.2   Different Explanations

There have been two competing accounts in the literature as to how semantics and/or pragmatics should handle cases of framework ambiguity. In the lexical account, the two readings in (1) are generated by two different derivations, each one being articulated around the corresponding lexical entry of the directional P. Thus, in our example, we would assume the existence of two lexical entries: *behind*$_{Rel}$ and *behind*$_{Int}$.

A variant of the lexical approach, favoured by Jackendoff[*] and Pustejovsky[*], constructs a complex lexical entry which selects an invisible or non-indexed argument *VPT*, which is explicitly realised in the relative interpretation and implicitly identified with the internal argument (G) in the intrinsic reading. The pragmatic approach suggested in this paper, on the other hand, proposes an analysis in which both readings in (1) share the same syntactic, semantic and

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[*] Personal communications

lexical representation. Thus, assuming a single lexical entry, I claim that frame assignment is pragmatically determined and affects the truth conditions of framework-sensitive items such as directional prepositions.

In this model, ambiguity arises from the possibility of generating two competing enriched interpretations (i.e. after pragmatic enrichment). The point I am making here is the following: since we clearly need to posit different types of spatial frameworks, and since these types correlate directly with the various interpretations that an ambiguous sentence like (1) gives rise to, why should we replicate these categories in the lexicon?

In fact, this would constitute a rather counterintuitive statement, as we would be claiming that even though a language does distinguish between frame types linguistically it has deliberately blurred the distinction! And this is true of all Indo-European languages (to the best of my knowledge), as they systematically display such ambiguity as instantiated in (1).

On the other hand, under a pragmatic analysis, directional prepositions are regarded as encoding a piece of spatial information that requires being hooked on a frame of reference. As long as the frame types are compatible with one another in terms of features (which has been confirmed by our previous observations), a preposition can be applied across different frameworks; hence the ambiguity. Or, to return to our initial problem, the ambiguity in (1) is the result of diverging orientation parameters in the two interpretations: changing the orientation of the spatial framework directly affects the truth conditions of the PP. To conclude, a single abstract lexical entry under a pragmatic analysis seems to constitute a preferable approach.

Both the separate lexical item hypothesis and the abstract lexical item hypothesis are found in current research. For instance, when scholars try to define the meaning of a preposition like *behind*, one can easily distinguish between the two approaches. Alternatively, proponents of the 'overlap theory' claim that frontal directional prepositions (i.e. *in front of* and *behind*) imply that there is some degree of visual occlusion between the ground object and the figure object (see Vandeloise 1986, Nam 1995, Levinson 1996, O'Keefe 1996, Tversky 1996). On the other hand, proponents of the 'quadrant theory' argue that the horizontal plane is divided into four 90° regions, and *behind* denotes one of those quadrants (see Herskovits 1986, Levelt 1996, Landau 1996, Zwarts & Winter 2000). In this second view, the meaning of a directional preposition is described as an angular range. The crucial difference here is that, while

quadrant theory can be readily applied to both the intrinsic and the relative readings of (1), 'overlap theory' fails to account for the intrinsic reading. As a result, under the 'overlap' hypothesis, one would have to posit a second lexical entry for *behind* to explain the intrinsic reading (since visual occlusion is not an operative factor in that particular reading).

Some people have adopted an intermediate view. Jackendoff and Landau (1992) write that "a subsidiary use of some of the directional prepositions invokes the distinction 'visible' versus 'occluded'. […] Vandeloise (1986) argues that occlusion of the reference object is the main relation expressed by French *devant* 'in front of'. Though we would not go quite so far, we believe this criterion plays a secondary role […]." [114]

In brief, if we are to build a semantic model for directional prepositions based on the assumption that a single lexical entry covers all readings, we want to be able to show that 'overlap theory' makes the wrong predictions.

The goal of the experiment described below is to get a better idea of the *spatial templates*, or *spatial maps* (see O'Keefe 1996, Logan & Sadler 1996; see also Jackendoff's "regions") that correspond to the four horizontal directional prepositions (*to the left of / to the right of*, *in front of / behind*). In particular, the experiment tries to see if these templates reflect an underlying 'quadrant' model or an 'overlap' one.

3. The Experiment

3.1 Description

A group of subjects were exposed to the same set of stimuli which consisted of a series of computer-generated scenes, where two geometrically identical spheres, a red one in the centre of the picture and an orange one rotating around it, 'float' above a chequered surface. The stimuli could only elicit a relative reading. A series of twenty-four scenes were produced, varying by 15-degree anticlockwise rotations, in which the distance between the two spheres was held constant. The 0° reference point was set along the right axis.

Picture 1 below shows an example of stimulus screen where the rotation angle for the orange (light) sphere around the red (dark) one is set at 60°.
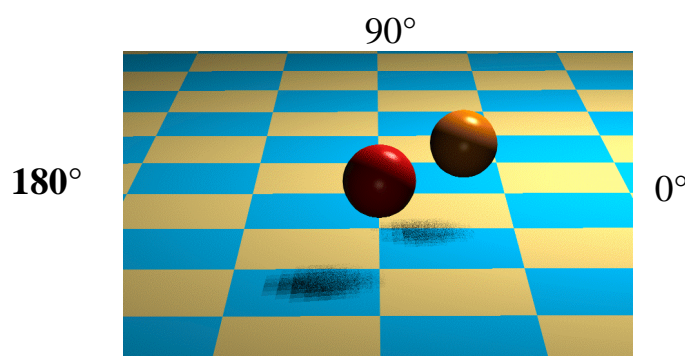
Picture 1

Each subject was asked to judge the position of the orange sphere relative to the red one, using only one of four possible prepositional constructions — *to the left of*, *to the right of*, *behind*, and *in front of* — by choosing the one expression that they thought was most accurate to describe the picture.

Finally, in order to collect a statistically relevant quantity of data, it was decided that the test would be run using a small number of subjects (3 male & 3 female native speakers of American English, all right-handed) and a large number of repeats (10). The sequence of 240 stimuli was randomised to ensure that the results obtained can be regarded as statistically independent. Altogether, a total of 1440 independent responses were obtained. (60 for each stimulus)

3.2 Results

First, we can say that the results obtained in this experiment unmistakably and consistently contradict the proponents of the overlap theory. This high level of consistency allows us to safely dismiss the overlap hypothesis. Recall that this is quite a desirable finding, as the reverse would have greatly undermined the credibility of a single-lexical-entry model.

A second remark would be that visual overlap between the two spheres is not a necessary condition for the use of frontal prepositions (*contra* Vandeloise 1986, O'Keefe 1996, Tversky 1996 and Bennardo 1996). The experiment was designed in such a way that the two spheres were visually overlapping for three positions near the frontal axis (i.e. 75°, 90°, 105° and 255°, 270°, 285°). Picture 2 shows the corresponding stimuli when the rotation angle is set at 105° and 285°, respectively:
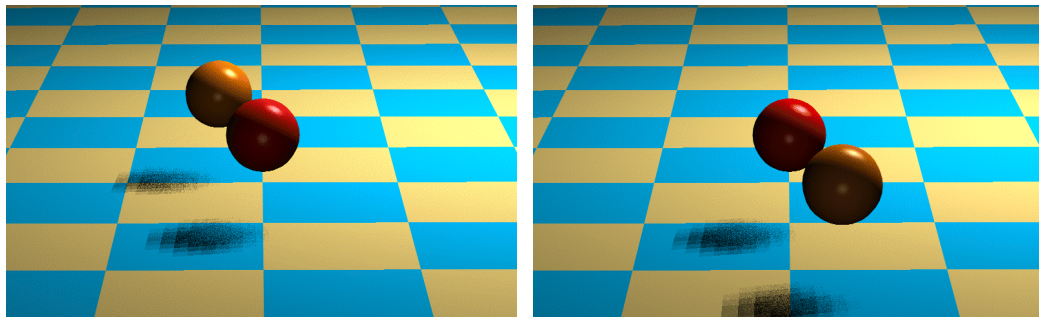
Picture 2

However, Graph 1, displayed below, indicates that subjects overwhelmingly chose frontal prepositions at 60°, 120°, 240° and 300°, by 93%, 85%, 85% and 76% respectively, even though those stimuli did not involve visual occlusion between ground and figure objects. In other words, these native speakers of American English described the figure object as being behind or in front of the ground object, even when the objects were NOT perceived as visually overlapping. These findings seem to indicate that the correct hypothesis about spatial maps is to be found in the quadrant theory.

Nevertheless, it should be pointed out that proponents of the overlap theory were not entirely wrong in their predictions, in the sense that visual overlap does appear to constitute a knockdown factor in favour of the frontal prepositions (as hinted at in Levinson 1996).
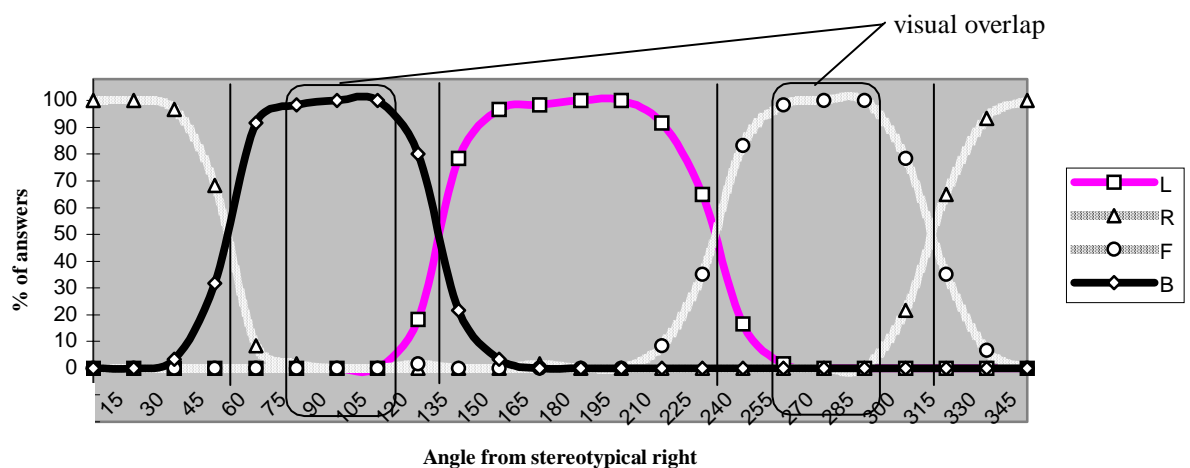
Graph 1

Indeed, for those locations where overlap between the two objects occurred, subjects almost always reached perfect unanimity in selecting the frontal preposition rather than the lateral one. Thus, we can say that visual overlap

overrides the potential ambiguity between lateral expressions and frontal ones and prompts subjects to systematically choose the frontal option (percentages of selection of a frontal expression range between 98.3 and 100 for the positions in question).

However, this observation does not undermine my previous statement, since these findings show that visual overlap cannot be part of the semantic description of the frontal preposition. If that were the case, subjects would have spontaneously produced an overwhelming number of ungrammatical sentences, semantically speaking, for those positions that are immediately adjacent to the overlap areas in Graph 1.

Graph 1 shows that quadrant theory is not entirely accurate either, although it can be regarded as being much closer to the truth than the competing view. It appears that the lateral axis pair is slightly more prominent and covers more space than the frontal axis pair. In the graph, we can see that the normal distributions of the frontal pair (*behind* / *in front of*) are notably narrower than those of the lateral expressions. Statistically speaking, this difference is expressed in terms of *circular standard deviation*. Subjects, as a group, display the following values for circular standard deviation: *left* = 31.33; *right* = 31.26; *front* = 27.51; *behind* = 25.12.

Theoretical boundaries have been represented in Graph 1, above. By 'theoretical boundaries' I mean the statistically measured points at which subjects' preference between two spatially adjacent prepositions is reversed (i.e. the 50% - 50% points). On Graph 1, those boundaries correspond to the points where one curve crosses another.

Under the quadrant hypothesis, the boundaries would be set at 45° (right/behind), 135° (behind/left), 225° (left/front) and 315° (front/right), whereas the lines drawn on our graph fall at 50°, 130°, 230° and 310°, respectively. Thus, on the whole, subjects show a tendency to use lateral expressions more often than frontal ones (55.1%, against 44.9% of all variations). Also note the remarkable symmetry found in both the lateral and the frontal pair. Graph 1 shows quite clearly that the angular range of *left of* is almost the exact mirror image of the range covered by *right of*. The same holds for *behind* and *in front of*. This seems to provide further support to the pairing of directional expressions into a lateral and a frontal set. In turn, axial symmetry strongly suggests that we are right to assume the existence of an axial system organising spatial cognition (see Maillat 1999).

In brief, these results go against a strict application of the quadrant theory. What we find instead is an intermediate course combining both hypotheses. As suggested in the quadrant theory, the meaning of all four directional expressions is defined in terms of angular range and is not (necessarily) conditioned by visual overlap. However, frontal prepositional constructions do seem to have a more restricted range of use than lateral ones, as predicted by the proponents of the overlap hypothesis. In addition, as we noted earlier, overlap theory appears to be accurate in another respect: although visual overlap does not constitute a necessary condition to the use of a frontal preposition, it still acts as an overriding factor. In the end, it looks very much as if the right solution is to be found in a hybrid model. Such a conclusion explains rather neatly the fact that both theories have been able to co-exist in the literature.

4. Spatial Templates: A Model

4.1 Proposed model

I can now use the results of the experiment in order to draw a tentative spatial template for each of the four prepositional constructions. In Graph 2 below, the radial representation takes the form of a spatial layout which matches the actual circumstances of the experiment. In other words, Graph 2 visually renders a bird's-eye view of the experiment's setting, with the ground sphere at the centre and a line originating from the centre for each of the 24 fifteen-degree rotations. The areas coloured in different shades of grey correspond to the four normal distributions analysed above, indicating the percentage of answers for each preposition for a given stimulus (i.e. rotation angle). The final output is a fairly good approximation of the kind of spatial template that our subjects invoke when they linguistically encode directional relations in a relative framework. For easier viewing, the results for the two axes have been represented separately.
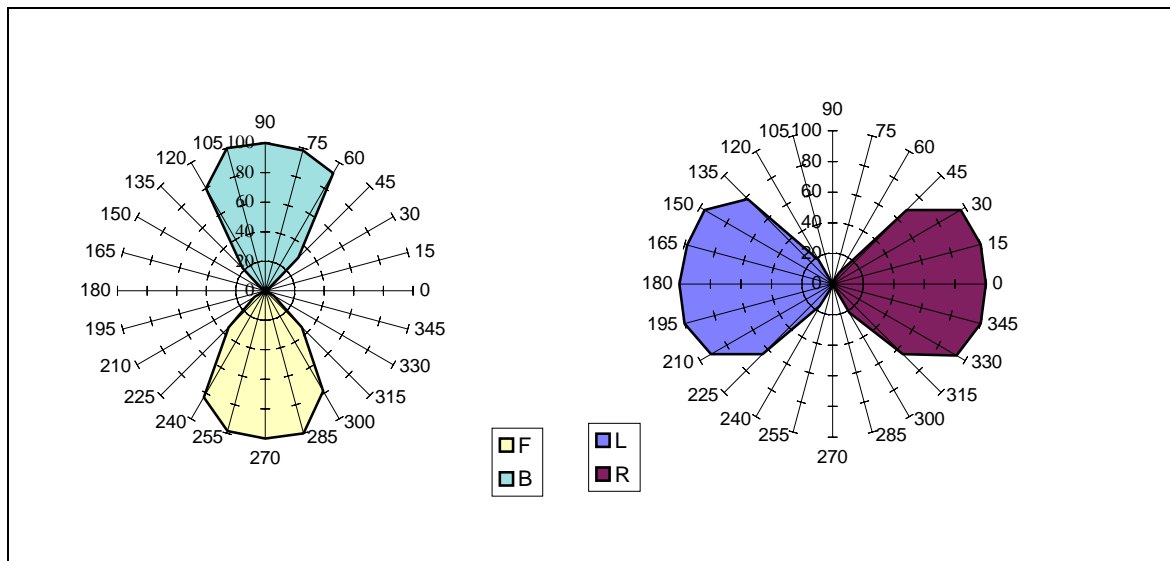
Graph 2: Radial

The four grey areas are reminiscent of the quadrants that we considered earlier. The main problem with our templates as they now stand comes from their overlapping sections. In other words, the boundaries between each prepositional template require some fine-grain tuning. To be more specific, Graph 2 is overly precise. Instead, we need to extrapolate an idealised model that is more likely to reflect the cognitive reality of a native speaker of American English. In Figure 3, the boundaries between the four templates have been fixed in accordance with the values that were statistically determined in the previous section.
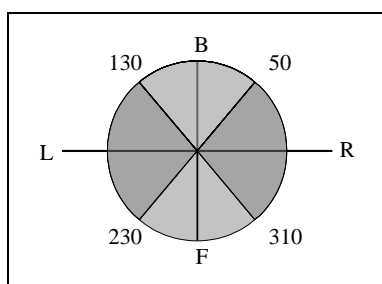

Figure 3

4.2. Problems

As a last comment on this point, I wish to underline one important *caveat* in connection with the type of template suggested in Figure 3. In fact, this type of template and all other versions of spatial templates based on angular ranges (i.e. derived from the quadrant model) face a very specific computational issue which has been massively overlooked in the literature (see Zwarts & Winter 2000, for the latest instance of this omission). The particular problem I have in mind here could be referred to as the 'paper syndrome'. In fact, most researchers who have worked on spatial templates have offered two-dimensional representations of their models, due to the medium used to convey their findings: paper. But all of these models are supposed to be applied in a three-dimensional world. As it happens, most existing formalisations work well to the extent that they are tested in a two-dimensional environment. A three-dimensional domain, however, would prove them to be underdetermined (but see Aurnague 1995 for a successful solution to this problem).

For instance, a model like the derived quadrant model in Figure 3 is not satisfactory unless one assumes some level of overlap between the different templates. The problem comes from the fact that these models define the area denoted by a directional P by means of an angular range. Consequently, the three-dimensional template of a preposition like *behind* corresponds to a cone-shaped volume symmetric around the frontal axis. But if one tries to use these same cone-shaped templates for, say, *to the left of* and *above*, there will be an area left unspecified (i.e. outside the scope of all three cones) between these three templates. In fact, for any two abutting cones, there is no third cone such that it can be adjoined on the same boundary along which the first two cones meet. Therefore, unless one supposes some level of overlap between the different conic templates, there is bound to be a 'gap' between them. In other words, an idealised representation like the one suggested in Figure 3 will do for the argument presented in this paper, but will need to be refined in a larger context in order to avoid computational indeterminacy.

5.   Conclusion

To conclude, one should point out some key features of the model for directional prepositions proposed in this paper. First of all, the experiment illustrates that even in the context of relative encoding, subjects appear to rely upon angular cognitive templates.

On the basis of this first observation, it seems reasonable to assume that a single lexical entry, denoting an angular range, can be used to account for both reading of a sentence like (1).

As a result, we are led to make the claim that the ambiguity illustrated in (1) is not lexical (*contra*, e.g. Herskovits 1986, Nam (1995), Zwarts & Winter 2000). Rather, (1) is pragmatically ambiguous. That is to say, the ambiguity in (1) is to be re-analysed in terms of the cognitive process by which a native speaker assigns a frame of reference when he/she interprets a directional expression. In other words, our task is to construct an interpretative model in which the intrinsic and relative frames of reference are essentially similar (in order to account for the fact that the same lexical entry is used within both frameworks). The two frameworks, however, should display some parametric variation, which triggers the ambiguity in (1). Maillat (1999) shows that such a model can be formally implemented and that it successfully predicts the meaning of directional prepositional constructions in English.

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A Minimalist Approach to Quantifiers

HISASHI MORITA

In this paper I will present a new way to represent quantifiers at LF.[1] I claim
that:

(i)   No QR (Quantifier Raising) is necessary.
(ii)   LF is a level at which scopal ambiguity is resolved.
(iii)   It is not c-command relations which determine scopal relations but
        timing of checking.

This paper is organised as follows: I first introduce May (1977, 1985), who
analyses quantifiers in terms of QR. I argue that QR is not a syntactically
desirable notion, so the meaning of quantifiers should be represented without it.
I then consider Hornstein (1995), who manages to explain quantifier
phenomena without assuming QR. However, I show that his theory is not free
from problems either. Finally I present my account which explains the
quantifier phenomena and the problems encountered by the above proposals.

1.   May (1977, 1985)

First let me consider May (1977) and May (1985), which are instances of the
QR approach. May (1977) presents the notion of LF and argues that LF is a
level at which ambiguity is resolved. Consider (1):

 (1)   Someone kicks everyone.

(1) is ambiguous in two ways. To account for this scopal ambiguity, May
(1977) introduces Quantifier Raising (QR). QR is an operation which adjoins

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quantifiers to places where their scope is defined. In other words, QR takes place to assign quantifiers with appropriate scope. Therefore, QR is semantically motivated. After QR is applied to (1), two LFs are generated as follows:

(2) $[_{IP}$ someone$_x$ $[_{IP}$ everyone$_y$ [x kicks y]]

(3) $[_{IP}$ everyone$_y$ $[_{IP}$ someone$_x$ [x kicks y]]

   (2) and (3) correspond to the two readings above. If one sentence is ambiguous in two ways, two different LFs are provided. This is what May (1977) means by saying that LF is a level at which ambiguity is resolved. However, May (1985) abolishes this theoretically attractive notion regarding LF and presents a different view of it as follows:

(4)   'Holding that a single structure at LF represents a class of interpretations differs in an important way from […] that of May (1977), in that multiply quantified sentences are no longer disambiguated with respect to the interpretations, but rather with respect to the interpretations with which their LF-representations are compatible.'

   May (1985: 36).

   May's (1985) reason for adopting this approach is that the Empty Category Principle (ECP) can be incorporated into his account. The ECP requires an empty category to be properly governed. Therefore, (2) is not a possible structure if the ECP is operational at LF too (because "x" is not properly governed), which May (1985) assumes. May (1985) hence presents the *Scope Principle*, which is defined as follows:

(50)   The Scope Principle:

       An operator A may have scope over an operator B iff A c-commands B or an A'-element in the chain headed by B.

The Scope Principle allows (3) to be compatible with the two interpretations presented above. In other words, (3) is, for May (1985), the only available LF representation (because of the ECP), which produces two interpretations. Hence, May (1985) cancels May's previous (1977) attractive view that LF is a level at which ambiguity is resolved. Furthermore, Chomsky (1995) claims that every movement should be syntactically (or morphologically) motivated, therefore, QR is not a desirable operation because it is motivated semantically.

2.   Hornstein (1995)

Above we have seen, both May (1977) and May (1985) have proposed the QR operation and these accounts are problematic. One problem is that QR is not morphologically motivated. Another problem for May (1985) is that LF is not a level where ambiguity is cleared unlike May (1977). From now on I will consider one non-QR argument proposed by Hornstein (1995). He claims that QR is not necessary. If this is possible, it would be a great advantage because semantically motivated operations like QR should be removed. Before discussing his proposal, it is necessary to mention two assumptions. He supposes the VP-Internal Subject Hypothesis and Chomsky and Lasnik's (1993) IP-structure. Let me now explain these features briefly. Examining the following sentence:

(6)   Ken saw Mary.

The representation of 6 at SS is as in 7:[2]

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[2] If we follow Chomsky and Lasnik's (1993) argument that an object is raised to AgrOP at LF, (7) is a representation at LF. However, here I follow Koizumi (1995) in that an object is raised to AgrOP at SS. Note that in Koizumi's (1995) representation, AgrOP is lower than a subject's initial position (spec of TP).

(7)   AgrSP

Spec   AgrS'

Ken$_1$ AgrS   TP
         [+case]

                      AgrOP

              Spec   AgrO'

              Mary$_2$ AgrO   VP
                        [+case]

                              NP   V'

                              t$_1$ V   NP

                                      saw   t$_2$
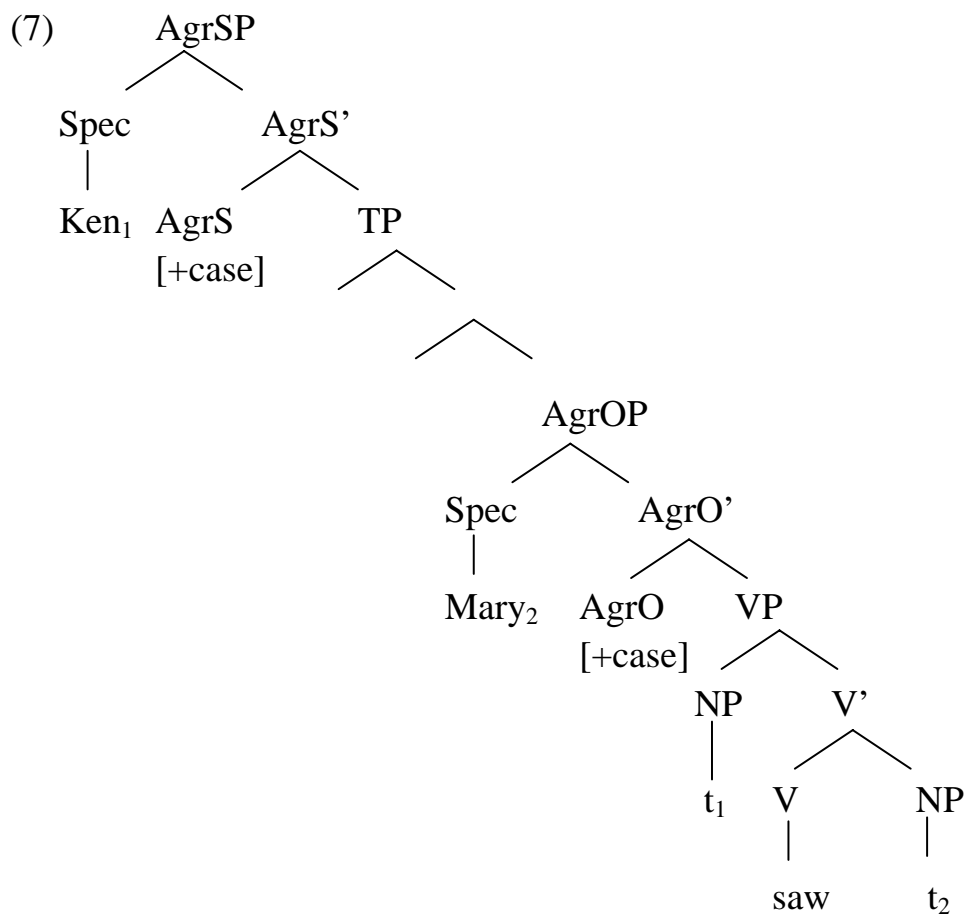
The VP-Internal Subject Hypothesis claims that a subject as well as an object is merged with a verb. As (7) shows, the subject *Ken* is generated at Spec of VP and the object appears at Complement of V at the beginning. Both the subject and the object have a feature [+case], so they must be raised to AgrP to check them off. Subjects go to AgrSP and objects move to AgrOP. Thus, (7) has two AgrPs and this is Chomsky and Lasnik's (1993) IP-structure. If these assumptions are accurate, the base-generated position of subjects (spec of VP) is lower than the case-checking position of objects (spec of AgrOP), which is a key feature in Hornstein (1995) as we see below.

Bearing these assumptions in mind, we examine Hornstein (1995) (Kitahara (1996) proposes a very similar account, but I concentrate only on Hornstein here). Let us return to example (1), which is repeated here.

(8)   Someone kicks everyone.

After the subject and the object are raised to check their case features, (1) generates the following structure:

(9)   [$_{AgrSP}$ someone$_1$ [$_{TP}$ [$_{AgrOP}$ everyone$_2$ [$_{VP}$ t$_1$ [$_{V'}$ kicks t$_2$]]]]]

Hornstein (1995) assumes that a phrase leaves its copy rather than its trace when it is moved, so (8) is represented as in (9).

(9)   [$_{AgrSP}$ someone$_1$ [$_{TP}$ [$_{AgrOP}$ everyone$_2$ [$_{VP}$ someone$_1$ [$_{V'}$ kicks everyone$_2$]]]]]

Here, Hornstein (1995:154) adds the following constraint:

(10) At the CI (Conceptual-Intensional) interface an A-chain has at most one and at least one lexical link.

(10) implies that the same phrase should not appear in more than one place if they are in the same (A-)chain. Therefore, one *everyone* and one *someone* are deleted in (9). After deletion we will have the following four different configurations:

(11) (a)   [$_{AgrSP}$ someone [$_{TP}$ [$_{AgrOP}$ everyone [$_{VP}$ [$_{V'}$ kicks]]]]]
                    (someone >> everyone)

      (b)   [$_{AgrSP}$ [$_{TP}$ [$_{AgrOP}$ everyone [$_{VP}$ someone [$_{V'}$ kicks]]]]]
                    (everyone >> someone)

      (c)   [$_{AgrSP}$ someone [$_{TP}$ [$_{AgrOP}$ [$_{VP}$ [$_{V'}$ kicks everyone]]]]]
                    (someone >> everyone)

      (d)   [$_{AgrSP}$ [$_{TP}$ [$_{AgrOP}$ [$_{VP}$ someone [$_{V'}$ kicks everyone]]]]]
                    (someone >> everyone)

(11)a), c), and d) correspond to the interpretation that there is one (unique) person who kicks everyone, while (11)b) is equivalent to the other one, i.e. that for everyone, there is a person who kicks him. Therefore, this account can generate the two interpretations of (1). One advantage of this proposal is that the ambiguity has arisen as a result of syntactic movement. Thus, the principle that movement is morphologically driven is obeyed here because the movement of those quantifiers is triggered by case-checking, which is morphologically

driven. Furthermore, it is generally thought that quantifiers cannot take scope across their lodging clauses. Thus, the following sentence is not ambiguous:

12.   Someone thinks that everyone is happy.

In (12), *everyone* never takes scope over *someone*. Therefore, this fact led researchers to speculate that QR is somehow clause-internal. However, this is naturally explained for Hornstein. This is because it is impossible for *everyone* to be in a higher place than *someone* in the course of its A-movement. Despite these advantages, Hornstein (1995) has a few conceptual and empirical problems.[3]

The first problem is (10). Hornstein argues that at the CI (Conceptual-Intensional) interface, copies of a phrase are deleted except one. The problem is whether this operation occurs before or after the LF is generated. If (10) is applied before LF, it is a syntactic operation. However, this deletion process seems to be semantically motivated, so I am not sure if this operation is allowed at all in the syntactic component. If (10) is applied after the LF is provided, that deletion procedure is reasonable because it is semantically strange that more than one scope be assigned for a single quantifier. However, if this is the case, (9), not (11), is the representation at LF. Therefore, like May (1985), this approach assumes that LF is not a level at which ambiguity is resolved, which is unattractive in terms of aesthetics.

The second problem is found in control verbs, which is noted by Johnson (2000). Consider the following example:

13.   (=(22) in Johnson (2000))
      A different student tried to stand near every visitor.

(13) has the control verb *tried*, so we expect PRO to be between *tried* and *to* (cf. Chomsky (1981)). According to Hornstein (1995), both the base-generated position (Spec of the matrix verb) and the case-checking position (the Spec of the matrix AgrSP) of the subject *a different student* are higher than the position where *every visitor* is adjoined (the embedded AgrS'), so he predicts that (13) is unambiguous. However, Johnson (2000) maintains that (13) is ambiguous: *every visitor* takes scope over *a different student* and vice versa. If his

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[3] The problems for Hornstein (1995) also hold true for Kitahara (1996).

judgement is correct, this is the first empirical problem for Hornstein's (1995) approach. One way to solve this problem is to cancel the Theta-Criterion as Hornstein (1999) does. If the Theta-Criterion does not exist, the same phrase can receive a theta-role more than once. If this is possible, we can consider that *a different student* is base-generated at Spec of *stand*, which is lower than the place where *near every visitor* is adjoined. Therefore, *every visitor* can take scope over *a different student*, hence, (13) is ambiguous. This might be correct, but as we will see below, I will provide an account which can explain the data above without eliminating the Theta-Criterion.

The last problem is inverse linking, which has been recognised since May (1977). Examining the following example:

14.   (=(32) in Johnson (2000))
       A resident of almost every Californian city curses its traffic.

Though *a resident* c-commands *almost every Californian city*, the latter can take scope over the former and can bind *its*.[4] This is a problem for Hornstein (1995) because *a resident* continues to c-command *almost every Californian city* in the course of its A-movement. Therefore, there is no chance for *every Californian city* to take scope over *a resident* under Hornstein's (1995) model.

3.   A new proposal

From now on, I present a new analysis to show how quantifiers are represented at LF. There are three important features in my approach. The first is that I do not assume QR like Hornstein (1995) and Kitahara (1996) do. In other words, scope is determined in the course of A-movement of quantifiers. The second feature is that the c-command relationship does not necessarily correspond to scope relationship. What determines scope hierarchy is the timing of checking the semantic features of quantifiers. The last feature is that LF is a level at which (quantificational) ambiguity is resolved like May (1977). In addition to the VP-Internal Subject Hypothesis, I need to make several assumptions. First, nominative case is checked at TP and accusative case at *v*P

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[4] It is also possible for *a resident* to take wide scope. However, in that case, *almost every Californian city* cannot bind *its*.

(cf. Chomsky (1995)). Thus, no AgrP is necessary. Secondly, a semantic representation is constructed derivationally (see Higginbotham (forthcoming) for details). The approaches introduced so far are all representational ones.

Higginbotham (forthcoming) distinguishes the derivational and the representational representations as follows:

(15)   A representational view of semantics makes the representations of linguistic structures at one or more levels the inputs to semantic theory, and within that setting formulates principles of semantic combination. In a derivational theory, on the other hand, the semantics is computed in parallel with the syntactic derivation; thus the final representation at LF comes with a meaning computed in the course of deriving it.

Finally, I assume that quantifiers and functional categories possess [+quant]. [+quant] is an interpretable feature for quantifiers but it is uninterpretable for functional categories. As we see below, the way quant features are checked determines how scope relation is represented.

Now let me illustrate this proposal. Consider (1) again, which is repeated below:

(1)   Someone kicks everyone.

As we have already established, (1) is ambiguous in two ways. One is the wide scope reading of *someone* and the other is the wide scope reading of *everyone*. I will provide two syntactic derivations of (1) and show how two interpretations are produced (but tense is ignored). Consider (16), first:

(16) (i) vP   →   (ii) vP

someone$_i$ everyone$_j$
[+quant] v VP   [T+quant]   someone$_i$
        [+quant]   [+quant] v VP
                    kick   everyone   [T+quant$_j$]
                            [+quant]

→ (iii) TP   →   (iv) TP

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→ (iii)   TP                →   (iv)   TP
         /  \                         /  \
  someoneᵢ   T'              someoneᵢ    T'
  [T+quant]  / \                        /  \
           T     vP                   T      vP
          / \                         |
         T    v-kick               T-v-kick
      [T+quantᵢ]  [T+quantⱼ]     [T+quantᵢ, T+quantⱼ]
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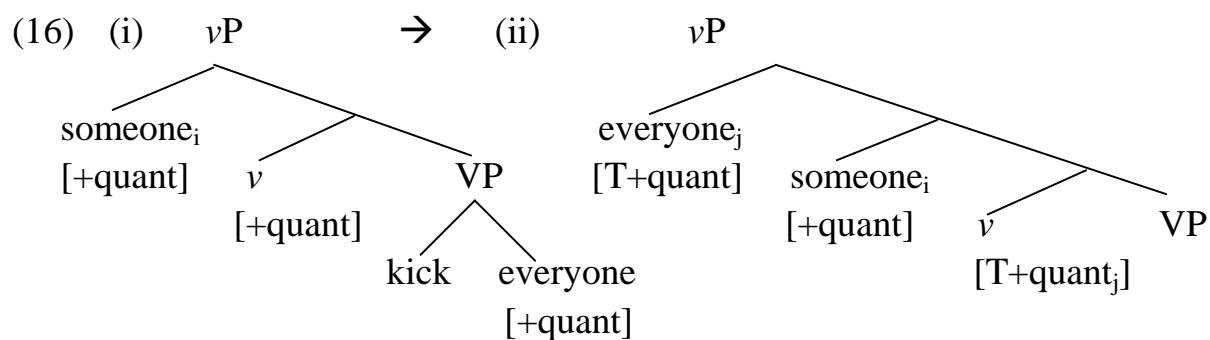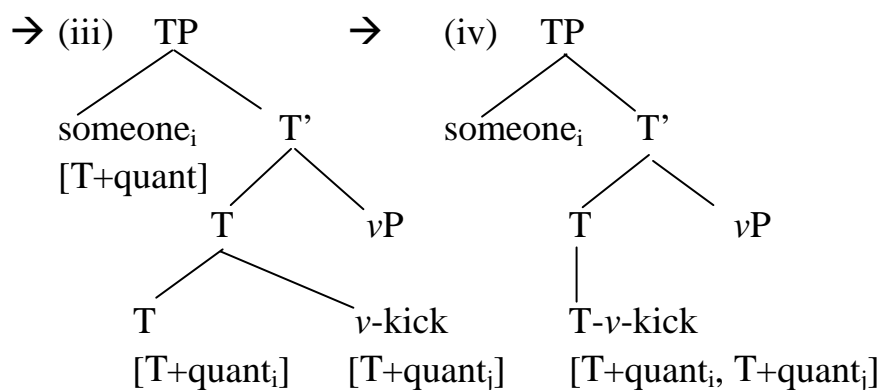
In (16) (i), *everyone* is merged with VP and *someone* is with *v*P. In (ii) *everyone* is raised to *v*P for case checking. Here *v* has [+quant] and [+quant] of *v* and *everyone* are checked in (ii). When [+quant] of *everyone* and [+quant] of *v* are checked, they are *agreed* (cf. Chomsky (1998)). To mark this process, I use indexes for the sake of exposition. Thus, when the two quant features check each other, [+quant] of *v* receives an index of *everyone*, which is *j*. In (iii), *someone* is raised to spec of TP for case-checking. Suppose T has [+quant]. Then [+quant] of *someone* and T are checked here. As a result, [+quant] of T receives the index, *i*, from that of *someone*. In (iv), the complex verb, *T-v-kick*, ends up having [T+quantᵢ, T+quantⱼ], which supplies the LF component with two important things. One is that the order of the two quant features represents the relative scope hierarchy between *someone* and *everyone* in (16). For the sake of exposition, I assume that a feature which is checked earlier is put on the right hand side of a feature which is checked later. In the present case, since *everyone* is checked earlier than *someone*, its quant feature is at the right hand side. This order represents the scope hierarchy. To be more precise, a quantifier A takes wider scope than B iff its quant feature is situated leftward of the quant feature of B in a complex verb. In (16) (iv), the complex verb has [T+quantᵢ, T+quantⱼ], so *someone* whose index is *i* takes wider scope than *everyone* whose index is *j*. As May (1985) and Barss (2000) note, it is necessary to define two kinds of scope when more than one quantifier is involved in a sentence. The first scope is called *relative scope* and the second one is called *absolute scope*. The *relative scope* corresponds to the relative scope hierarchy between *someone* and *everyone*.
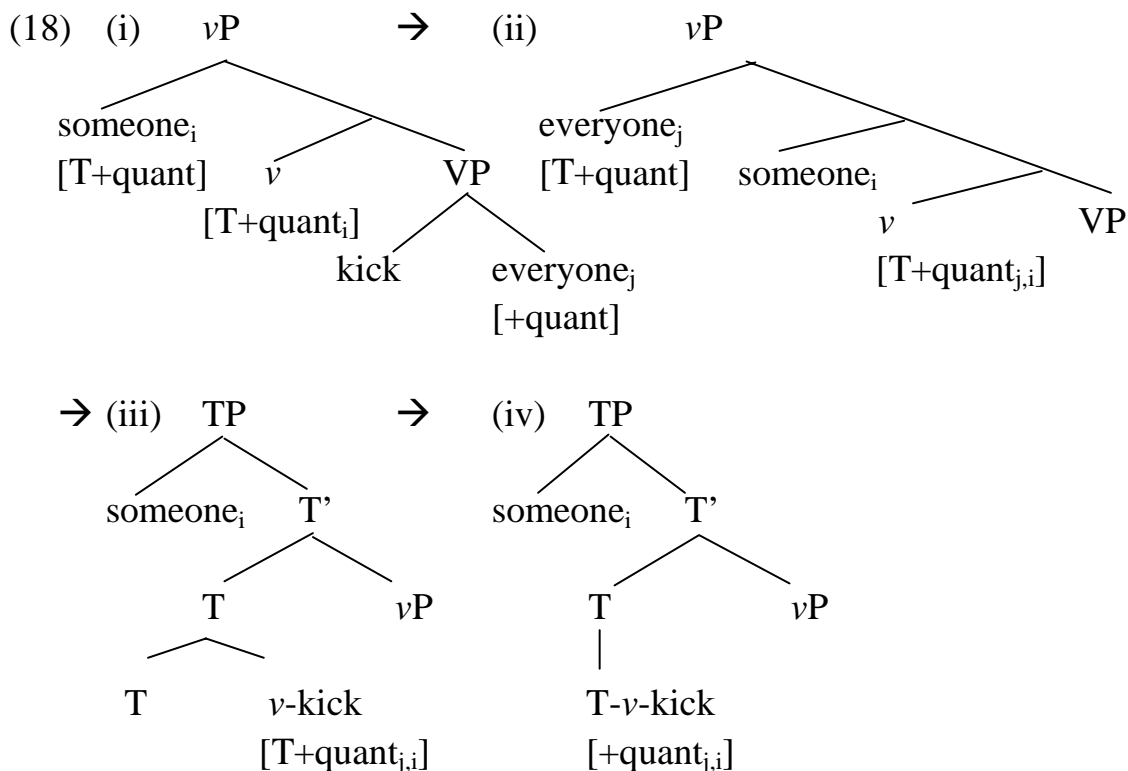
The second important point which the LF component must include is related to the other scope, "absolute scope". The "absolute scope" defines the scope for quantifiers. The final position of the two quant features in the complex verb determines the "absolute scope" for the two quantifiers. Since the two quant

features ended up being in T, the absolute scope for the two quantifiers is over the TP. When the LF component interprets this information, it will produce a semantic interpretation like (17):

(17) $\exists$x:people $\forall$y:people [x kick y]⁵

In (17) the two kinds of scope are represented clearly. One is the relative scope and this is shown by the order of "$\exists$x:people $\forall$y:people", which tells us that the existential quantifier takes wider scope than the universal quantifier. The "absolute scope" is represented by the square brackets. In other words, the scope for the existential and universal quantifiers are over *x kick y*. This is how the features of the complex verb in (16) (iv) provides the LF component with the information on the two kinds of scope.

Now consider another derivation of (1):

(18)   (i)   *v*P   →   (ii)   *v*P

someone$_i$ everyone$_j$
[T+quant]   *v*   VP   [T+quant]   someone$_i$
                [T+quant$_i$]   *v*   VP
                              kick   everyone$_j$ [T+quant$_{j,i}$]
                                        [+quant]

→ (iii)   TP   →   (iv)   TP

someone$_i$ T'   someone$_i$ T'

            T   *v*P   T   *v*P

      T   *v*-kick   T-*v*-kick
              [T+quant$_{j,i}$]   [+quant$_{j,i}$]

In (18)(i) *everyone* is merged with VP and *someone* with *v*P as in (16)(i). But one difference arises here. That is that *someone* does not have a quant feature here. Here I assume that most quantifiers can be non-quantificational. If phrases

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⁵ Tense information is omitted here.

are non-quantificational, they are not operators and thus lose the quant features. Suppose *someone* is non-quantificational here. Then it will be treated as an ordinary noun phrase: a theta-role is assigned and the case is checked, and it lacks the quant feature. In (ii), *everyone* is raised to vP to check its case. Then its quant feature is checked with the quant feature of v. When [+quant] of v checks that of *everyone*, it receives the index, j, from *everyone*. In (iii), someone$_i$ is raised to spec of TP to check its case. In (iv), the complex verb has [+quant$_j$]. Since this quant feature remains at T, the absolute scope for everyone is over the TP. When the LF component sees the feature of the complex verb in (iv), it will receive the following two pieces of information on scope. One is that everyone (j) is the only operator from the disposition of the index of [+quant$_j$]. The other is that the final position of the quant feature, which is in T, shows that the absolute scope for everyone is over TP. As a result, the LF component will present the following information to the Concept component:

(19) $\forall$y:people [x kick someone]^6

This is how another scope reading of (1), hence the two interpretations are derived. These two readings are represented differently at LF, hence, the assumption that LF is a level at which ambiguity is resolved holds in my account.

Let me outline the three important features of my proposal again. The first is that QR is not necessary. The second is that timing of checking quant features, rather than the c-command relationship determines the relative scope of quantifiers. The last feature is that LF is a level at which ambiguity is resolved.

4.   New section: "Solutions provided by the new proposal"

4.1   Control verbs

We have seen that control verbs might show quantificational ambiguity and Hornstein (1995) has difficulty in explaining this. Consider (14), which is repeated below:

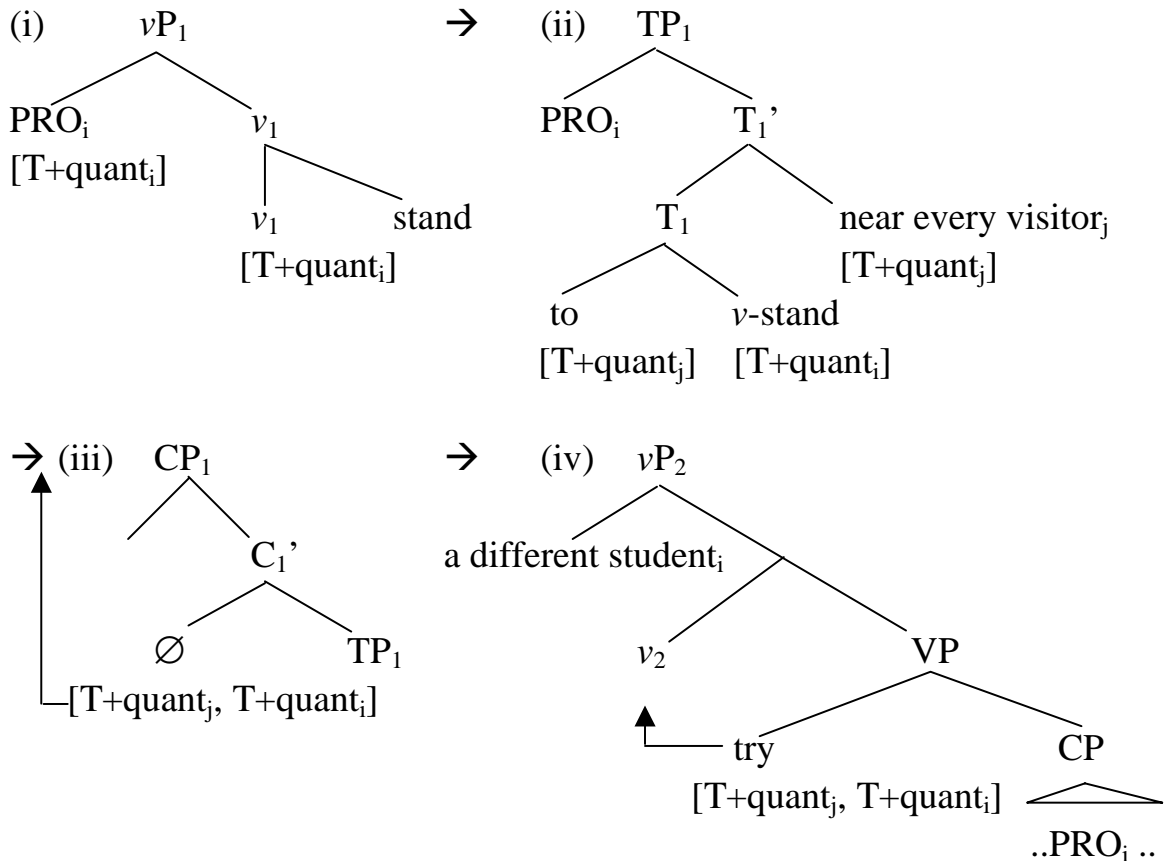^{6} Tense information is omitted here.

(13)   A different student tried to stand near every visitor.

Suppose Chomsky (1981) is right in assuming PRO in (13). Then (13) is represented as in (20):
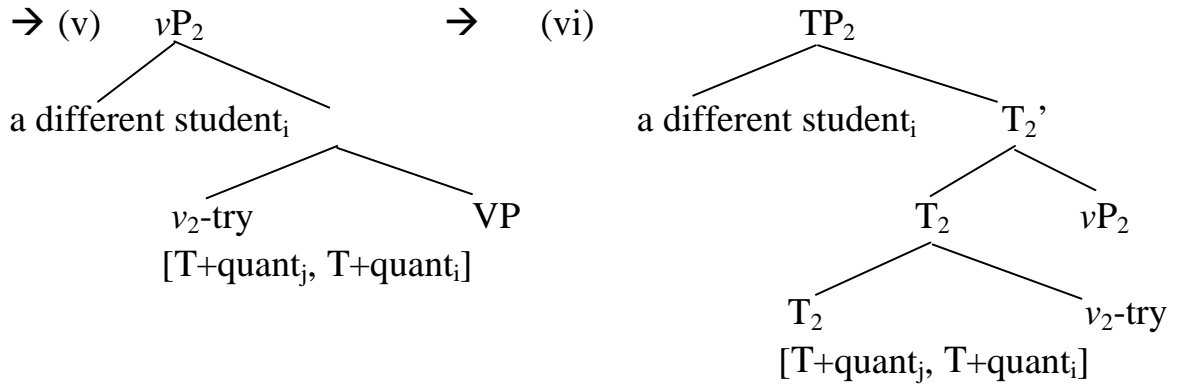
(20)   A different student tried [PRO to stand near every visitor].

(20) is ambiguous: *a different student* takes scope over *every visitor* and vice versa. The problem for Hornstein (1995) is that *a different student* is never lower than *every visitor* in the course of its A-movement so that *every visitor* should not take wide scope, which is, however, possible according to Johnson (2000). Under my approach, this can be explained quite easily. Suppose PRO can have a quant feature and this feature is checked within the embedded VP. Then the quant feature of *every visitor* is checked later than the PRO. Since the PRO is controlled by *a different student*, its quant feature decides the relative scope for *a different student*. As a result, *every visitor* takes scope over *a different student*. This process is shown as follows:

(21)

→ (v) vP_2 →   (vi) TP_2

a different student$_i$ a different student$_i$ T_2'

     v_2-try   VP T_2 vP_2

   [T+quant$_j$, T+quant$_i$]

                                 T_2 v_2-try

                            [T+quant$_j$, T+quant$_i$]

In (i), PRO$_i$ is merged with v_1. Then, the quant feature of PRO$_i$ is checked here, so the quant feature of v_1 receives the index *i* from that of PRO$_i$. In (ii), *near every visitor* is adjoined to T_1' and its quant feature is checked by T_1. As a result, the quant feature of T_1 gets the index *j* from *near every visitor$_j$*. Since the quant feature of *near every visitor$_j$* is checked later than that of *a different student$_i$*, *every visitor$_j$* takes scope over *a different student$_i$*, which is represented in *[T+quant$_j$, T+quant$_i$]* of the complex verb. In (iii), I suppose that an invisible complementiser merges with TP$_1$ and it attracts features of *stand* including the two quant features. Furthermore, the matrix verb attracts the two quant features. In (iv), (v) *a different student* and TP$_1$ are merged with vP_2. Here *a different student* binds the PRO$_i$ in the infinitival. In (vi), the two quant features ended up being in the matrix T_2. Here the absolute scope for *a different student* and *every visitor* is determined. The interpretation of this derivation looks roughly as in (22):

(22)   ($\forall$y: visitor)($\exists$x: student) [x try to stand near y]

This is how *every visitor* takes scope over *a different student* in (13) without violating the Theta-Criterion.

In this section I have explained why quantificational ambiguity may arise in control verb constructions. I have suggested that PRO can have a quant feature. If the quant feature of PRO is checked, the relative scope for the binder (or controller) is determined. This is why quantifiers within embedded verbs may take scope over matrix subjects.
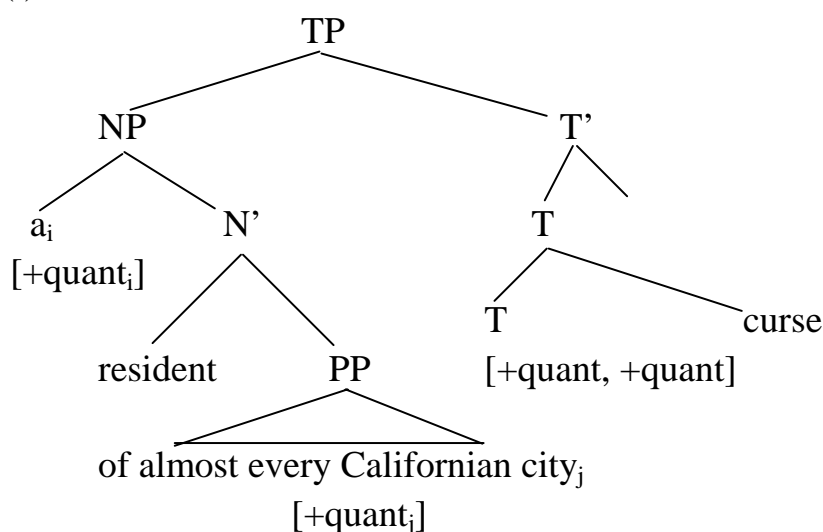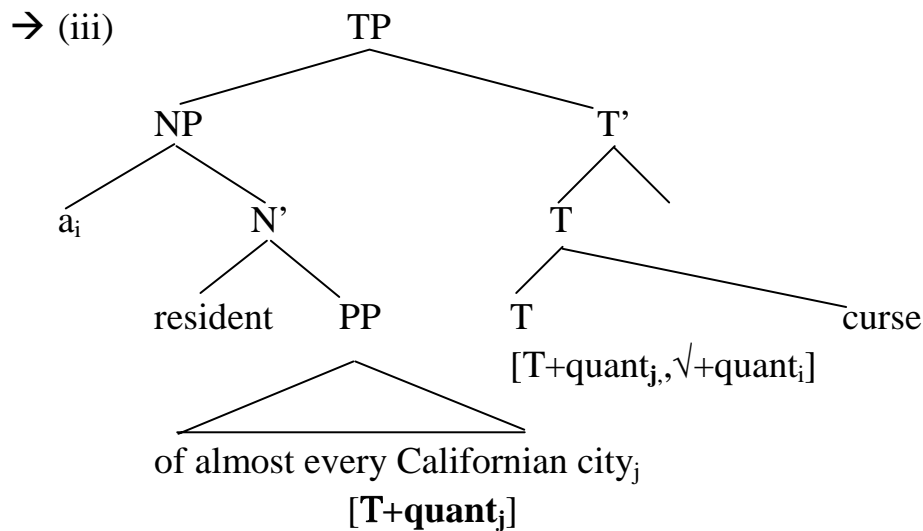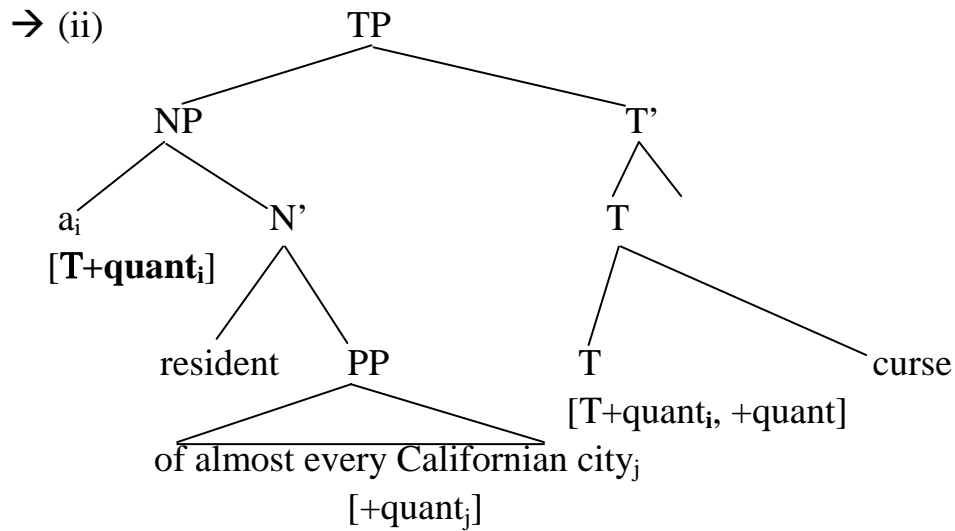
4.2   Inverse linking

Another problem which Hornstein (1995) faces is that he cannot explain inverse linking. Consider (14) again, which is repeated below:

(14)   A resident of almost every Californian city curses its traffic.

We have already seen that *every Californian city* can take scope over *a resident* though the former does not c-command the latter. (14) tells us that c-command relations do not necessarily correspond to (relative) scope relations (if there is no quantifier raising). Therefore, this is a problem for Hornstein (1995) because it is impossible for *almost every Californian city* to be higher than *a resident* in the course of its A-movement. However, this is not a problem under my approach because what decides (relative) scope relations is not c-command relations but the time of checking quant features of quantifiers. Thus, the reason why *almost every Californian city* can take scope over *a resident* is that its quant feature is checked later than the quant feature of *a resident*. This is done as follows:

(23)   (i)

→ (ii)
```
                        TP
             _____
            NP                       T'
        _____              _____
       aᵢ          N'            T
    [T+quantᵢ]  _____      _____
              resident  PP   T        curse
                     _____  [T+quantᵢ, +quant]
           of almost every Californian cityⱼ
                    [+quantⱼ]
```

→ (iii)
```
                        TP
             _____
            NP                       T'
        _____              _____
       aᵢ          N'            T
                _____      _____
              resident  PP   T        curse
                     _____  [T+quantⱼ, √+quantᵢ]

           of almost every Californian cityⱼ
                    [T+quantⱼ]
```

We start the derivation from TP. In (i), the NP *a resident of almost every Californian city* is merged with T. In (ii) suppose T can have two quant features. Then one quant feature of T checks that of "aᵢ" first following the Minimal Link Condition.

(24) Minimal Link Condition:
K attracts α only if there is no β, β closer to K than α, such that K attracts β. Chomsky (1995:311)

In fact, the Minimal Link Condition is designed for movement, so it does not say anything about the checking relation. However, I argue that the time of checking should be sequenced. Thus I posit the following condition:

(25)   Minimal Checking Condition
       (i) K (a feature) checks α first only if there is no β, β closer to K than α, such that K checks β;

       (ii) α is closer to K than β iff α c-commands β and α and β are in the same checking domain of K.

According to (25), a_i is closer to T than *almost every Californian city$_j$* and these two quantifiers are in the same minimal checking domain of [+quant] of the T (cf. Chomsky (1995: 178)), that is, in Spec of the TP, so the quant feature of the former is checked earlier than that of *almost every Californian city$_j$*. Then one of the two quant features of T receives the index *i* from a_i. In (iii), the other quant feature of T can check that of *almost every Californian city$_j$*. So, the second quant feature gets the index *j* from *almost every Californian city*. Since the quant feature of *almost every Californian city$_j$* is checked later than that of *a*, *almost every Californian city$_j$* takes wide scope over a_i *resident*, which is represented as in [+quant$_j$, +quant$_i$] of T in (iii). Furthermore, the two quant features of T ended up being in T,[7] so the absolute scope for the two quantifiers is over TP, hence, over the entire sentence. Thus, *almost every Californian city* can bind *its* in the semantic representation. An interpretation for (14) looks as in (26):

(26)   (almost $\forall$y: Californian city) ($\exists$x: resident) [x of y curse y's traffic]

In (26), *almost every Californian city* takes wide scope despite its position and binds *y* in *y's traffic*.

There is one piece of evidence for Minimal Checking Condition. If there is no such condition, then T could check the quant feature of *almost every*

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[7] As Didier Maillat (p.c.) points out to me, there is no guarantee that the two quant features end up being in T.

I suppose that if the two quant features finished in different positions, an uninterpretable reading would follow, whose derivation will be discarded at LF.

Californian city earlier than that of *a resident*. If so, we would have the following representation:

(27) (∃x: resident) (almost ∀y: Californian city) [x of y curse y's traffic]

As we have noted in footnote 4, this is not possible. When *a resident* takes wide scope, *almost every Californian city* cannot bind "its" of "its traffic. However, in (27), *almost every Californian city* can bind "its". Therefore, (27) should not be a possible semantic representation for (14).

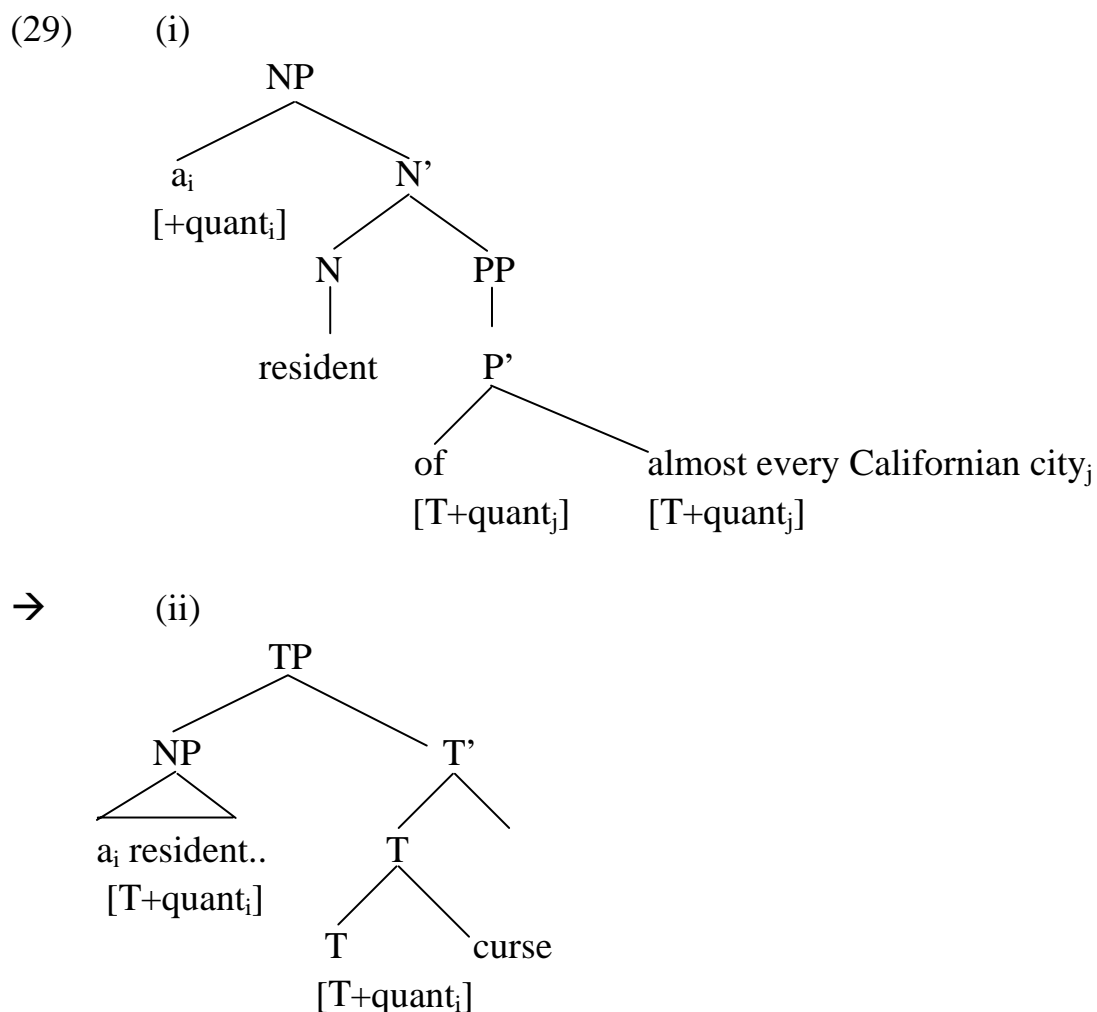One problem remains in the present account. Consider the following example:

(28) A resident [_{CP} who is from almost every Californian city] curses the traffic.

In (28), it is impossible for *almost every Californian city* to take scope over *a resident*, which leads to a strange interpretation. However, according to (25), *almost every Californian city* is in the checking domain of T and *a resident* is closer to T than *almost every Californian city*. Thus, *almost every Californian city* should have taken wide scope over *a resident*. One way to avoid this problem is to employ Chomsky's (1998) *phase*. He argues that when a derivation reaches a category called phase, this category converges and is sent to the LF and PF components. Thus, once the derivation reaches a phase, the derivation cannot see the phase (except its head and Spec) any more. Therefore, the converged category (except its head and spec) is invisible for further computation. He claims that a phase is propositional and *v*P and CP are such examples. If this is correct, T in (28) cannot check the quant feature of *almost every Californian city* because the relative clause is a phase. On the contrary, in (14), T can check the quant feature of *almost every Californian city* because the phrase is in the PP and the NP, and these two categories are not a phase. (14) is repeated below:

(14) [_{NP} a resident [_{PP} of almost every Californian city]] curses its traffic.

index *i* from a_i. The interpretation which is derived from (29) roughly looks as in (30):

(30)   ($\exists$x: resident) [(x (almost $\forall$y: Californian city) [of y]) curse its traffic]

Note that the absolute scope for *almost every Californian city* is just over the PP "of y". This is because the quant feature of "of" remains in the P, which is inside the whole NP. In the case of *a resident*, the final position for [+quant$_i$] is T, so the absolute scope for the quantifier is over the TP, hence, over the whole clause. Note that (30) shows that the universal quantifier cannot bind "its" and this is what we expect.

5.   Conclusions

5.1   Contribution of the new proposal

In this and the previous sections I have argued that the scope relation is determined not by c-command relation but by timing of checking. This is a welcome result because the notion of c-command is no longer a fundamental concept according to Epstein *et al* (1998). They show that c-command is a derived notion from the operation *merge* (see Chomsky, 1995). If c-command is not a fundamental notion in syntax, it should not be the essential factor in the determining of the relative scope for quantifiers. Thus, the argument that scope relations are decided by timing of checking quant features, not by c-command relations, is theoretically more desirable. To show how the timing of checking is decided, I have introduced the *Minimal Checking Condition*. This condition says that checking takes place first between the two features which are closest to each other. Therefore, if there are several features which are checked by the same feature, they are checked not at the same time but one by one in order of the closeness. This is how the features are checked at different times. Due to this checking condition, my proposal can account for the inverse scope phenomenon, unlike Hornstein's (1995). Thus my proposal has empirical support in addition. However, we have seen that there is a limit to checking configurations. For example, quantifiers cannot take scope across their lodging clause. To account for this, I have introduced Chomsky's (1998) *phase*, which

becomes invisible for further computation. Finally I have shown how non-inverse scope is derived. I have argued that prepositions can optionally have quant features. This is why an embedded phrase can take its scope within its dominating NP.

5.2   Overview

In this paper I have examined how quantifiers are represented at LF. I have argued that (i) no QR is necessary, (ii) LF is a level where scopal ambiguity is resolved and (iii) the scope relationship is determined not by c-command relationship but by the timing of checking quant features of quantifiers. QR has been regarded as problematic because it is not morphologically motivated. Thus it is desirable if quantifier relations can be represented without QR. I have shown that this is indeed possible.

I have introduced May (1977) at the beginning of this paper, who claims that LF is a level at which ambiguity is cleared. However, the work after May (1977) (e.g. May, 1985) abolishes this aesthetically attractive notion, which I have restored in my account.

Finally I have argued that c-command relations do not correspond to scope relations. The argument is theoretically attractive because c-command is no longer a fundamental notion in syntax and this suggests that something other than c-command determines scope relations. I have claimed that what decides scope relations is timing of checking. Furthermore, this idea is also supported empirically in the inverse linking phenomenon. Note that the current proposal is available only if we assume semantic representations are constructed derivationally rather than representationally, as suggested by Higginbotham (forthcoming). If we derive an LF representationally, c-command relations within NPs remain constant all the time (unless we assume QR). Hence there is no way to account for the inverse linking phenomenon. Thus, this too, suggests that LFs are constructed derivationally.

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Syntactic Ergativity in Tongan[1]

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0.   Introduction

Tongan (Polynesian) is an ergative language, in which the subject of intransitive verb (S) bears the same case (ABS) as the object of a transitive verb (O), while the subject of a transitive verb (A) bears a special case (ERG). Ergativity in Tongan is also manifested at the level of syntax. Tongan consistently treats S and O as equivalents in syntactic operations such as relativisation and coordination. This paper attempts to analyse various syntactic phenomena in Tongan that show an ergative pattern within the framework of the Minimalist Programme (Chomsky 1993, 1995).

The organisation of the paper is as follows. First, I will outline how ergative Case marking is analysed in the Minimalist Programme. Following Bobaljik (1993), I assume that ABS and ERG are both structural cases, whose features are checked in [Spec, Agro] and [Spec, Agrs], respectively. In §2, it will be shown that S and O undergo ordinary relativisation, whereas A requires a resumptive pronoun in the position vacated by the movement. In §3, three coordinate constructions will be considered. First, *pea* coordination does not allow S/O to be coreferential with A, suggesting that coreference requirement in *pea*-construction refers to the structural positions. Second, *'o*-coordination allows only S/O to be an antecedent. I propose that the latter arises because the gap in *'o*-coordination is a null anaphor, which must be bound by the closest potential antecedent, i.e., NP in the lower position of the matrix clause, perhaps reflecting Rizzi's (1990) relativised minimality condition. There is also *mo*-coordination, which shows an accusative rather than ergative pattern. In §4, I argue that this accusative pattern arises because *mo*-coordination requires that

obligatory theta-role identification apply to the arguments in [Spec, VP] at the base structure, thus requiring the two verbs connected by *mo* to have the same subject. Thus, the accusative pattern reflects not the case but the theta-role (i.e., grammatical function) of the arguments. §5 focuses on a special instance of *'o*-coordination that could be analysed as a serial verb construction. Altogether the study shows that the syntactic operations in Tongan refer to the structural Case positions [Spec, Agro] and [Spec, Agrs].

1.   Ergative Case marking in the Minimalist Program

The Minimalist Program consists of Numeration (a set of lexical items that are used to compose a sentence) and a feature-checking mechanism. It is assumed that lexical items have formal features that need to be checked in the course of the derivation. If all the formal features are successfully checked, the derivation converges, yielding a grammatical structure. In this approach, structural Case is regarded as a formal feature that is checked in a Spec-head configuration. Specifically, Chomsky (1993, 1995) assumes that NOM is checked by T in [Spec, Agrs] and ACC by V in [Spec, Agro]. This approach, however, encounters a difficulty when ergative Case marking is taken into consideration. We assume that in ergative languages S and O have a Case feature [ABS] and A, [ERG]. The question is, however, how these features are checked.

In order to account for the ergative Case marking, one must assume that a) both T and V can check ABS, b) T checks ABS and V, ERG, or c) V checks ABS and T, ERG. The first possibility is unlikely, for it allows one Case feature to be checked in two different structural positions. The second hypothesis must assume the nested path in the transitive construction, which is generally prohibited: O moves up to [Spec, Agrs] skipping [Spec, Agro], which in turn is occupied by A (Murasugi 1992). This approach considers that ABS is equivalent to NOM: they are both unmarked Case in each system and are both assigned to S. Hence, ABS is checked by T, the head which checks NOM in the accusative system. However, the idea of O being located higher than A is intuitively wrong. There is ample evidence showing that A asymmetrically c-commands O even in ergative languages (cf. Bobaljik 1993).

The third possibility correctly predicts this asymmetry between A and O. In a transitive construction, A moves to [Spec, Agrs] to have its Case checked by T, while ABS of O is checked by V in the lower [Spec, Agro]. In this view, T has a feature [NOM/ERG] and V, [ACC/ABS]. To account for the ABS

marking on S, Bobaljik (1993) proposes that in an intransitive construction, only one Agr can be active and that the choice of the active Agr is parameterised. Specifically, in accusative languages the active Agr is AgrS and in ergative languages it is AgrO. The Case feature of S is checked in the active Agr. Consequently, S appears in NOM in accusative languages while it appears in ABS in ergative languages. This approach is preferred to the above two in that a) it maintains the one-to-one correspondence between Case and a structural position and b) it predicts the asymmetry between A and O. Therefore, this paper adopts the active Agr analysis of ergative Case marking. In the following discussion, it is assumed that ERG is checked in [Spec, Agrs] and ABS in [Spec, Agro].

2.   Relativisation

Syntactically ergative languages commonly have the following restriction on relativisation: only S/O can be relativised, but A cannot.[2] Tongan shows a similar pattern in that relativisation of A is more restricted than that of S/O. Tongan relative clauses are formally the same as tensed clauses except that the relativised argument appears either as an empty category or a (resumptive) pronoun. Relative clauses are introduced by a tense marker and not by an overt operator like English relative pronouns. I assume that the relative clauses in Tongan are similar to the English *that*-relative clauses. Specifically, I assume that an empty operator OP has moved to [Spec, CP] of the relative clause, leaving a *wh*-trace in the base generated position. Consider (1) below.[3]

(1)   a.   E fefine [OP$_i$ [na'e 'alu t_i ki Tonga]]
              def woman Pst go to Tonga
              'The woman who went to Tonga'

       b.   E fefine [OP$_i$ ['oku 'ofa'i 'e Sione t_i]]

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[2] In such a language, the clause must be antipassivised first in order for the underlying A to be relativised. Antipassive is a syntactic operation that alters the underlying A to a derived O.

[3] ' represents a glottal stop. Abbreviations used in this paper are as follows: def = definite, Pst = past tense, Prs = present tense, Fut = future tense, Perf = perfect aspect, Pred = predicate marker, s. = singular, d. = dual, pl. = plural, Dir = directional, ABS = absolutive, ERG = ergative, NOM = nominative, ACC = accusative.

def woman   Prs love ERG Sione
'The woman whom Sione loves'

In (1a), the relativised argument is S. In (1b), it is O. The relativised argument is realised as a *wh*-trace. In contrast, when A is relativised, it must be realised overtly as a pronoun. See (2) below.

(2)   a.   *E siana [OP$_i$ [na'e langa t_i 'a e fale]]
             def man   Pst build   ABS def house
             'The man who built the house'

       b.   E siana [OP$_i$ [na'a ne$_i$ langa 'a e fale]]
             def man   Pst 3.s. build ABS def house

Furthermore, the occurrence of a resumptive pronoun yields ungrammaticality if the relativised argument is S or O, as illustrated in (3) below.[4]

(3)   a.   *E fefine [OP$_i$ [na'a ne $_i$ 'alu ki Tonga]]
             def woman   Pst 3.s. go to Tonga
             'The woman who went to Tonga'

       b.   *E fefine [OP$_i$ ['oku 'ofa'i ia$_i$ 'e Sione]]
             def woman   Prs love 3.s. ERG Sione
             'The woman whom Sione loves'

In short, the use of resumptive pronoun is restricted to A. Put differently, the operation of relativisation respects the ERG-ABS distinction.

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[4] Chung (1978: 40) claims that a resumptive pronoun is allowed if it is not third person singular and provides the following examples.

(i)   a. Ongo siana na'a na hop
          d. man Pst   3.d. jump
       "the two men who jumped"
     b. Kimoutolu kuo mou toki a'u mai
        3.pl.   Perf 3.pl. immediately arrive Dir.1.
        "those of you who have just arrived"

However, my informants consistently reject the sentences containing a resumptive pronoun as S regardless of its person and number.

It should be noted that indirect objects as well as middle objects also require a resumptive pronoun. See (4) below.

(4)   a.   E siana [OP$_i$ ['oku sai'ia 'a Mele 'i ai$_i$/*t_i]]
            def man   Prs like ABS Mele in there
            Lit. 'The man in whom Mele likes'
      b.   E siana [OP$_i$ [na'e 'oange 'e Mele 'a   e tohi ki ai$_i$/*t_i]]
            def man   Pst give ERG Mele ABS def letter to there
            'The man to whom Mele gave the letter'

The pronoun *ai* is used after a preposition[5] and usually can be translated as "there". It can refer to human beings as well as inanimate objects and places. The same pronoun is used, therefore, when the relativised NP is a constituent of an adjunct. See (5) below. Note that the relative adverbs are also phonetically null in Tongan.

(5)   a.   E tepile [OP$_i$ [na'e hili 'e Sione 'a   e tohi ai$_i$/*t_i]]
            def table   Pst place ERG Sione ABS def letter there
            'The table where Sione put the letter'

      b.   E 'uhinga [OP$_i$ ['oku fiefia 'a Sione ai$_i$/*t_i]]
            def reason   Prs happy ABS Sione there
            'The reason why Sione is happy'

The element *ai* is indispensable in forming questions asking *why*. The most proper form of *why*-questions is (6a). In spoken language, *'a e 'uhinga* ("the reason") can be omitted, but dropping *ai* renders a sentence ungrammatical, as illustrated in (6b) and (6c), respectively.

(6)   a.   Ko e hā 'a e 'uhinga [OP$_i$ ['oku ke tangi ai$_i$]]?
            pred def what ABS def reason   Prs 2.s. cry there
            Lit. 'What is the reason (that) you are crying?'

      b.   Ko e hā [OP$_i$ ['oku ke tangi ai$_i$]]?
            pred def what   Prs 2.s. cry there
            Lit. 'What is (it) (that) you are crying?'

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[5] Note that the preposition *'i* ("in") is often omitted when followed by *ai*.

    c.   *Ko e hā 'a e 'uhinga [OP ['oku ke tangi]]?
            pred def what ABS def reason   Prs 2.s. cry
            Lit. 'What is the reason (that) you are crying?'

Assuming *ai* is a resumptive pronoun for the raised empty operator, the ungrammaticality of (6c) is to be expected; the empty operator is stranded without a bindee.

As illustrated in (4), indirect and middle objects behave in the same fashion as NP's in adjunct clauses. The resumptive element is always *ai* rather than a personal pronoun. Compare the sentences in (7) with those in (4).

(7)   a.   *E siana [OP$_i$ ['oku sai'ia ia$_i$ 'a Mele]]
           def man   Prs like 3.s. ABS Mele
           Lit. 'The man in whom Mele likes'

    b.   *E siana [OP$_i$ [na'e 'oange ia$_i$ 'e Mele 'a e tohi]]
           def man   Pst give ERG Mele ABS def letter to there
           'The man to whom Mele gave the letter'

In this sense, we should treat middle/indirect objects separately from the core arguments of the verb, S, O, and A. Hence, although middle/indirect objects also require a resumptive pronoun, we assume that they are governed by a separate rule. Consequently, our observation that A is distinguished from S and O is retained. Our data show that a trace of an empty operator must be realised as a resumptive pronoun in [Spec, Agrs], while a trace in [Spec, Agro] may remain phonetically null. As mentioned earlier, it is assumed that ERG is assigned in the former position and ABS, in the latter. Our data show that relativisation in Tongan is sensitive to structural Case positions.

3.   Coordination

In an accusative language such as English, O is distinguished from S and A in coordinate constructions: S and A can be coreferential, whereas neither S nor A can be coreferential with O. In other words, the gap cannot be in O function, nor can an O-argument be coreferential with the gap. (8) below illustrates this accusative pattern.

(8)   a.   John$_i$ came in and *e*$_i$ saw Mary.

b. *John$_i$ came in and Mary saw e_i.

c. John$_i$ saw Mary$_j$ and $e_{i/*j}$ smiled.

(8a) is grammatical, as the gap is A and is coreferential with the subject (S) of the first clause. In contrast, (8b) is ungrammatical because the gap, being O, cannot be coreferential with the subject of the first clause. Furthermore, (8c) shows that when the gap is S, it can only be coreferential with A of the first clause. Coreference with O is prohibited.[6] Syntactically ergative languages, on the other hand, show an ergative pattern with respect to coordination: S can be coreferential with O, but not with A. Tongan exhibits syntactic ergativity with regard to coordination as well. In Tongan, there are three coordinate constructions, involving the conjunctions *pea*, *mo*, and *'o*, respectively. As Dixon (1979) points out, coordination in Tongan shows a split pattern. Specifically, *mo*-coordination consistently shows an accusative pattern. In the following subsections, I will study each of the three coordination constructions and attempt to explain what causes the split.

3.1   Use of conjunctions

The three conjunctions mentioned above are used in different environments, in addition to being semantically different from one another. In terms of semantics, *pea* is interpreted as sequential, *mo* as simultaneous, and *'o* as resultative. See (9) below.

(9)   a.   Kai pea inu.
           eat and drink
           'Eat and then drink!'

      b.   Kai mo inu.
           eat and drink
           'Eat and also drink!'

      c.   Ha'u 'o kai.
           come and eat

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[6] Combination of O and O is also prohibited in English, as illustrated in (i) below.

(i) *John likes Mary$_i$ and Bill hates e_i.

Hence, the generalisation is that the gap can only be S/A and not O.

> 'Come to eat!'

'O is resultative in the sense that the two events are regarded as virtually one event, with the second event arising from the first one. Hence, it is often translated as "so that", "in order to", or "and as a result". We will study more examples of *'o*-coordination shortly.

Regarding syntactic conditions, all of the three are used to connect verbs as illustrated in (9) above. However, *pea*, *mo*, and *'o* are subject to different restrictions in other environments. For example, only *pea* can be used to connect tensed clauses; neither *mo* nor *'o* can be followed by a tense marker. See (10) below.

(10)   Na'e kai lahi 'a Sione pea/*mo/* 'o na'e inu lahi 'a Pita
       pst eat much ABS Sione and   Pst drink much ABS Pita
       "Sione ate a lot and Pita drank a lot"

However, as long as the tense marker is absent, all of the three can be used to connect clauses. Note also that the subject of the second predicate, if it is coreferential with an argument of the first verb, may be realised either as a gap (11a) or as an overt pronoun (11b).

(11)   a.   Na'e kai lahi 'a Sione$_i$ pea/mo/'o fiefia e_i.
             pst eat much ABS Sione and happy
             'Sione ate a lot and was happy'
       b.   Na'e kai lahi 'a Sione$_i$ pea/mo/'o ne$_i$ fiefia.
             pst eat much ABS Sione and 3.s. happy
             'Sione ate a lot and he was happy'

3.2   *Pea*-coordination

Coordination by *pea* demonstrates an ergative pattern: A is never paired with S/O. Specifically, the combinations, A-S/O and S/O-A are prohibited. However, the A-A combination is allowed. See (12) below.

(12)   a.   Na'e tangi 'a Hina$_i$ pea taa'i 'e Mele e_i.
             pst cry ABS Hina and hit ERG Mele
             'Hina cried and Mele hit (her)'

   b.   *Na'e tangi 'a Hina$_i$ pea taa'i e_i 'a Mele
          Pst cry ABS Hina and hit ABS Mele
          'Hina cried and (she) hit Mele'

The subject (S) of the first clause can be coreferential with the gap in O-function, but not with one in A-function. The ergative principle also applies to those structures in which the gap occurs as S. See (13) below.

(13)   Na'e taa'i 'e Hina$_i$ 'a Mele$_j$ pea tangi $e_{*i/j}$.
          Pst hit ERG Hina ABS Mele and cry
          'Hina hit Mele and (*Hina/Mele) cried'

The gap, being S, is coreferential with *Mele*, O of the first clause, but not with *Hina* (A).[7] A-O as well as O-A combinations are also forbidden, as illustrated in (14) below.

(14)   a.   Na'e 'ave 'e Sione$_i$ 'a Mele$_j$ ki he palasi pea fakamolemole'i 'e
               he kuini $e_{*i/j}$
               pst take ERG Sione ABS Mele to def palace and forgive   ERG def
               queen
               'Sione took Mele to the palace and the Queen forgave (*him/her)'
       b.   *Na'e tamate'i 'e Sione 'a Lisiate pea tamate'i 'e Tevita *e*
               pst kill ERG Sione ABS Lisiate and kill ERG Tevita
               'Sione killed Lisiate and Tevita killed (*Sione/*Lisiate)'

As shown by (14a), the gap in O-function can only be coreferential with O of the first clause. The sentence cannot be interpreted as "Sione took Mele to the palace and the Queen forgave him". Similarly, the ungrammaticality of (14b) with the O-A reading can be explained in terms of the ergative constraint on *pea*-coordination. (14b), however, is considered unacceptable even if the O-O reading is intended. I suggest that native speakers reject this sentence not because of the syntactic ungrammaticality, but because of the semantic anomaly. It is semantically impossible to obtain coreference between the gap

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   [7] However, some of the informants allow coreference with A if the second verb is *kata* ("laugh"). This exception seems to be due to a semantic reason: "hit and laugh" makes more sense than "being hit and laugh". Those who accept the A-S combination with *kata* nevertheless take the O-S combination with a semantically neutral verb such as *'alu* ("go").

and O of the first clause: as *Lisiate* (O) was already killed by *Sione*, it is impossible for *Tevita* to kill him (again). Coreference with *Sione* (A) is syntactically prohibited. As a result, the sentence is ruled out. O-A combination is also prohibited, as illustrated by (15) below.

(15)   Na'e 'ave 'e Sione$_i$ 'a Mele$_j$ ki he maaketi pea fakatau mai $e_{i/*j}$ 'a e kumala.
        pst take ERG Sione ABS Mele to def market and buy Dir ABS def sweet potato
        'Sione took Mele to the market and (he/*she) bought the sweet potato'

These examples clearly indicate that *pea*-coordination respects ergativity. ABS-arguments are never paired with ERG-arguments. This ergative pattern can be explained as follows. The gap in the second clause is *pro*. As discussed in Otsuka (2000), the occurrence of an empty pronoun is restricted to third person singular arguments in Tongan. *Pro* in coordinate constructions, however, is not required to be third person singular, as illustrated by (16) below.

(16)   a.   Na'a nau$_i$ pau'u pea taa'i *pro*$_i$ 'e he faiako
              pst 3.pl. naughty and hit ERG def teacher
              'They are naughty and the teacher hit (them)'

        b.   Na'e taa'i kinautolu$_i$ 'e he faiako pea *pro*$_i$ tangi
              pst hit 3.pl. ERG def teacher and cry
              'The teacher hit them and (they) cried'

Let us call *pro* of this kind co(ordinate)-*pro*. Co-*pro* is a special instance of *pro* and is permitted in languages that generally do not allow *pro*-drop, such as English. That is, the empty category *e* in (8) is also considered to be a co-*pro*. A co-*pro* requires an overt antecedent with which its features can be identified. Let us assume that just like overt NPs, *pro* has a Case feature and phi-features. Let us further assume that co-*pro*, being an exceptional case, is subject to a relatively strict licensing condition: namely, not only phi-features, but also the Case feature must be identified. Thus, an ABS-marked *pro* cannot be coreferential with an ERG-marked argument because it fails to be licensed.

Similarly, in an accusative language, an NOM-marked *pro* looks for an NOM-marked antecedent. Hence, the antecedent cannot be O.[8,9]

It should be noted, however, that under certain circumstances, the A-O combination could be accepted. Some, though not all, of the informants accept sentence (17), allowing the gap (O) to be coreferential with A.[10]

(17)   Na'e fakafoki 'e Sione$_i$ 'a e koloa pea fakamolemole'i 'e he kuini e_i
           pst return ERG Sione ABS def treasure and forgive ERG def queen
       'Sione returned the treasure and the Queen forgave him'

In (17), the O-O interpretation, which is the legitimate combination, results in nonsense. Since O of the first clause is *koloa* ("treasure"), an inanimate object, it is semantically odd for O to be the object of queen's forgiving. Given a [+ human] A and [– animate] O, it is more natural to interpret that the former is what the Queen forgave. (17) suggests that the A-O combination could be exceptionally permitted if the O-O reading results in nonsense and the A-O reading makes sense. Although it is admittedly unusual that semantics affect the syntactic restrictions, this seems to be the only way to account for the grammaticality of (17). On the other hand, it should be noted that this is not always the case. As we have seen above, in (14b), the A-O combination is strictly banned, even though the interpretation, "Sione killed Lisiate and Tevita killed Sione", is semantically possible in a context, for example, in which Lisiate is Tevita's father and the enraged son took revenge on the murderer. Thus, semantics cannot be regarded as a crucial factor in determining coreference possibility in *pea*-constructions. How the semantic conditions affect

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[8] As mentioned above, in English O cannot occur as a gap either. This requires another language-specific rule that co-*pro* is not permitted in an object position.

[9] This analysis does not necessarily support the claim that ERG is a structural Case because as long as the feature [ERG] is identified it does not matter whether it is structural or inherent. However, consider the following example.

(i) *John is proud of Mary$_i$ and Bill is tired (of) *pro*$_i$.

Genitive (GEN) is an inherent case (Chomsky 1986b). (i) is ruled out even though theoretically feature identification of *pro* is possible. This could mean that the inherently case-marked argument is incapable of licensing co-*pro*. However, it may be that (i) is ruled out because of a specific constraint on GEN. Thus, it is necessary to study other instances of coordinate constructions including an inherently Case-marked NP such as Icelandic quirky subjects. However, I will leave this question to future research.

[10] Those who reject (17) consider the sentence nonsensical.

the acceptability of A-O combination is an interesting issue to be pursued, for a similar effect is observed also with *'o*-coordination as we will see shortly. However, I will leave this question open to future research.

3.3   *'O*-coordination

Coordination by *'o* also respects the ERG-ABS distinction. However, the ergative restriction is different from that of *pea*-coordination. S/O-A combination is freely allowed, as illustrated in (18) below. In other words, coreference is possible between ABS-marked arguments and ERG-marked arguments.

(18)   a.   Na'e ha'u 'a Hina$_i$ 'o taa'i e_i 'a Mele
             pst come ABS Hina and hit ABS Mele
             'Hina came and hit Mele'

       b.   Na'e 'ave 'e Sione$_i$ 'a Mele$_j$ ki he māketi 'o fakatau mai $e_{*i/j}$ 'a e kumala
             pst take ERG Sione ABS Mele to def market and buy dir ABS def sweet potato
             'Sione took Mele to the market and (*he/she) bought the sweet potato'

The sentence (18a) is grammatical with the gap (A) being coreferential with S. In (18b), the gap (A) is coreferential with O rather than A. In fact, the A-A interpretation is not possible for (18b).

As far as *'o*-coordination is concerned, the restriction is that A cannot be coreferential with the gap: thus, A-S, A-O, and A-A are all illicit combinations.[11] See (19) below.

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[11] Chung (1978) argues that the gap must be S/A, thus S-O is also an illegitimate combination. This contradicts my observation, as my informants consider (i) grammatical.

Na'e ha'u 'a Hina 'o fakalangilangi'i 'e Mele.
Pst come ABS Hina and award   ERG Mele
"Hina came and Mele praised (her)."

However, Chung's examples contain a middle verb in the second clause instead of a canonical transitive verb. Considering that the object of a middle verb differs from the object of a transitive verb in various respects (e.g., it is marked in OBL, not ABS), her examples are

(19) a.   Na'e teke'i 'e Mele 'a Hina 'o $e_{*i/j}$ tō
            pst push ERG Mele ABS Hina and fall
            'Mele pushed Hina and (*Mele/Hina) fell'

      b.   *Na'e fakafoki 'e Sione 'a e koloa 'o fakamolemole'i 'e he kuini *e*
            pst return ERG Sione ABS def treasure and forgive ERG def queen
            'Sione returned the treasure and the Queen forgave him'

      c.   *Na'e tamate'i 'e Lisiate 'a Tevita 'o ma'u *e* 'a e koloa
            Pst kill ERG Lisiate ABS Tevita and get ABS def treasure
            'Lisiate killed Tevita and got the treasure'

The sentence (19a) cannot mean, "Mele pushed Hina and Mele fell (because Hina was too big and strong)". The gap can only be coreferential with O. (19b) is ruled out because the A-O combination is prohibited. Besides, the O-O interpretation is semantically impossible. Sentence (19c), in which A-A is the only semantically natural interpretation, is also considered ungrammatical. The judgement indicates that the A-A combination is syntactically banned. To support this hypothesis, in a context where the O-O interpretation is tenable, the structure in question is accepted. See (20) below.

(20) Na'e 'ave 'e $Sione_i$ 'a $Mele_j$ ki he palasi 'o fakamolemole'i 'e he
      kuini $e_{*i/j}$
      pst take ERG Sione ABS Mele to def palace and forgive ERG def queen
      'Sione took Mele to the palace and the Queen forgave (*him/her)'

What our data show is that A cannot serve as the antecedent of the gap.[12]

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not appropriate to illustrate the condition in question. It should be noted, however, that one of Chung's examples raises a problem to our argument.

  (ii) *Na'a ku puna atu 'o ne ma'u

     pst 1.s. jump Dir.2 and 3.s. catch

     "I jumped up and he grabbed (me)"

Only one condition distinguishes (ii) from (i): namely, the former contains a pronominal arguments.

  [12]As is the case of *pea*-coordination, semantics could affect the syntactic restriction on the antecedent-gap combination. Consider (i) below.

  (i) Na'e fakalavea'i 'e Sione 'a Mele 'o 'ave 'e Tevita *e* ki he 'api polisi

This anti-A orientation can be explained if we assume that the gap in *'o*-clause is a null anaphor, which must be bound by an element outside the clause. In addition, our data suggest that binding of the null anaphor must respect relativised minimality in the sense of Rizzi (1990): it must be bound by the closest potential binder, which is in effect the argument in [Spec, AgrO]. This is why A in the higher Agr fails to bind the null anaphor.[13,14]

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   pst injure ERG Sione ABS Mele and take ERG Tevita to def house police

  "Sione injured Mele and Tevita took him/her to the police station"

Semantically, the A-O interpretation makes more sense than the O-O. For this reason, some informants exceptionally allow the A-O combination. Nevertheless, some others, who are more syntactically inclined, either judge (i) as nonsensical or choose the O-O interpretation despite the semantic oddity.

[13] The condition of relativised minimality applies before the application of A-bar movement rules. For example, scrambling does not affect the condition. As illustrated by (i) below, coreference is impossible even if the first clause is a VOS construction.

(i) Na'e teke'i 'a Hina$_i$ 'e Mele$_j$ 'o $e_{i/*j}$ tō

   pst push ABS Hina ERG mele and fall

   "Mele pushed Hina and (*Mele/Hina) fell"

[14] As William O'Grady (p.c.) points out, it is not clear why relativised minimality is not respected in accusative languages. For example, in English the empty element in a resultative clause cannot have the closest NP as its antecedent. See (i) below.

(i) a. The princess$_i$ kissed the frog$_j$ and $e_{i/j*}$ turned into a prince.

   b. The princess$_i$ kissed the frog$_j$ [$e_{i/j*}$ to turn into a prince].

However, note that in (ia), the empty element is a co-*pro*. As we have argued above, co-*pro* must have the same case feature as the antecedent in order to be allowed. Thus, in (ia), the antecedent must be a NOM-marked argument. The closest NP bears ACC, thus cannot be identified with the empty element. In (ib), the empty element is PRO since the clause is infinitival. Since these elements are not a null anaphor equivalent to that in *'o*-constructions, relativised minimality is irrelevant.

3.4 *Mo*-coordination

Finally, let us consider *mo*-coordination. Unlike the other two cases mentioned above, *mo*-coordination does not distinguish ERG from ABS. Rather, it shows an accusative pattern: the gap must be S/A *and* coreferential with S/A. In other words, *mo* cannot conjoin clauses with different subjects. Hence, (21a) in which S and O are coreferential is ruled out because the second clause contains an independent subject. In contrast, (21b) demonstrates that the S-A combination is allowed.

(21) a. *Na'e tangi 'a Hina$_i$ mo taa'i 'e Mele e_i
          pst cry ABS Hina and hit ERG Mele
          'Hina cried and Mele hit (her)'

     b. Na'e tangi 'a Hina$_i$ mo taa'i e_i 'a Mele
          pst cry ABS Hina and hit ABS Mele
          'Hina cried and (she) hit Mele'

Similarly, the sentences in (22) illustrate that the gap (whether S or A) must be coreferential with the subject (either S or A) of the first clause. The O-S/A combination is never allowed.

(22) a. Na'e taa'i 'e Hina$_i$ 'a Mele$_j$ mo kata $e_{i/*j}$
          pst hit ERG Hina ABS Mele and laugh
          'Hina hit Mele and (Hina/*Mele) laughed'

     b. Na'e taa'i 'e Sione$_i$ 'a Pila$_j$ mo 'akahi $e_{i/*j}$ 'a Taniela
          pst hit ERG Sione ABS Pila and kick ABS Taniela
          'Sione hit Pila and (Sione/*Pila) kicked Taniela'

Note, however, that the restriction is not simply that combinations including O are prohibited. (23) is ruled out not because the O-O combination is illegal but because the two clauses have different subjects.

(23) *Na'e 'ave 'e Sione 'a Mele ki he palasi mo fakamolemole'i 'e he kuini e
          pst take ERG Sione ABS Mele to def Palace and forgive ERG def
          queen

'Sione took Mele to the palace and the Queen forgave (*him/*her)'

In short, *mo* requires the conjoined clauses to share the subject. Hence, the combinations, S/A-O and O-S/A are impossible. Consequently, *mo*-coordination shows an accusative pattern. In the following section, I will discuss why this accusative pattern arises.

4.   Split

In summary, coordination involving *pea* and *'o* shows an ergative pattern, whereas *mo*-coordination shows an accusative pattern. S/O cannot be paired with A in *pea*-constructions: A-S/O and S/O-A combinations are prohibited. As for *'o*, only S/O may occur as the gap's antecedent; A-S/O as well as A-A combinations are ruled out. In contrast, coordination by *mo* demonstrates an accusative pattern. O cannot be part of coordination; both O-A/S and A/S-O combinations are prohibited in *mo*-construction. The accusative pattern exhibited by *mo*-coordination is regarded as a syntactic split.[15]

It should be noted that *mo*-coordination shows yet another idiosyncratic property. As mentioned above (§3.1), all of the three conjunctions under the current investigation may be followed by a pronoun instead of a gap. If the shared argument is overtly realised as a pronoun, the ergative constraints are not effective. A-O/S and O/S-A combinations are allowed with *pea*, as illustrated in (24) below. Similarly, (25) shows that coreference between A and the pronoun is permissible with *'o*.

(24)   a.   Na'e tangi 'a Hina$_i$ pea ne$_i$ taa'i 'a Mele
             pst cry ABS Hina and 3.s. hit ABS Mele
             'Hina cried and she hit Mele'

        b.   Na'e taa'i 'e Hina$_i$ 'a Mele$_j$ pea ne$_{i/j}$ tangi[16]
             pst hit ERG Hina ABS Mele and 3.s. cry
             'Hina hit Mele and Mele/Hina cried'

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[15] As far as I know, Dixon (1979) is the first to note this phenomenon of syntactic split in Tongan.

[16] With regard to (24b), where both A-S and O-S combinations are possible, some speakers prefer the O-S to the A-S interpretation.

(25) a.   Na'e tamate'i 'e Lisiate_i 'a Sione 'o ne_i ma'u 'a e koloa
               pst kill ERG Lisiate ABS Sione and 3.s. get ABS def treasure
               'Lisiate killed Sione and got the treasure'

      b.   Na'e fakafoki 'e Sione_i 'a e koloa 'o fakamolemole'i ia_i 'e he kuini
               pst return ERG Sione ABS def treasure and forgive 3.s. ERG def
               queen
               'Sione returned the treasure and the Queen forgave him'

While coreference between O and the gap is prohibited, coreference is legitimate once the shared argument is pronominalised. This effect can be explained as follows. First, with regard to *pea*, the sentence is ungrammatical unless the content of *pro* is identified. As we argued above, *pro* in *pea*-construction is identified by being matched with an argument in the corresponding structural Case position in the first clause. On the other hand, an overt pronoun need not be licensed in a similar fashion, as its features are indicated in its form. Thus, it may refer to any argument that has the same feature specification in person and number. In reference to *'o*, we have argued that the coreference possibility is constrained because the gap, being an anaphor, must be bound by the closest potential binder outside the clause. These conditions do not hold of pronouns.

In contrast, the same strategy does not help improve grammaticality of *mo*-coordination; O-S/A as well as S/A-O combinations are barred regardless. See (26) below.

(26) a.   Na'e taa'i 'e Sione_i 'a Pila_j mo ne_{i/*j} 'akahi 'a Taniela
               pst hit ERG Sione ABS Pila and kick ABS Taniela
               'Sione_i hit Pila_j and he_{i/*j} kicked Taniela'

      b.   *Na'e tangi 'a Hina_i mo taa'i ia_i 'e Mele
               pst cry ABS Hina and hit 3.s. ERG Mele
               'Hina cried and Mele hit her'

      c.   *Na'e fakafoki 'e Sione_i 'a e koloa mo fakamolemole'i ia_i 'e he
               kuini
               pst return ERG Sione ABS def treasure and forgive 3.s. ERG def
               queen
               'Sione returned the treasure and the Queen forgave him'

The fact that pronominalisation does not affect grammaticality of *mo*-constructions confirms our observation that the two clauses connected by *mo* must have coreferential subjects. Whether the argument in the second clause is overt or covert is irrelevant to this same-subject condition. We may formulate this condition in terms of theta-identification in the sense of Higginbotham (1985): *mo* requires that theta-identification obligatorily applies to the arguments in [Spec, VP] of the two clauses that it conjoins. This ensures that the two arguments share the same theta-role. This in turn predicts that unaccusatives cannot occur in *mo*-constructions.[17] In fact, this prediction is borne out. See (27) below.

(27)   a.   *‘Oku puke ‘a Mele mo tapu *pro* ke mou hū ki hono loki.
              prs sick ABS Mele and forbidden that 2.pl. enter to poss.3.s. room
              ‘Mele is sick and you cannot enter her room’
              Lit. ‘Mele is sick and it is forbidden that you enter her room’

        b.   *Na’e ‘ikai *pro* ke ha’u ‘a Sione mo ‘ita lahi ‘a Mele.
              pst not ke come ABS Sione and angry much ABS Mele
              ‘Sione didn’t come and Mary was angry’
              Lit. ‘It wasn’t that Sione come and Mele was angry’

An interesting analogy may be the contrast between the *resultative* and *conjunctiv*e compounds in Chinese. In Chinese, resultative as well as conjunctive compounds are formed fairly productively. Li (1993) proposes that the formation of such a compound involves theta-identification. For example, see (28) below.

(28)   **Chinese resultative** (Li 1993: 480)
        Táotao zhuī-lèi-le Yōuyou le
        Taotao chase-tired-ASP Youou LE
        ‘Taotao chased Youyou and as a result Taotao/Youyou got tired’

Li (1993) argues that theta-identification in the process of forming such a compound is governed by a rule, which can be summarised as follows: the hierarchy that the theta-roles concerned hold with each other in the head must be maintained in the resulting compound. To be specific, the external argument

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[17] Thanks to William O’Grady (p.c.) for bringing this point to my attention.

of the head must remain (part of) the external argument of the compound. The curious fact that sentences like (28) are ambiguous can be explained in terms of this condition. The Chinese resultative compounds are assumed to be head-initial. Therefore, in (28) above, for example, the external theta-role of *zhuī* must remain (part of) the external theta-role of the compound *zhuī-lèi*. Consequently, assuming the following theta-grids, *zhuī* <1,2> and *lèi* <a>, possible patterns of theta grid of the compound are <1-a, 2> and <1, 2-a>, giving rise to the ambiguity.[18] The interpretation with the theta grid <2-a, 1> ("Youyou chased Taotao and as a result Youyou got tired") is impossible. This analysis of the Chinese resultatives has some implication regarding the *'o*-construction in Tongan. We will return to this point shortly.

In contrast, theta-identification is compulsory in forming a conjunctive compound in Chinese. Moreover, an external theta-role must be theta-identified with an external theta-role. See (29) below.

(29) **Chinese conjuntive** (Li 1993:489)

    a.   Táotao hé Yōuyou jīngcháng lái-wăng

            Taotao and Youyou often come-go

            'Taotao and Youyou often visit each other'

    b.   *Táotao jīngcháng lái-wăng Yōuyou.

            Taotao often come-go Youyou

            Intended meaning: same as (5.31a)

            Intended theta-grid: <1, a>

In (29a), the compound has a theta-grid <1-a> and this theta-role is assigned to *Táotao hé Yōuyou*. In (29b), the intended theta-grid is <1, a>, the external theta-role of *lái* being assigned to *Táotao* and that of *wăng* to *Yōuyou*. Li (1993) argues that this theta-grid is illicit because the conjunctive compounds are formed by two heads and therefore the external theta-roles of the two verbs both

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[18] In contrast, the Japanese resultative compounds do not allow this type of ambiguity. See (i) below.

    (i) John-ga Mary-o oikake-tsukare-ta.

       John-NOM Mary-ACC chase-tired-Pst

     "John chased Mary and as a result John/*Mary got tired"

This is because the Japanese resultative compounds are head-final. Theta-identification is possible as long as the external theta-role of *tsukare* remains the (part of) external theta-role of the compound. Thus, only <1-a, 2>, but not <1, 2-a> is allowed.

must remain part of the external theta-role of the compound.[19] I suggest that the Tongan *mo*-construction is governed by a similar rule. Theta-identification is obligatory, and the external theta-role must remain the (part of) external theta-role throughout.[20]

5.   Further speculation on *'o*

As mentioned above, two verbs connected by *'o* are regarded as representing parts of one continuous event. The relation between the two verbs is sometimes that of cause-and-effect, and sometimes that of means-and-purpose. This property of *'o*-construction leads one to wonder whether there is any syntactic resemblance between the Tongan *'o*-construction and the Chinese resultative. Specifically, one may speculate that the two verbs conjoined by *'o* form a compound by means of theta-identification. However, this hypothesis is not feasible because the two verbs share only one argument. Specifically, if two transitive verbs with different objects, <1, 2> and <a, b>, are combined, the compound will theoretically have three arguments <1-a, 2, b>, with the theta-roles <2> and <b> being assigned not to the compound, but to each component of the compound. Obviously, this raises a problem. Besides, when comparing the legitimate and illegal patterns, no consistent condition can be obtained: the external theta role of the first verb which sometimes cannot remain (part of) the external theta-role of the compound, sometimes is allowed to do so. Thus, *'o*-construction in Tongan cannot be regarded as analogous to Chinese resultatives.

Nevertheless, there is a particular instance of *'o*-construction, which seems to conform to the definition of *compound*. Two intransitive verbs, *lava* ("to be able, capable") and *hanga* ("to proceed"), show a peculiar behaviour when used in an *'o*-construction; the subject of *lava*/*hanga* appears in ABS if the second verb is intransitive, but it appears in ERG if the second verb is transitive. See (30) below.

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[19] More interestingly, two verbs that form a conjunctive compound must share the same number of theta-roles. That is, a transitive verb cannot be connected with an intransitive verb (Li 1993).

[20] It is not entirely feasible to assume that verbs conjoined by *mo* form a compound, for reasons that are not discussed here due to the limit of space. However, whether the two verbs conjoined by *mo* form a compound or not is not a crucial issue for my assumption that *mo*-construction involves obligatory theta-identification of the external theta-roles.

(30) a.   Na'e lava 'a Sione 'o ha'u
             pst able ABS Sione and come
             'Sione was able to come'
      b.   Na'e lava 'e/*'a Sione 'o langa 'a e fale
             pst able ERG/ABS Sione and build ABS def house
             'Sione was able to build the house'

Considering that *lava* is an intransitive verb, it is exceptional that the subject *Sione* is preceded by the ERG case marker in (30b). Presumably, this ERG case is assigned by the second verb. Here, it appears that *lava* and *langa* connected by *'o*, form a kind of compound, *lava-'o-langa*, with the theta-grid <1-a, b>.[21] In fact, there is evidence that *lava/hanga 'o* V is more like an idiomatic expression that is regarded as one chunk. As illustrated in (31) below, the subject (shared argument) may appear after the second verb. The sentence forms the VSO order if we consider *lava-'o-V* as a verbal compound.

(31) a.   Na'e lava 'o ha'u 'a Sione.
             pst able and come ABS Sione
             'Sione was able to come'
      b.   Na'e lava 'o langa 'a e fale 'e Sione
             pst able and build ABS def house ERG Sione
             'Sione was able to build the house'

Furthermore, with *lava/hanga*, the S-O combination is not allowed.

(32) *Na'e lava 'a Sione 'o fakamolemole'i 'e he kuini
        pst able ABS Sione and forgive   ERG def queen
        'Sione could (managed to) be forgiven by the queen'

This restriction on coreference seems to support Li's (1993) generalisation. Assuming that *lava* is the head of the compound, the external theta-role must remain (part of) the external theta-role of the compound, whereby <1-a, b>, but not <a, 1-b> is allowed.

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[21] What is worth noting is that when theta-identification applies to A and S, the case of A prevails over that of S and as a result the argument to which this theta-role is assigned will appear in ERG despite the fact that it appears in the S-position.

The aforementioned facts seem to suggest that at least where *lava* and *hanga* are concerned, *'o* forms a compound with two verbs, rather than introducing a simple coordinate structure. In this sense, this particular occurrence of *'o* can be regarded as a serial verb construction.[22] An illustrative example of serial verb construction is found in Sranan (an English-based Creole spoken in Surinam). Sranan has a serial verb construction as well as a simple coordinate structure, which are superficially of identical form. The structure contains only one tense/aspect specification for the whole chain of verbs, and verbs have a single structural subject and share logical arguments. Compare (33a), an example of the serial verb construction, with (33b), which is a simple coordination structure.

(33)   **Sranan** (Sebba 1987: 110, 89)
      a.   Kofi sutu Amba kiri Kwaku
            Kofi shoot Amba kill Kwaku
            'Kofi shot Amba and killed Kwaku'

      b.   Kofi teki a nefi koti a brede
            Kofi take the knife cut the bread
            'Kofi cut the bread with the knife'

The difference between the two syntactically unrelated constructions can be demonstrated by the extraction test. Extraction from a coordinate structure is barred due to the coordinate structure constraint (Ross 1967), while it is permissible in a serial verb construction. The contrast is illustrated by (34) and (35) below.

(34)   **Sranan coordination** (Sebba 1987: 110)
      a.   *Suwa$_i$ Kofi sutu Amba kiri t_i?
            who Kofi shoot Amba kill
            'Who did Kofi shoot Amba and kill?'

      b.   *Suwa$_i$ Kofi sutu t_i kiri Kwaku?
            who Kofi shoot   kill Kwaku

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[22] It should be noted that serial verb constructions are generally assumed to consist of two or more verbs *without* overt makers of coordination or subordination (Sebba 1987). In this respect, *'o*-construction fails to qualify as a serial verb construction.

'Who did Kofi shoot and kill Kwaku?'

(35) **Sranan serial verb construction** (Sebba 1987: 101)

    a.   San$_i$ Kofi teki a nefi koti t_i?
        what Kofi take the knife cut
        'What did Kofi cut with the knife?'

    b.   San$_i$ Kofi teki t_i koti a brede?
        what Kofi take cut the bread
        'What did Kofi cut the bread with?'

Application of the extraction test reveals an intriguing fact about the Tongan *'o*-construction. As illustrated in (36) below, extraction is permissible if the first verb is either *lava* or *hanga*, but prohibited otherwise.[23, 24]

(36) a.   Ko e hā$_i$ 'oku lava 'e Sione 'o omi t_i?
        pred def what Prs able ERG Sione and bring
        'What can Sione bring?'

    b.   Ko e hā$_i$ na'e hanga 'e Sione 'o hua'i t_i?
        pred def what Pst proceed ERG Sione and throw out
        'What did Sione proceed to throw out?'

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[23] To be precise, it is extraction from the second clause that is strictly disallowed, while extraction from the first clause is acceptable.

  (i) a. $^?$Ko hai$_i$ na'e ha'u t_i 'o taa'i 'a Mele?
      pred who Pst come and hit ABS Mele
      "Who came and hit Mele?"

  b. $^?$Ko hai$_i$ na'e 'ave 'e Sione t_i 'o fakataumai 'a e talo?
      pred who Pst take ERG Sione and buy ABS def taro
      "Who did Sione take and (she) buy taro?"

The same results are obtained with *pea*-construction, which indicates that both *'o* and *pea* involve coordination.

[24] Chung (1978: 119) argues, however, that extraction from *'o*-clause is freely allowed and that therefore, it is not coordination, though our data (36c-d) do not conform to her claim. Chung proposes that *'o* is a complementiser that introduces an adverbial clause, containing PRO. Her assumption is that the gap in *'o*-clause is PRO is problematic, in that PRO generally occurs as S/A but not O. As our data show, PRO in *'o*-clauses may freely occur as O.

c.   *Ko hai$_i$ na'e ha'u 'a Hina 'o taa'i t_i?
pred who Pst come ABS Hina and hit
'Who did Hina come and hit?'

d.   *Ko e hā$_i$ na'e 'ave 'e Sione 'a Mele 'o fakataumai t_i?
pred def what Pst take ERG Sione ABS Mele and buy
'What did John take Mele and (she) buy?'

Based on this observation, we may conclude that *'o*-construction in general is an instance of coordination. However, there is a particular instance in which *'o* seems to form a serial verb, namely, the one involving *lava* and *hanga*. It is possible to take the peculiar properties of *lava/hanga* as an indication that reanalysis of *'o*-construction as serial verb construction is in process. However, the question remains open to future research.

6.   Conclusion

We have studied three instances in which syntactic ergativity is manifested. First, with regard to relativisation, the position vacated by *wh*-movement requires a resumptive pronoun if the moved argument is A (i.e., ERG-marked), but not if it is A/O (i.e., ABS-marked). Secondly, coordination by *pea* shows an ergative pattern: the gap in the A-function cannot be coreferential with S/O of the first clause, nor can the gap in the S/O-function have A as its antecedent. This is a pattern commonly found among the so-called syntactically ergative languages such as Dyirbal. Thirdly, coordination by *'o* shows a slightly different ergative pattern: only S/O can be coreferential with the gap, whether S, A, or O. The first two instances are particularly significant in that they respect the structural case positions. The resumptive pronoun rule applies exclusively to [Spec, Agrs]. *Pea* matches two arguments with the same case feature, either [ABS] or [ERG]. An ERG-marked argument is never matched with an ABS-marked co-*pro*, or vice versa. In other words, these phenomena suggest that ERG as well as ABS are syntactic notions. With regard to *'o*-coordination, we propose that the empty element in *'o*-clauses is a null anaphor, which must be bound by the closest potential binder, respecting relativised minimality (Rizzi 1990).

We have also observed that there is an exception to this otherwise consistent tendency towards ergativity. Namely, coordination involving *mo* shows an

accusative pattern, requiring S, either as a gap or the antecedent, to be coreferential with A rather than O. We argued that this deviation is due to the constraint idiosyncratic of *mo*: *mo* requires theta-identification to apply obligatorily to the arguments in [Spec, VP]. This condition ensures that the two verbs conjoined by *mo* have a coreferential subject, S or A, and thereby an accusative pattern arises. In other words, an accusative pattern that *mo*-coordination demonstrates is caused by an independent constraint that applies at the base structure.

To conclude, We have shown that various syntactic phenomena that show an ergative pattern in Tongan can be accounted for if we assume that ERG is checked in [Spec, Agrs] and ABS in [Spec, Agro]. Syntactic operations such as relativisation and coordination are governed by the rules that respect these two distinct structural case positions. We have also argued that a superficial accusative pattern is not necessarily an indication of accusative Case marking. Rather, the accusative pattern arises when a syntactic rule refers to theta-roles. The data studied in this paper confirm that ergativity is not merely a morphological phenomenon, but should be taken as a syntactic notion.

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