

ABSTRACT

Title of Dissertation: Topics in the Syntax and Semantics of
 Coordinate Structures

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This thesis is concerned with developing a syntax for coordinate structures which is compatible with both the syntactic behaviour of conjunction structures and with their semantics. It argues that coordinate structures are asymmetrical, hierarchical structures that conform with X-bar theory. The conjunction head projects a phrase which is adjoined to the first conjunct. This provides an account of a number of syntactic asymmetries in conjunct ordering including agreement and binding asymmetries and provides a principled analysis of Across-the-Board extraction as instances of parasitic gaps. It further argues that the Coordinate Structure Constraint cannot be a syntactic constraint, but rather must be a condition on conjoining identical semantic categories. This provides an account of unlike category coordination which is shown to be freely possible if semantic identity is preserved and no independent syntactic constraints are violated, a result which follows from the adjunct nature of the coordinate structure. In order to account for the semantic identity, it is proposed that at Logical

Form, each conjunct is a predicate in an identification relation with the conjunction head, which raises to take scope over all the conjuncts. Assuming theta role assignment at LF, only the conjunction head receives a theta role; none of the conjuncts does. Because each conjunct is in a predication relation with the conjunction head at LF, the semantic identity constraint follows directly. The fact that the conjuncts do not receive a theta role accounts for their inability to act as antecedents for reflexive binding and for the fact that modal adverbs can appear inside conjoined NPs. The proposed analysis assimilates coordinate structures directly to plurals, and argues that a consequence of the proposed LF is that all natural language conjunction and disjunction is group forming rather than propositional. All semantic ambiguities between distributed and collective coordination can then be derived with the appropriate logical representation for plurals in general, rather than having a separate semantics altogether for coordination.

**Topics in the Syntax and Semantics
of Coordinate Structures**

by
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Chapter 1

Introduction

This dissertation explores various problems in the analysis of coordinate structures. It has three main goals. The first is to show that coordinate structures are syntactically hierarchical and asymmetric. Two consequences of this view that arise out of the arguments for hierarchy are the analysis of extraction from coordinate structures as instances of parasitic gaps, and the fact that unlike syntactic categories may be coordinated. These facts lead to the second goal, namely a reanalysis of the Coordinate Structure Constraint (CSC). In particular I will show that the CSC must not be a syntactic constraint, but rather a semantic constraint enforcing identity of semantic category on conjoined elements. This in turn leads to the third goal of the dissertation which is to derive the semantic identity constraint from independent properties not directly related to coordinate structures. In addressing this goal I will show that coordinate structures are at least semantically, and perhaps syntactically much more related to plurals and distributed singular NPs than has been assumed (or at least made explicit) in the literature on plurals and coordination.

The thesis is organised as follows: Chapter 1 presents a brief introduction to delimit the scope of the work.

Chapter 2 presents evidence for treating conjunctions as heading their own maximal projections such that the second conjunct is an adjunct to the first conjunct. There are two parts to this argument, one which shows that the conjunction structure must be hierarchical, and the other

that shows that the second conjunct is an adjunct. In showing the hierarchy I will present a problem with binding into conjunction phrases and copied phrases under VP ellipsis, which will lead to a preliminary discussion of the proper definition of 'antecedent' for binding.

Chapter 3 discusses the syntactic consequences of treating coordinate structures as adjunct structures, and shows that there is no syntactic constraint on conjoining like categories, but rather such a restriction must be stated over semantic categories. This leads to a reassessment of the syntactic nature of the CSC.

Chapter 4 tries to tie together the binding problem presented in Chapter 2 with the semantic identity problem raised in Chapter 3. Here I will argue that the LF of the coordinate structure consists of a pronominal-like element related to a list of coordinated elements. This allows for a principled explanation for the semantic identity condition and ties coordinate structures syntactically and semantically very close to plurals. If the semantic argument reflects the syntactic structure at LF, then a solution to the binding problem presents itself.

1.1 What this thesis is about

1.1.1 Looking into the past

At different times within the history of generative grammar, coordination has been both studiously ignored and intensely discussed. Coordination is the most obvious example of recursion and thus figured quite prominently in early discussions of formal devices for capturing that recursion. The fact that many sentences with coordinated phrases have sentential paraphrases focused much of the early discussion around

deriving all coordination from sentential coordination. As various researchers have shown (see Gleitman 1965, Dougherty 1970 for example) not all phrasal coordination can be derived from underlying sentential coordination, and there has been a rather uneasy truce between the two points of view ever since.

Ross's 1967 dissertation, which focused on constraints on transformations, particularly movement transformations, brought to light the fact that extraction is generally barred out of coordinate structures. In Ross's framework this was stated as a constraint on particular to coordinate structures themselves, the Coordinate Structure Constraint (CSC), as were his other constraints such as the Complex Noun Phrase Constraint, and Chomsky's Wh-island constraint etc. With Chomsky's introduction of Subjacency (Chomsky 1973) and the ECP (Chomsky 1981) independent constraints on specific *constructions* were for the large part eliminated in favour of general principles constraining representations or constraining maximally general rules such as Move- α . In the shuffle to remove construction specific rules and constraints, coordination phenomena got largely ignored although two notable attempts are Pesetsky 1982 and Goodall 1984. Pesetsky subsumed a large part of the CSC under his version of the ECP which he reduced to properties of tree geometries. Goodall argued that three dimensional structures were needed for coordinate structures, but argued that they were independently needed to account for properties of causative constructions especially in Romance languages, thus removing their construction specificity, although at the expense of adding significantly more power to the theory by embracing parallel structures.

1.1.2 Looking into the future

This study is a continuation of these lines of thought, but in a more extreme way. Ideally, one would like to remove *all* reference to coordinate structures from the grammar, i.e. other than minimal lexical specification, there should be no parts of the grammar that refer to coordinate structures at all. Specifically, constraints such as the Coordinate Structure Constraint or Williams' 1978 Law of Coordination of Likes, which refer to coordinate structures specifically should be eliminated altogether. This includes the rough description that only like syntactic categories can be coordinated, for example. Nor should there be any syntactic processes that apply only to coordinate structures, as has sometimes been claimed. If the properties of coordinate structures can be reduced to independently needed properties of the grammar in general, then this is a significant result.

This thesis, then, is an essay in reductionism. I will try to show that there are no compelling reasons to treat coordinate structures in any special way at all. The reduction is accomplished in two ways. The first is purely syntactic: coordinate structures adhere to X-bar theory in a straightforward way, are hierarchical, and are licensed as adjuncts. This allows movement out of coordinate structures to be reduced to independently needed mechanisms of null operator movement and chain composition. This syntactic reduction is in the spirit of other work along these lines as mentioned above.

The second part of the reduction is largely semantic, although I will argue that much of it is reflected at LF. To put the main idea of this part

in very basic terms, coordination is simply a special way of referring to plurals (semantically construed). While plurals can be thought of as referring roughly to sets of individuals, coordinate structures are simply language's way of enumerating the sets to which those plurals refer. Assuming we have a reasonable syntax/semantics for plurals, then this will generalise to coordinate structures.

1.2 Disclaimer: What this thesis is not about and why

Every theory defines the range of 'facts' it considers important to explain. So long as the range of facts covered is substantial, reasonable progress can be made. This is not an excuse for ignoring data, but rather a methodological necessity, since what a 'fact' is depends largely on the theory anyway. There are three types of data which have been the focus of much of the literature on coordination: gapping and right node raising and 'respectively' coordination. Other than the comments below, I will have nothing at all to say about gapping. Nor will I have much to say about Right Node Raising or 'respectively' coordination except some brief observations in Chapters 2 and 4 respectively. Lest I be accused of ignoring a crucial part of the coordination data, I will briefly discuss my reasons for excluding these topics from the present work.

1.2.1 Gapping

Gapping refers to construction of the sort in (1.1). One observation about them is that it requires a very special intonation pattern. It is also largely restricted to coordination with *and*. The seminal analysis of

gapping constructions is found in Neijt 1979. Further discussion of gapping can be found in van Oirsouw 1987.

(1.1) John likes Bill, and Fred, Sue

Van Oirsouw (op cit. p. 88) states the following about the relevance of gapping to studies of coordination:

These controversies are real, and recent attempts to relegate rules like Gapping to some domain outside syntax in order to avoid problems ... are clearly inadequate and uncalled for.

I shall take van Oirsouw at his word, and not relegate Gapping to some other domain. However, as he concludes, Gapping is best seen as a deletion phenomenon, with the main problem being stating the identity conditions (among others) under which the deletion can apply. This presupposes a constituent structure for coordination, and an explanation for what constitutes a valid conjunct before deletion applies, subjects on which van Oirsouw is noticeably silent. It also assumes that the analysis of coordinate structures in which deletion does not apply is straightforward.

These latter questions are largely the ones that I will address here. To the extent that I can shed some light on the phrase structure, syntactic constraints and semantic properties of coordinate structures before deletion applies, I see no reason to believe that a deletion analysis (if it turns out to be correct) could not then be applied to results.

1.2.2 Right Node Raising

Right Node Raising (RNR) concerns sentences of the following sort:

- (1.2) John cooked, and Mary ate, the bouillabaisse

Essentially two verb phrases share a single object. RNR also exhibits a particular intonation pattern. As Goodall 1987 points out, it is also not restricted only to coordinate structures, but also occurs in clausal adjunct structures such as (1.3):

- (1.3) John ate, before Mary could throw out, the leftover
 bouillabaisse

One of the main claims of this thesis is that coordinate structures are syntactically adjunction structures, so (1.3) could be taken as supporting evidence for this position. However, it is still not clear what the best analysis of RNR is. It may also be a deletion phenomenon, and as such would be independent of the proper analysis of coordinate structures as described above.

Right Node Raising also applies in some cases to material smaller than a (lexical) word as the examples in (1.4) show¹. Its domain of

¹ It is far from clear what to make of data such as (1.4). The stress pattern here is not the same as that of standard cases of RNR, however this may be an independent problem. Since examples such as **We have to un- and re-tie this knot* are unacceptable, as are cases involving suffixes such as **The open and thoughtful-ness of the visitor surprised us*, the status of *pro*, *anti*, etc. as prefixes is questionable. Maybe they are adjectives, in which case the examples are simply straightforward cases of RNR, and not relevant to the argument. Minimally, they seem to form a separate phonological word, as argued in Booij 1985, for example. I thank Irene Vogel for pointing out this reference to me.

application may therefore be prosodic and out of the domain of syntax proper.

- (1.4) a. John watched both the pre- and post-game shows of the
 Super Bowl
 b. The police arrested both pro- and anti-abortion protesters

1.2.3 'Respectively' coordination

'Respectively' coordination involves cases such as (1.5):

- (1.5) John and Bill like Fred and Harry respectively

Again, this has been of some interest to many studies of coordination especially since the proper analyses of it may not be accountable in terms of a context free grammar. In the Principles and Parameters approach to syntax that I am assuming, questions about context freeness have largely been discarded. If there is something to be said about the analysis of *respectively* it is largely semantic. Roughly, *respectively* sets up a one-to-one mapping between two sets. It is not even clear that the two sets need to be syntactically coordinate structures as long as the elements of them are ordered so as to set up a proper mapping. For example, the example cited above could, as an answer to the question *Who do John and Bill like?*, be (1.6):

- (1.6) They like Fred and Harry, respectively

Since plural NPs do not in general order their members, it is usually the case that coordinate structures are necessary to set up the relevant sets, however, I believe that examples can be constructed to show that *respectively* is not related specifically to coordinate structures, but rather to plurals. Consider a set of musical variations where pairs of variations refer to each other, in addition to the main theme. One could then felicitously utter (1.7a) or (1.7b), yet the second example contains no coordinate structure at all:

- (1.7) a. The fifth and sixth variations refer the third and tenth,
respectively.
b. The first two variations refer to the last two, respectively.

That the relevant notion is *ordering* rather than *distinctness* can be shown by the fact that even with very pragmatically distinct sets, it is very difficult to set up a *respectively* relation between the plurals that denote them. Consider the following examples:

- (1.8) a. *The Three Bears ate the three bowls of porridge,
respectively
b. ?The three candidates kissed their wives respectively
vs. The three candidates kissed their respective wives

Even though we know that *The Three Bears* refers to the Papa bear, the Mama bear and the Baby bear, and that the three bowls of porridge refer to the big bowl, the medium bowl and the small bowl, (1.8) is not felicitous.

What is important, it seems is not simply the identities of the set referred to by the plural, but rather the ordering of the set. This is what distinguishes (1.8) from (1.7).

In Chapter 4 I will argue that coordinate structures are to be interpreted as plurals, therefore the fact that RNR can sometimes allowed with plurals makes it consistent with the general proposal for coordination that I will develop here.

Chapter 2

This chapter concerns the phrase structure of coordinate structures. Its main goal is to remove any stipulations about the phrase structure of coordinated phrases that refer specifically to coordinate structures. I will present some conceptual and empirical arguments for incorporating conjunctions into X-bar theory and show that coordinates are structurally identical to other types of adjuncts.

2.1 Coordination and phrase structure

Very few studies on coordinate structures have explicitly discussed their phrase structure. (Gazdar et. al 1985 is perhaps the sole exception). Most studies have simply assumed that coordinate structures are flat structures and are (either implicitly or explicitly) multiply headed. The structure of a coordinate structure is thus assumed to be something as in (2.1), with the coordinating conjunction assumed to be adjoined syncategorematically to XP. Partially this is motivated by the fact that in a sequence of identical conjunctions, the presence of *and* for instance, in more than one place in the tree does not seem to correspond to different semantic occurrences of *and* (see e.g. the comments in Carlson 1983)

(2.1)



There are a two main conceptual reasons to suspect this kind of approach. First of all, the projection in (2.1) is either non-headed or multiply headed. All other things being equal, it would be conceptually advantageous to

make no special assumptions about coordinate structures with respect to their adherence to headedness. In particular, one of the driving motivations of X-bar theory is that it captures the endocentric relation between a maximal projection and its head. The structure in (2.1) violates endocentricity in two ways. Most versions of X-bar theory assume that there is a *unique* head for any particular $X^{\max}$, thus (2.1) violates this part of endocentricity. Secondly, the conjunction, although a head, does not project to an $X^{\max}$, violates the idea that all lexical items project phrases.

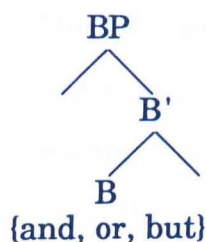
A second conceptual argument against structure like (2.1) is that there is some reason to believe that all syntactic structures are binary branching (see e.g. Kayne 1984, Pollard 1984). If this hypothesis is correct, then no linguistic structure should be flat. There should thus be evidence for hierarchy in coordinate structures.

2.2 The Boolean Phrase and evidence for hierarchy

2.2.1 X-bar theory and conjunctions

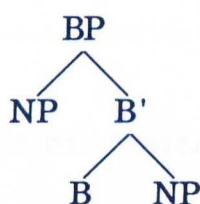
If we accept the conceptual guidelines above, then minimally, coordinating conjunctions should project to their own maximal projections. I proposed this structure, called a Boolean Phrase originally in unpublished work in 1986, published in Munn 1987a. Independently, similar structures have been proposed by Collins 1988, Kolb and Thiersch 1991, Thiersch 1985. The basic structure of a conjunction phrase should look like (2.2). I shall adopt the label BP or Boolean phrase

(2.2)



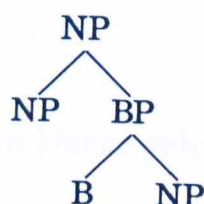
This structure is simply what needs to be assumed for projecting the coordinate head as a phrase. A priori, it says nothing about the actual phrase structure coordinated phrases themselves. The most obvious solution is to place one conjunct in the Specifier position of BP, and one conjunct in the complement position. This was what I originally proposed in Munn 1987a, and seems to be what the other references cited have proposed. In Munn 1987b, 1992 I proposed a different structure for coordinated phrases in which the first conjunct is *not* the specifier of the BP. Instead, the conjunction phrase consisting of the conjunction and the second conjunct is Chomsky adjoined to the first conjunct. Conjoined NPs would thus have the following structures given the two different assumptions:

(2.3) a.



"Spec/Head BP"

b.



"Adjoined BP"

For ease of discussion, I will refer to the structure in (2.3a) as the Spec/Head BP and the structure in (2.3b) as the Adjoined BP. In what follows I will present three independent arguments that the adjoined BP is a more accurate reflection of the structure of conjoined phrases than

the Spec/Head BP. The first argument comes from the binding facts and the definition of c-command. The second comes from the analysis of Across-the-Board extraction. The third comes from cases of asymmetric (unlike category) coordination.

Ross (1967:90-91) showed that there is syntactic evidence for the constituency of the conjunction and the second conjunct by virtue of the difference shown in (2.4):

- (2.4) a. John left, and he didn't even say good-bye.
b. John left. And he didn't even say good-bye.
c. *John left and. He didn't even say good-bye.

Intonational pauses, although not specifically test for syntactic constituency, are only possible between the first conjunct and the conjunction. The conjunction and the first conjunct never form a constituent. Also, in languages where conjunctions can cliticise, they do so into the second conjunct, as the following examples from German show:

- (2.5) a. Sie will tanzen, aber ich will nach Hause gehen.
b. Sie will tanzen, ich will aber nach Hause gehen.
c. *Sie will aber tanzen, ich will nach Hause gehen.

'She wants to dance, but I want to go home.'

The second conjunct can also be extraposed, while the first may not, as in (2.6):²

- (2.6) a. John bought a book yesterday, and a newspaper.
b. *John bought a newspaper yesterday a book and.
c. *John bought a book and yesterday, a newspaper.

Example (2.6b) shows that extraposition of the first conjunct and the conjunction is ruled out, while (2.6c) shows that the second conjunct and the conjunction must move as a whole³. This example provides the first piece of evidence that the second conjunct and the conjunction are a maximal projection. If extraposition is a movement rule, then we predict that it should only apply to maximal projections. If it is simply an interpretive rule, then it is even more likely that the extraposed constituent is a maximal projection. If it were not, we would predict extraposition of other non-maximal projections in standard extraposition cases. If the only case of extraposition involving non-maximal projections involves coordinate structures then this is an indication that the Spec/Head BP is incorrect.

² This was pointed out to me by Gert Webelhuth.

³ There are reasonable grounds to believe that extraposition is not really movement, but this is not important, since there is no evidence that the extraposed element is not a maximal projection. See Culicover and Rochemont 1990.

2.2.2 Binding theory and the definition of c-command

The strongest motivation for the BP structure is that there are binding asymmetries between the first and second conjuncts. Thus, in conjoined NPs, the first conjunct can bind the second conjunct, but not vice versa, as in (2.7): If c-command is required for binding, then *every man* must c-command *his* in (2.7b). This is not absolute evidence, however, because one might argue that (2.7b) violates the Leftness Condition (Chomsky 1973, Higginbotham 1980) which states that a pronoun may not be interpreted as a bound variable of a quantifier to its left.

- (2.7) a. Every man_i and his_i dog went to mow a meadow
b. *His_i dog and every man_i went to mow a meadow

However, an R-expression in the first conjunct can be co-referential with a pronoun in the second, but not vice versa.

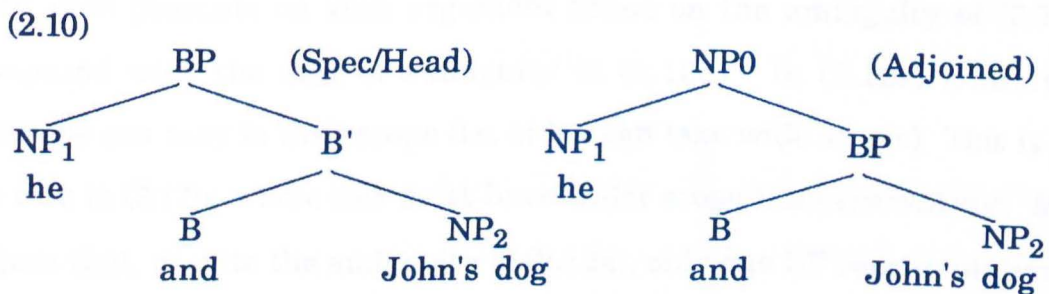
- (2.8) a. John_i's dog and he_i/him_i went for a walk.
b. *He_i and John_i's dog went for a walk.

Assuming a flat structure would allow *John* and *he* to c-command each other in both the (a) and (b) examples above predicting that both should constitute violations of Principle C of the binding theory which states that R-expressions must be free. If the structure is asymmetrical as in either of (2.3a) or (2.3b), however, the contrast in (2.8) follows unexceptionally. The first conjunct will c-command the second but not

vice versa given a standard definition of c-command as in (2.9) (see Reinhart 1976):

- (2.9) A c-commands B iff the first branching node dominating A dominates B

Example (2.8b) will have the possible structures shown in (2.10) under the Spec/Head BP analysis and the Adjoined BP analysis:



NP_0 is a projection of NP_1 and therefore constitutes the c-command domain for *he*. *He* will thus c-command *John* and the two may not be coreferent.

The binding facts argue against either a flat structure or a multiply headed projection. If NP_0 (or BP) were simultaneously a projection of both NP_1 and NP_2 then NP_0 would be the c-command domain for both conjuncts. We can conclude that the structure is asymmetrical, and there is an intervening branching node between the conjuncts. These binding facts do not allow us to decide between the Spec/Head BP analysis and the adjoined BP analysis, however, since the definition of c-command as given simply specifies first branching node rather than making reference to maximal projections.

There is, however, some evidence in favour of using the notion m-command as defined in (2.11) rather than c-command as the relevant relation for binding.

- (2.11) A m-commands B if A and B are maximal, $A \neq B$ and every maximal projection dominating A dominates B (where A dominates B if all segments of A exclude B)

May 1985 presents on such argument based on the ambiguity of (2.12a) compared with the lack of ambiguity in (2.12b). In (2.12a) *what* and *everyone* can vary in their scope (i.e. either can take wide scope.) This is not the case in (2.12b) where *who* must have wider scope than *everything*. May argues that, despite the ambiguity of (2.12a), only one LF representation is licensed, namely that shown in (2.13a). There are two reasons to believe that there is only one such LF. If we assume that scope at LF is determined by c-command (rather than m-command), then (2.13a') would be the required LF representation. However, this representation would arguably violate either the ECP or the superiority condition given that *everyone* and *what* in (2.13a') are in a crossed rather than a nested relationship. Secondly, a wide scope reading of *everyone* as analysed in (2.13a') would require the quantifier to adjoin to CP. If [+WH] Comps can only contain [+WH] elements, then adjunction of the quantifier to CP should be ruled out. On the other hand, (2.13a) should only allow a narrow scope reading, since the quantifier does not c-command the *wh*-phrase. Given this apparent paradox, May argues that m-command rather than c-command is the correct relation for determining LF scope. Under the definition of m-command given above, *everyone* and *what* will

m-command each other and since *everyone* is not (exhaustively) dominated by IP, thus the only maximal projection dominating it is the CP.

(2.12) a. What did everyone buy for Max

b. Who bought everything for Max

(2.13) a. $[_{CP} \text{ what}_j \text{ did } [_{IP} \text{ everyone}_i [_{IP} t_i \text{ buy } t_j \text{ for Max }]]$

a' $*[_{CP} \text{ everyone}_i [_{CP} \text{ what}_j [_{IP} t_i \text{ buy } t_j \text{ for Max }]]$

Returning to the non-ambiguity of (2.12b), the only LF representation which would allow *who* and *everything* to c-command each other would be (2.14) where *everything* adjoins to IP. This structure is straightforwardly ruled out by superiority or the ECP, analogously to (2.13a'). In order to give (2.12b) a well formed LF, May assumes that the quantifier adjoins to VP rather than IP as in (2.14b) This is also an implicit argument for m-command, since, for semantic reasons we want quantification only over sentences, (as opposed to over VPs) *everything* in (2.14b) should have sentential scope rather than VP scope. Given that VP does not exhaustively dominate the quantifier, its scope will domain will be IP as required.⁴

⁴ Chierchia 1991 (see also Engdahl 1983) argues that semantically one should never be able to quantify into questions, thus there can be no wh/quantifier scope interactions at all. This obviously obviates May's argument for m-command as a way of determining scope, since if there are no scopal interactions, m-command is not required to account for them. Although Chierchia's arguments are compelling against quantification into questions, his solution involving what amounts to arbitrarily complex layered traces with both a pure variable and any number of pronominal variables seems to me difficult to implement syntactically.

- (2.14) a. *[CP who_i [IP everything_j [IP t_i bought t_j for Max]]]
 b. [CP who_i [IP t_i [VP everything_j [VP bought t_j]]]]

There have also been some arguments raised explicitly *against* using m-command for binding purposes. The most well-known of these arguments is found in Saito 1984. Saito's most straightforward argument against m-command is based on the structure of noun phrases. On the assumption that possessors are in the Spec NP position, NPs such as those in (2.15) should violate Principle C under a definition of m-command, because complement of the head noun and the possessor will c-command each other.

- (2.15) a. [NP John's [N' criticism (of) [NP himself_i]]]
 b. [NP the city_i's [N' destruction [NP t_i]]]

Given current assumptions about the structure of noun phrases, particularly the DP hypothesis of Abney 1987 (and further work), there is considerable evidence for at least one extra maximal projection in the noun phrase. Under Abney's analysis, for example, the examples above would have the structure in (2.16). In this case, no Principle C violation will arise, since the possessor and the complement of the head noun no longer share the same maximal projection.

- (2.16) a. [_{DP} John [_{D'} 's [_{NP} criticism (of) [_{DP} himself_i]]]]
 b. [_{DP} [_{DP} the city_i] [_{D'} 's [_{NP} destruction t_i]]]

Saito's other arguments deal with scrambling in Japanese, and rest on the assumption that scrambling behaves like Quantifier Raising and adjoins to IP. There is much debate over the correct analysis of scrambling (see e.g. Mahajan 1990, Saito 1991, Webelhuth 1989), so it is hard to judge their relevance to the issues at hand.

Given the above discussion, there is little reason to believe that c-command is ever *necessary* to determine binding domains. M-command will always suffice, and may be required in some cases. Leaving aside the evidence from scrambling, the conjunction data would remain the only evidence which would *require* c-command for binding. If m-command is *required* for binding, then the Spec/Head BP analysis of conjunction would be ruled out in the same way as the flat structure. The binding facts thus support the adjoined BP structure if m-command is required for binding.

2.2.3 Conjunctions and selection

Another argument against the Spec/Head BP structure comes from selection. Assuming the Spec/Head structure, we predict that coordinate structures can be (c-)selected for by particular verbs. This does not seem to be the case, even though there are verbs which select for plural subjects or objects such as *gather* (*John gathered the tools/*tool*) and *be similar* (*John and Bill are similar/The men are similar*). If selection of functional heads is possible (as might be argued for for CP and IP) then

selection of BP should be possible, but clearly isn't⁵. The impossibility of selecting a conjunctive complement follows directly from the Adjoined BP hypothesis, however, because the BP structure is always adjoined to a constituent and is never selected directly by a head.

Elements such as *both* and *n/either* are possible candidates for heads which select BPs, but this does not seem to account adequately for their distribution. A central claim in recent GPSG analyses of coordination has identified two types of coordination (cf. Sag et al. 1985, Gazdar et al. 1985): so-called binary coordination involving the combinations of *both*, *either*, *neither* with *and*, and *or*, and the iterating coordination schema involving just *and* and *or*. These researchers claim that the distinction is one which has not been addressed in the transformational coordination literature, and see this as an advantage of their analysis.

Whatever the analysis of *both* and *n/either*, however, they should not be linked directly to the phrase structure of coordinate structures. Dougherty 1970 presents evidence that such words are best analysed as quantifiers which operate on syntactically plural noun phrases, there being no distinction between uses of *both* in coordinate structures compared to other plural NPs. The basic facts are shown in (2.17):

⁵ It is not so easy to dismiss the selection argument by simply stating that the conjunction is indistinct in category from the conjuncts as is suggested by Grootveld 1992. Even if one takes the approach of Grimshaw 1991 where functional heads are extended projections of lexical heads, they still add particular features of their own which can arguably be selected for. If this is the case, then there is no principled way of excluding B from such selection.

- (2.17) a. Both John and Bill will play soccer.
b. Both the men will play soccer.
c. John and Bill will both play soccer.
d. The men will both play soccer.

In (2.17), *both* acts a quantifier which operates on the plural subject, essentially forcing it to be interpreted (roughly) as a group. Clearly incorporating such quantifiers into the coordination phrase structure rules misses an important generalisation about their distribution. Even though (2.17a, b) have the same interpretation, the GPSG account cannot generate (2.17b) as part of their conjunction schema.

These facts do not represent all of the details with respect to the analysis of quantifiers like *both*, and *either*, but they do seem to point to an analysis which separates them from coordinate structures specifically and instead incorporates them into a theory of quantifiers of plural noun phrases.⁶ I will delay detailed discussion of this point until Chapter 4.

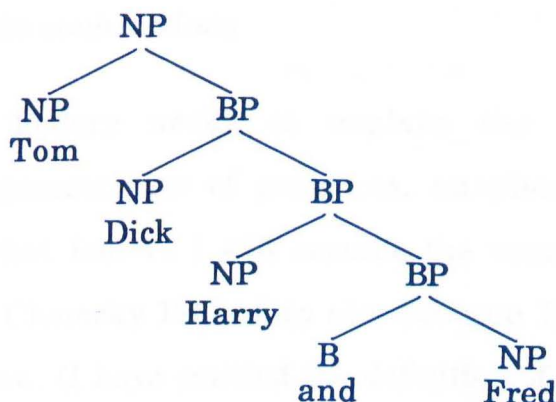
2.2.4 A note on iterative conjunction

In the discussion above, I have been assuming coordination of two conjuncts. As is well known, coordinate structures may be iterated many times; this was part of the motivation for the flat structure with a single instance of the conjunction. As far as I can tell, there is no reason to assume that iterating conjunction cannot be accounted for simply by

⁶ See for example Larson 1985 (on disjunction scope).

adjoining to the BP. Conjoined NPs of the sort *Tom, Dick, Harry and Fred* would thus have the structure in (2.18).⁷

(2.18)



2.3 A binding puzzle

Before presenting the other arguments for the adjoined BP analysis, I would like first to present some further evidence in favour of a hierarchical structure for coordinate structures. Although this will constitute an argument for hierarchy, it will also raise interesting questions about the way in which the binding theory operates. I will argue that it is necessary to distinguish formal indexing under c-command (which I will term binding) from antecedent identification. However, the calculation of binding *domains* must be stated in terms of antecedents rather than binders. Being a syntactic binder will be a necessary, but not sufficient condition for determining antecedence. This section will end with a tentative definition of *antecedent*. In Chapter 4 I

⁷ This is similar to the structure given by van Zonneveld 1992 cited in Grootveld 1992.

will return to the problems posed here and attempt to explain them in terms of the LF that coordinate structures have.⁸

2.3.1 Binding into conjunctions

The Binding Theory seeks to explain the distribution and (non-)coreference possibilities of pronouns, anaphors and referential expressions. In what follows I will assume the version of the binding theory proposed in Chomsky 1986a (see also Johnson 1987, Hestvik 1991) stated in (2.19) below. (I have omitted the definition of Principle C, which is irrelevant for the discussion at hand.)

(2.19) An indexing I is *BT-compatible* with (α, β) if:

(A) α is an anaphor and is bound in β under I

(B) α is a pronominal and is free in β under I

(2.20) For some β such that (i), I is BT-compatible with (α, β)

(i) α is an anaphor or pronominal, and β is the least CFC containing a (lexical) governor for α for which there is an indexing J BT-compatible with (α, β)

CFC = Complete Functional Complex, a maximal projection in which all grammatical functions compatible with its head are realised.

⁸ This is an expanded version (with a slightly different perspective) of joint work with Juan Uriagereka.

Informally, the content of (2.19) and (2.20) is the following: If α is an anaphor, it must be bound in the smallest CFC contains it, while a pronoun must be free in the smallest CFC that contains it. This predicts complementary distribution of pronouns and anaphors in binding domains with subjects but overlapping distribution in binding domains without subjects, such as NPs.

The lack of complementarity between anaphors and pronominals in NPs is due to the fact that anaphors must be bound and pronouns must be free. This explains the grammaticality of both (2.21a) and (2.21b): In (2.21a) the picture NP is the minimal CFC in which the pronoun can be free, while the matrix S is the minimal CFC in which the anaphor can be bound.

- (2.21) a. The candidates_i heard stories about them_i
b. The candidates_i heard stories about each other_i

Consider now the following data⁹:

⁹ It is often noted that NPs inside coordinate structures do not obey the binding theory at all as in (i) (see for example Zribi-Hertz 1989), but this observation does not hold for reciprocals as in (ii):

- (i) John said that the Queen invited Mary and himself to dinner
(ii) *The men said that the Queen invited Mary and each other to dinner

- (2.22) a. The candidates_i like Fred and each other_i
 b. *The candidates_i like Fred and them_i

Unlike the picture NPs, the conjoined NP does not constitute a separate CFC, and thus the binding domain for both the pronoun and the anaphor is the matrix clause. Crucially, the fact that *Fred* is a closer (potential) binder for the pronoun in (2.22b) does not affect the calculation of the binding domain. This is perhaps not surprising, since CFCs are determined in terms of a lexical head and its arguments. Since conjunctions are not lexical, the relevant lexical head should be the matrix verb.¹⁰

The same fact shows up straightforwardly in picture NPs where the complement of the picture N is a conjoined NP.

- (2.23) a. The candidates_i saw videos of Fred and each other_i
 making speeches
 b. The candidates_i saw videos of Fred and them_i making
 speeches

¹⁰ Given the either of the BP analyses under consideration, the inclusion of *governor* in the definition of CFC is problematic. The second conjunct is governed by the conjunction and is never governed by the verb; no definition of government allows the complement of a head to be governed by another head. Of course if the conjunction were not a head and the structure was flat, then the verb would govern every conjunct, but this seems unlikely given the independent considerations discussed above. The main reason that *governor* is needed in the definition is to capture binding facts in Exceptional Case Marking structures such as *John expects himself to win* where the reflexive is an argument of the embedded verb but is governed by the matrix verb. Reinhart and Reuland 1991 resolve the problem by claiming that the embedded clause forms a complex predicate with the verb at LF and thus the CFC is the matrix clause. If this line of reasoning is correct, then *governor* may be dispensed with and the conjunction facts will not pose any problem.

In each of the examples in (2.23), the complement of the picture N is a conjoined NP. In each case, the conjunction does not affect the calculation of the binding domain for either the anaphor or the pronoun; in particular it must not be the case that the NP *Fred* is a potential antecedent for the anaphor in (2.23a), or else the example would violate Principle A. These examples are predicted given the simpler examples in (2.22):

Now consider the following examples¹¹:

- (2.24) a. The candidates_i saw a video of them_i and each other_i making speeches
 b. *The candidates_i saw a video of each other_i and them_i making speeches

Before proceeding, let me make clear the situation which the sentences in (2.24) are describing. On the assumption that the candidates never make speeches together, (2.24) can refer to a single video in which each of the candidates appear (separately) making speeches. If each candidate saw this video, then (2.24) is a possible description of what they did.^{12,13}

¹¹ Examples of this sort were first pointed out to Uriagereka and me by Germàn Westphal.

¹² The data becomes slightly more plausible if the NP is plural as in (i), but this leads to the possibility of a Gapping analysis which I would like to avoid.

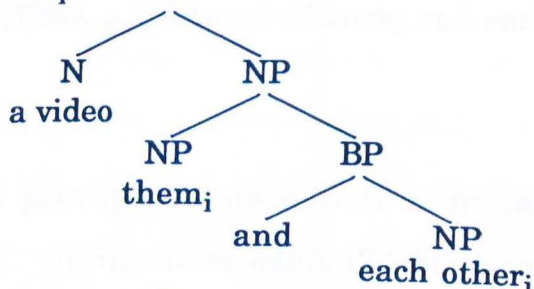
(i) The candidates_i saw videos of them_i and each other_i making speeches

¹³ A reviewer for *Linguistic Inquiry* suggested that the effect in (2.24) might be due to contrastive stress on the conjuncts, and that the asymmetry disappears if there is contrastive stress as in (i), and that (2.24a) becomes unacceptable with stress on the determiner of the picture NP as in (ii) [reviewers judgements]:

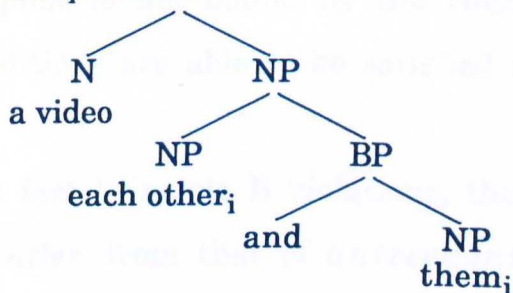
(i) The candidates_i saw a video of each OTHER_i and THEM_i
 (ii) ?*The candidates_i saw those VIDEOS of them_i and each other_i

Given the fact that the coordinate structure did not change the binding domains in (2.23) and (2.22), the contrast in (2.24) is unexpected, since one would predict that (2.24b) should be grammatical given that *each other* does not count as a possible antecedent for *them* by analogy to (2.23b). However, assuming the BP analysis, (2.24b) violates Principle B because the pronoun *them* is *bound* by *each other*, even though it cannot act as an antecedent. These facts also constitute more evidence for hierarchy, since the contrast between the two examples would be unexpected if the structure were flat.

(2.25) a. the candidates_i saw NP



b. the candidates_i saw NP



While I agree that contrastive stress does stress affects the binding possibilities, I do not think that the (2.24a) is only possible with contrastive stress, since it has the characteristic stress pattern of coordinate structures generally. If we stress the conjunction, as in (iii) and (iv), the constraint still obtains, so (ii) cannot simply be due to the lack of stress on the conjuncts themselves. [My judgements]

(iii) The candidates_i saw a video of them_i AND each other_i making speeches

(iv) *The candidates_i saw a video of them_i AND each other them_i making speeches

In (2.25a), *them* binds *each other* (but is not its antecedent), while in (2.25b) *each other* binds *them*, violating Principle B. Since *each other* is an anaphor, being bound by *them* in (2.25a) does not affect its satisfaction of Principle A.

Notice, also, that positing the presence of a PRO inside the picture NP as suggested in Chomsky 1986a will not solve the problem here. According to the discussion above, (2.25) has either the structure in (2.26a) or (2.26b):

- (2.26) a. the men_i saw [pictures of them_i and each other_i]
b. the men_i saw [PRO_{arb} [pictures of them_i and each other_i]

But (2.26a) should violate principle B, since there is no intervening subject to protect the pronoun. On the other hand, (2.26b) should violate principle A, since the anaphor is not bound by the closest subject. Somehow, though, both conditions are able to be satisfied making the sentence grammatical.

If the facts above are in fact Principle B violations, then we must separate the notion of *binder* from that of *antecedent*. Almost paradoxically, the calculation of binding domain must refer only to indexings involving antecedents while the binding principles themselves must refer simply to binders and not to antecedents. To see why this is so,

consider two possible redefinitions of the binding theory, as given in (2.27) and (2.28)¹⁴.

(2.27) (A) An anaphor must be bound by its closest potential binder

(B) A pronoun must be free from its closest potential binder

(2.28) (A) An anaphor must be bound by its closest potential antecedent

(B) A pronoun must be free from its closest potential antecedent

If binding domains were calculated simply in terms of closest potential *binders* as in (2.27) then data of the sort *John saw Bill and him* would not be explained, since the closest *binder* for the pronoun is *Bill*. However if binding domains were calculated simply in terms of *antecedents* then the ungrammaticality of (2.25b) is not predicted, since the element in the coordinate structure should not count as a potential antecedent for the pronoun.

I am claiming that the element in the conjunct cannot be an antecedent for the anaphor. This predicts that (2.29) is ungrammatical:

¹⁴ Of course, these are not meant to be exact (re)formulations of the BT, since (at least for anaphors) they do not predict any choice in antecedent in cases such as *John told Bill about himself*.

- (2.29) *John saw pictures of the men_i and each other_i

This example is not conclusive, however, if we think that binding must relate elements with independent semantic roles. Assuming that *the men* and *each other* both receive the same theta role, (2.29) might be ungrammatical on other grounds. However there is reason to believe that this is not the case. In languages with possessive reflexives, such as Russian and Icelandic, sentences such as (2.30a) are ungrammatical in contrast to (2.30b):¹⁵ Example (2.30c) shows that the ungrammaticality of (2.30b) is not due to the fact that *John* is not a subject, since even in subject position the sentence is ungrammatical.

- (2.30) a. *Bjarni sá Jón_i og hundinn sinn_i
Bill saw John and dog self's
'Bill saw John_i and his_i dog'

b. Bjarni_i sá Jón og hundinn sinn_i
Bill saw John and dog self's
'Bill_i saw John and his_i dog'

c. *Jón_i og hundurinn sinn_i fóru út að ganga
John_i and the-dog his_i went out to walk
'John and his dog went out to walk'

Similar examples can be constructed for English using picture NPs as shown below:

¹⁵ Lilijana Progovac first drew my attention to this fact. I thank Kjartan Ottosson for the Icelandic examples.

- (2.31) *(Either) John_i or a picture of himself_i will suit our purposes

Here again, there is no reason to assume that *himself* bears the same semantic role as *John*, so this cannot be the explanation for the unacceptability of the example. Nor can this be attributed to the so-called *i-within-i* condition (Chomsky 1981) since both examples (2.32) are acceptable in contrast with the classic examples of self-reference noted by Higginbotham 1983 and Haik 1984 in (2.33)¹⁶.

- (2.32) a. Either John_i or a picture of him_i will suffice
 b. Either John_i or his_i picture will suffice

- (2.33) a. *John_i is his_i cook
 b. *[His_j wife]_i saw [her_i husband]_j

The data in (2.30) constitute strong evidence that an element in a coordinate structure cannot act as an antecedent for the purposes of binding.¹⁷ There are two questions which immediately arise: how does this fact follow from the LF of coordinate structures, and what is the proper definition of *antecedent*?

¹⁶ The possibility that the data in (2.31) involved *i-within-i* was suggested to me by R. Hendrick.

¹⁷ Although this result does not pose any problems for the Principle C effects used to show hierarchy in §2.2 above, it does bring into question the validity of the quantificational binding effects shown in (2.7). If the notion of *antecedent* is needed for both quantificational binding and reflexive binding, then quantificational binding within coordinated NPs should not be possible. I shall return to this problem below.

For the moment I shall not attempt to answer the either question, leaving both until the discussion of the LF of coordinate structures in Chapter 4, although I will propose a tentative characterisation of antecedent below to be supported in the discussion in that Chapter.

The data so far have dealt only with reflexive binding. An obvious question is whether the condition on antecedents extends to quantificational binding. It seems that it does not. First of all, it does not seem difficult to get quantificational elements in coordinate structures to bind pronouns, as in (2.34):

- (2.34) a. No soldier and his rifle should ever be separated
b. Every professor and his wife attended the convocation

This fact is not surprising, however, if we distinguish A-binding from A-bar binding. This indicates that the correct characterisation of antecedent should make reference to, or be explained in terms of, A-positions rather than A-bar positions. We know independently that A-bar binding cannot be derived from A-binding in that pronouns may be quantificationally bound directly rather than via a mediating A-position.

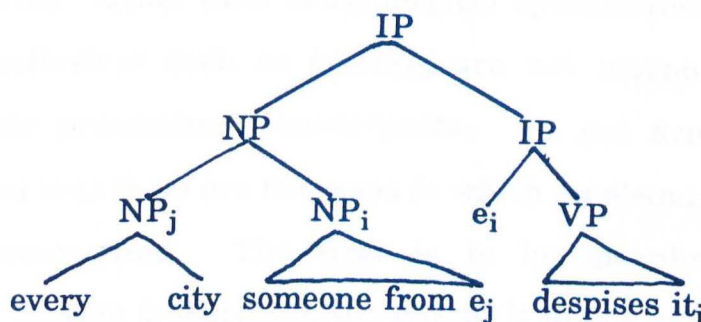
The evidence for this comes from cases of crossed binding as in (2.35).

- (2.35) Someone from every_i midwestern city hates it_i

As discussed in e.g. Higginbotham 1983, May 1985, at S-Structure the NP *every midwestern city* does not c-command the pronoun *it*. In order for the pronoun to be interpreted as a bound variable, it must be bound by an

operator or a variable bound by an operator at LF. This is achieved by raising the quantifier to a position where it will c-command. The LF of (2.35) is thus (2.36):

(2.36)



According to the definition of m-command given above, *every city* will m-command *it* at LF. This is a case of direct A-bar binding rather than A-bar binding via a variable, so in principle, quantificational binding may not require the same definition of antecedent that would be required for A-binding.

2.3.2 Towards a characterisation of 'antecedent'

What then is the correct characterisation of *antecedent*? I believe there are two ways approach the question. The basic idea is to restrict antecedents for reflexives conjuncts of coordinated NPs are disallowed.

In recent work, Burzio (1989a,1989b,1991) has argued for a version of the binding theory which replaces the binding conditions with a principle of Morphological Economy stated in (2.37)

- (2.37) *Morphological Economy* (Burzio 1991)
 A bound NP must be maximally underspecified

A corollary of this principle is that antecedents must be at least as specified as the elements they bind. Burzio 1991, in discussing English reflexives with respect to (2.37) suggests that one might revise the condition to refer to "referential" rather than morphological specification. This is because English reflexives such as *himself* are not morphologically complex than their pronominal counterparts. To get around this problem, he proposes that there are two ways in which an element may be referentially underspecified. The first is to be morphologically underspecified (i.e. lacking Φ features); the second is to not have a theta role. On the assumption that English reflexives consist of two parts, one can claim that the *him* part doesn't receive a theta role, while the *self* part, being the head, is morphologically underspecified. Burzio presents some independent evidence for this view by showing that Italian 'emphatic pronouns', which appear in A-bar positions, behave as reflexives; in this sense they are referentially unspecified because they do not receive a theta role.

How then would this modification work in the case of conjoined NPs? Under standard assumptions, both NPs in (2.31) and (2.32) (repeated below as (2.38) receive a theta role. If, however, they *did not* receive a theta role, then they would not meet the conditions for being an antecedent, and secondly would require a local antecedent in order to be interpreted. Further, we would need to distinguish the reflexive example from both the pronominal example and the quantificational binding cases discussed above.

- (2.38) a. *Either John_i or a picture of himself_i will suffice
b. Either John_i or his_i picture will suffice

I will postpone further discussion of this issue until Chapter 4 where the facts presented will follow from the LF motivated independently for coordinate structures.

What we have seen in this section, however, is that there are further binding facts which support a hierarchical conjunction phrase. In doing so, we have also uncovered a curious, and as yet unexplained inability of NP conjuncts to act as antecedents for reflexives, even though they can act as binders.

2.4 ATB extraction as evidence for the BP

Although the discussion of c-command and m-command above provided some conceptual support for the adjoined BP structure, there is one aspect of the structure which is somewhat tenuous given the discussion so far. If the BP is a maximal projection, then it should have a Specifier position. It is not obvious what should fill the specifier position, however. In this section I shall provide some explicit evidence for the Spec BP position by showing that it hosts a null operator when Across-the-Board extraction from coordinate structures arises.

2.4.1 ATB extraction as null operator movement¹⁸

Various researchers have noted explicitly the similarity between parasitic gaps and the Across-the-Board (ATB) extraction phenomena noted by Ross 1967. If the two phenomena are due to the same grammatical principles, then there are two logical reductions: either parasitic gaps are instances of ATB extraction, or ATB extraction is an instance of parasitic gaps. In this section I will argue that the latter reduction is the correct one. This is contrary to two explicit proposals in the opposite direction, those of Haik 1985 and Williams 1990. Both of these researchers treat adjunct structures as coordinate structures, presumably by interpreting the clausal preposition in the adjunct as optionally coordinating. In particular, I will argue that ATB extraction is best analysed as null operator movement and chain composition, as in Chomsky's 1986b analysis of parasitic gaps.

Deriving ATB structures as instances of parasitic gaps has several conceptual advantages over the opposite strategy investigated by Haik and Williams. First, it generalises instances of multiple gap constructions to cases of null operator binding which is independently required in the grammar, the only stipulation being the condition under which chain composition (in the sense of Chomsky 1986b) can apply. If it can be shown that the same structural requirements are met in both ATB gaps and parasitic gaps, then whatever the details of the chain composition mechanism, both would be accounted for. Second, reducing ATB gaps to P-Gaps rather than *vice versa* avoids problems associated with construing

¹⁸ Portions of this section appear in Munn 1992. I have removed some parts and expanded on others.

non-coordinating elements as coordinating, and removes the ATB formalism from the grammar. It also provides evidence for the veracity of the adjoined BP structure.

There are also empirical advantages to this approach. Most notably, it predicts asymmetries between the first and second gap in an ATB structure due to the parasitic nature of the second gap. These differences have been amply noted in the parasitic gap literature (c.f. Taraldsen 1981, Chomsky 1982, Engdahl 1983, Haik 1985, Chomsky 1986b, Stowell and Lasnik 1987, Cinque 1990 among others) and I will show that the same contrasts show up in coordinate structures.

There are, of course, many ways in which coordinate structures behave differently from the structures which support parasitic gaps. The claim of this section is thus restricted to showing that where multiple gap constructions exist in coordinate structures, they are best analysed as instances of null operator binding and chain composition just as parasitic gaps are analysed. Coordinate structures do impose additional restrictions on their conjuncts in ways that adjunct structures do not. Some of these restrictions are semantic in nature as I shall argue in Chapter 3, thus differences between the two kinds of structures are likely to arise, but are independent of the multiple gap phenomena.

2.4.2 ATB gaps are parasitic gaps

The question of whether ATB extractions are instances of parasitic gaps has two distinct subparts. The first is simply whether the two constructions show the same syntactic properties. It is possible that the two are, in fact, separate phenomena, however, various researchers have

attempted to collapse the two phenomena from the point of view of deriving parasitic gaps as instances of ATB movement (c.f. Pesetsky 1982, Huybregts and van Riemsdijk 1985, Haik 1985, and Williams 1990). I will follow this consensus in assuming that ATB and PGap phenomena *are* in fact due to the same underlying principles.

The second question is whether parasitic gaps are to be subsumed under ATB movement or whether ATB gaps are to be subsumed under an independent mechanism of parasitic gap formation such as Chomsky's null operator hypothesis. The answer to this second question is logically independent of the exact formulation of the null operator hypothesis itself. In what follows I shall briefly outline the similarities between ATB structures and parasitic gaps and note those aspects which are predicted by both the null operator hypothesis and the ATB hypothesis. I shall then focus on data which supports null operator hypothesis and more importantly, is unaccounted for by the ATB hypothesis.

Consider the following cases of both parasitic gaps and ATB extraction:

- (2.39) a. Which paper did John file *t* before Mary read
b. Which paper did John file *t* and Mary read *e*

The basic data which support the claim that ATB extraction and parasitic gaps are the same lies in the arguments that both exhibit movement-like behaviour, as shown originally by Kayne 1983 and used by Chomsky 1986b as evidence for the null operator hypothesis. Both show subadjacency effects as the examples in (2.40) show. (Adapted from

Chomsky 1986b:55 ex. (126),(127) which give comparable examples with parasitic gaps.)

(2.40) which man did John interview t and ...

- a. expect us to hire e
- b. expect us to give the job to e
- c. *expect us to ask which job to give to e
- d. *wonder who to ask which job to give to e
- e. tell you that you should give the job to e
- f. *read the book you gave to e
- g. *hear about the plan you proposed to e
- h. ?*announce the plan to speak to e
- i. ?*hear about the plan to speak to e
- j. *expect you to leave without meeting e
- k. *meet the man in the office near e

As in the parasitic gap sentences, island violations of various types in ATB structures produce the same degree of unacceptability as their canonical (i.e. single gap) counterparts, thus the (c,d) examples are comparable with single gap *wh*-island violations; similarly the contrast between noun complement CNPC violations as in (h,i) and the relative clause type in (f,g) is maintained in the ATB structures.

As Kayne's original examples showed, a parasitic gap inside the subject of an adjunct is disallowed, as is the comparable ATB gap:

- (2.41)
- a. Who did John describe t without examining any pictures of e
 - b. *Who did John describe t without any pictures of e being on file
 - c. Who did John describe t and Mary examine pictures of e
 - d. *Who did John describe t and pictures of e upset Mary

As pointed out by Browning 1987a and Weinberg 1988, although a parasitic gap in a subject position is not licensed, if the subject is more deeply embedded, the gap becomes acceptable. This fact mirrors the original examples pointed out for ATB gaps by Williams 1978. We thus find the following comparable sets of parasitic gaps and ATB structures involving embedded subjects of various types.

- (2.42)
- a. Who did John support t after Mary said e would win
 - b. Who did John support t and Mary say e would win
 - c. Who did John hire t after Mary found out e was fired from his old job
 - d. Who did John hire t and Mary find out e was fired from his old job
 - e. Who did John meet with t after Mary hoped e had left
 - f. Who did John meet with t but Mary hope e had left

A subject gap does not license parasitic gap which it c-commands (2.43a,b), yet some apparent ATB subject gaps are allowed (2.43c). If (2.43c) is analysed as involving S coordination, involving two gaps as shown, then the parallelism between ATB gaps and parasitic gaps would be lost.

- (2.43) a. *Who t filed the paper before [e read it]
b. *Who t read the paper before [John talked to e]
c. Who t read the paper and [e filed it]
d. *Who t read the paper but [John didn't reply to e]
e. *Who t read the paper but [John thought e was biased]

A subject ATB gap, however, can only license another subject gap, but cannot license an object gap as in (2.43d), nor can it license an embedded subject gap (ruling out some sort of parallelism constraint) as in (2.43d)¹⁹. These facts can be accounted for by analysing (2.43c) as an instance of VP coordination rather than S coordination, thus the proper structure for (2.43c) is (2.44), involving a single extraction.

- (2.44) Who t [_{VP} read the paper] and [_{VP} filed it]

¹⁹ Relative clauses here show a different pattern, a fact I shall return to in detail in §2.4.4 below.

2.4.3 Parasitic gaps are not 'real' gaps

The preceding examples support the view that the multiple gap phenomena exhibited by ATB gaps and parasitic gaps derive from the same grammatical principles. This data, however, does not help choose between the null operator analysis and the ATB analysis, since movement-like effects are predicted in both accounts²⁰.

There is one major difference between the two analyses. Under an ATB analysis, there is no such thing as a 'parasitic' gap, as Williams states, "...it should be clear that the 'pg' in these structures is not really parasitic on the 'real' gap; in fact both gaps have equal status" (1990:271). This is a direct consequence of the ATB formalism which derives ATB gaps by a single application of WH-movement from all conjuncts simultaneously. In the null operator analysis, there is a distinction between the two gaps in that the chain of the parasitic gap must in some way be licensed by the chain of the real gap. If null operator constructions have differences in their distribution compared to overt operator constructions, then such differences constitute evidence against the ATB analysis.

²⁰ Actually, it is not clear that movement-like effects are actually predicted by the ATB analysis. Williams 1978 assumes that *wh*-movement applies in one fell swoop, which predicts either that ATB structures should not exhibit any subadjacency effects or that sentences like (i) should violate subadjacency. This predicts no contrast between (i) and (ii):

- (i) Who did John kiss *t* and say that he would someday marry *e*
- (ii) *Who did John kiss *t* and wonder who he would someday marry *e*

Since subadjacency must hold to explain the contrast, successive cyclic movement must be allowed within the factored conjuncts, yet it is not how this could be effected technically.

2.4.3.1 Categorical restrictions on parasitic gaps

Cinque 1990 argues that there are categorical restrictions placed on the gaps bound by null operators which are not in effect for overt wh-movement. Parasitic gaps are restricted to NPs, as the examples in (2.45a-c) show. As in the previous examples, the comparable ATB sentences (2.45a'-c') show the same degree of ungrammaticality.

- (2.45)
- a. *How tired can one be t without feeling e
 - a' *How tired can one be but not feel
 - b. *To whom did you leave the letter t after turning e
 - b' *To whom did you leave the letter t and turn e
 - c. *How kindly did he behave t with you without behaving e with your friends
 - c' *How kindly did he behave t with you but not behave e with your friends

In each of the examples above, a single WH-movement is grammatical. It is only when there are multiple gaps that the sentences become ungrammatical²¹.

²¹ A reviewer for *The Linguistic Review* questions the data in (2.45) citing the following examples which are grammatical:

- (i) How heavy do you think Bill is and Peter will become
- (ii) From which child do you think that John stole a book and Peter got one
- (iii) How kindly do you think that Peter talked to his parents and Bill wrote to his

While other adjunct *wh*-phrases do not license parasitic gaps, they do seem to be licensed in ATB structures as in (2.46).

- (2.46) a. *How did John fix the sink after Mary fixed the toilet
b. How did John fix the sink and Mary fix the toilet

However, Woolford 1987 has argued that in such cases, the adjunct hangs outside of the coordinate structure as in (2.47).

- (2.47) How did [[_{IP} [_{IP} John fix the sink] and [_{IP} Mary fix the toilet]] [t]]

This seems to be borne out by (2.48) where we have embedded the adjuncts within conjoined VPs, thus forcing interpretation of the adjuncts within the lower VPs. The unacceptability of (2.48) supports Woolford's claim, and thus the general claim that non-NP extraction is not licensed Across-the-Board.

- (2.48) *How do you think John fixed the sink t and believe that Mary fixed the toilet t

While I agree that these examples are grammatical, they have another curious property: the Across-the-Board reading is not obligatory, and for many speakers I have consulted, not preferred in at least (i) and (iii) i.e. two different answers can be given to the question, one answer for each conjunct. This result is unexpected, since ATB readings are obligatory in the usual cases. This seems to be a case where the coordinate structure allows a different interpretation than the subordinate adjunct, since parasitic gaps do not allow such an interpretation except for perhaps the cases of *Who did you give a picture of to* which many speakers interpret as meaning which two people did you give a picture of one to the other. The analysis presented to this point has no direct explanation for this fact; neither would an analysis such as Williams'.

A further property of parasitic gap constructions is that non-referential NPs are not permitted, and again a similar prohibition is found in coordinate structures. In these cases, there is also no restriction on extraction of a single non-referential NP²².

- (2.49) a. *How many kilos does he say that he weighs without believing that he weighs
- a' *How many kilos does he say he weighs but not believe that he weighs
- a" How many kilos does he believe he weighs
- b *How many weeks did you spend in Berlin without wanting to spend in London
- b' *How many weeks did you spend in Berlin but want to spend in London?
- b" How many weeks did you want to spend in London

It is important to note here the implication that these data have for the ATB analysis. In each of the examples in (2.45), overt WH-movement of PP, AdjP etc. is licensed, i.e. single gap constructions have no categoricity restrictions placed on them. There is, however, no rule of ATB movement—the ATB formalism simply constrains the representations to

²² Similar remarks hold for the extraction of non-referential NPs as were noted in fn. 21 above. To the extent that non-referential NPs are extractable from coordinate structures, they do not receive ATB readings obligatorily. This does not follow from the account presented here, and it certainly does not follow from an ATB analysis. Here we have a difference between coordinate structures and the adjunct structure which seems to be peculiar to coordinate structures. I would argue that this asymmetry is *not* a property of ATB gaps, but rather of coordinate structures.

which the rule of WH-movement applies. Since WH-movement is licensed out of the conjuncts individually, an ATB analysis would need to stipulate the particular categoricity restrictions as conditions on the ATB factorisation itself or specify in an *ad hoc* manner which categories could be moved out of coordinate structures. The factorisations of the examples above meet all the formal requirements of the ATB formalism, especially the cases of non-referential NPs, which are structurally identical to referential ones.

The categoricity restrictions are not limited to multiple extraction phenomena, however. Cinque also shows that they apply to Complement Object Deletion (COD) sentences which do not involve multiple gaps, but do involve null operator movement²³. Non-referential NPs are not permitted as COD subjects, as in (2.50).

- (2.50) a. *One hundred kilos is difficult for everyone to weigh
b. *Five weeks is hard to spend in London without going broke.

Another property of COD structures is that the direct object of a dative shifted verb resists extraction in those COD contexts, in contrast to overt WH-extraction:

²³ COD structures are also restricted to NPs as in (i-ii) below, although this may be attributable to independent factors

- (i) *To Bill is hard to give books
(ii) *Very tired is easy to feel

- (2.51) a. Which books did you send the man
 b. *?Books are hard to send the library
 c. *?Those books are too boring to send the library

A similar contrast appears with parasitic gaps and ATB gaps:

- (2.52) a. *?Which book did you send Paul without giving Mary
 a' *?Which book did you send Paul and give Mary

The fact that the same restrictions apply to COD structures is important, since such structures involve only a single movement and are not plausibly analysed in ATB fashion. A central difference between the Williams/Haik approach and the present strategy is the postulation of a null operator chain in the second conjunct and an overt operator chain in the first. By reducing ATB gaps to null operator constructions, we expect similar restrictions to be placed on other null operator constructions such as COD structures. It would be surprising if the restrictions which needed to be placed on ATB extraction out of coordinate structures and parasitic gaps needed to be placed on null operator constructions as well.

The particular restrictions which hold of parasitic gaps and COD gaps do not hold for null operator constructions in general. Comparatives and relative clauses, for example, can take non-referential NP heads as in (2.53a,b).

- (2.53) a. John weighs ten pounds more than Bill does
b. the ten pounds that John lost on his diet

However, there is evidence that a distinction must be made between the two types of operator constructions, since in comparatives the operator may be lexicalised in some dialects, while it may never be lexicalised in either COD structures or parasitic gaps:

- (2.54) a. John weighs five kilos more than (what) Fred does
b. Which paper did you file after (*what) reading
c. John is hard (*who) to talk to

Whatever the reason for this distinction, it clearly relates COD structures and PGaps as being different from other constructions involving null operators. Since COD gaps involve only one gap, it cannot be the case that the peculiar properties are of multiple gap constructions.

It should be noted that the specific details of the analysis of the null operator construction is not crucial for the discussion here. We might assume that operator constructions of the sort found in parasitic gaps have some property P which explains their different distribution. Since an ATB analysis derives both gaps equally, the principle P should apply across-the-board, i.e. to both gaps equally.²⁴

²⁴ There are at least four analyses which derive the distinct properties of such operator chains: Stowell and Lasnik 1987 argue that the operator is not quantificational, and further that the empty category it binds is a null name. Browning 1987b argues that the operator is *pro*, while Weinberg 1988 argues that it is PRO. Finally Cinque 1990 argues that the parasitic gap is *pro*. Since PRO/*pro* and Stowell and Lasnik's null names are all NPs, then parasitic gaps should be restricted to NPs.

2.4.3.2 Reconstruction effects

Another property which has been cited as evidence for the parasitic nature of the second gap is the lack of reconstruction effects in parasitic gaps as shown by the contrast in (2.55):

- (2.55) a. Which pictures of himself_i did John_i paint t before Mary bought e
b. *Which pictures of herself_i did John paint before Mary_i bought e

Haik 1985 argues that the examples in (2.55) are necessary but not sufficient to show the inability of parasitic gaps to license reconstruction. As a sufficient condition she shows that parasitic gaps cannot license "sloppy identity" as shown in (2.56) where *himself* can only be interpreted as coreferent with *John* and not *Peter*.

- (2.56) a. Which pictures of himself did John paint t before Peter bought e

The same contrast appears in ATB structures (2.57) as noted in Munn 1987b, 1989. Here I disagree with Haik's claim that sloppy identity is possible in ATB gaps, thus (2.57c) is comparable to (2.56) in that only *John* may be coreferent with *himself*.

- (2.57) a. Which pictures of himself did John buy and Mary paint
 b. *Which pictures of herself did John buy and Mary paint
 c. Which pictures of himself_i did John_i buy and Bill*_{i/j} paint

Williams 1990 disputes the reconstruction facts as evidence for the parasitic nature of the second gaps, claiming that the data in (2.55, 2.57a,b) represent a "proximity" effect, the exact nature of which he does not make clear. (He does not mention the lack of sloppy identity). He then shows that there are reconstruction effects to be found in (both) parasitic gaps (and ATB gaps) as in (2.58).

- (2.58) a. *Whose_i mother did we talk to t before he_i arrested e
 b. *Whose_i mother did we talk to t and he_i arrest e

The data in (2.58) are of a different sort from those in (2.57) since the latter exhibit an obviation effect, while the former show an anaphoric binding effect. There are a number of approaches to the reconstruction facts in (2.57) and (2.58). One approach roughly involves applying the binding conditions before movement (c.f. van Riemsdijk and Williams 1981, Williams 1986) or opportunistically throughout the derivations (e.g. Belletti and Rizzi 1988, Lebeaux 1988), while the other involves some form of reconstruction, either in terms of LF lowering or LF interpretation.

Under an ATB analysis, doing binding before movement leads to distinct problems. There are two options for deriving (2.57a). In the first, we generate an ATB structure like (2.59) in which both conjuncts contain the anaphor *himself*. If we assume that the binding theory applies

uniformly to each conjunct, then the second instance of *himself* in (2.59) is not bound in its governing category.

- (2.59) John_i buy | which pictures of himself_i |
 Mary paint | which pictures of himself_i | and

The other possibility is that the anaphor in the second clause of (2.59) is *herself*, as in (2.60), but this would violate the ATB condition on movement which requires that the two factors contain identical elements. (See Williams 1978 for details.)

- (2.60) John buy | which pictures of himself |
 Mary paint | which pictures of herself | and

Of course, it may be possible to claim that an indexing such as (2.59) would be allowed by modifying the binding theory with respect to factored forms. Such stipulation would plausibly be of the form '*An anaphor is licensed if it bears the same index as an anaphor in the same factor*'. This solution has two problems. First, it would need to stipulate that only the first factor could license something in another factor, otherwise *Which picture of himself_i did John_j paint and Bill_i buy* should be equally licensed. This amounts to stipulating that the first conjunct or gap is in some way special which is what Williams is trying to deny. The second problem is that it would predict that *John likes himself and Bill likes himself (too)* could have the interpretation of *John likes himself and Bill likes John (too)*, which it clearly cannot. Thus, any way of allowing a

properly licensed anaphor to license another anaphor in a subsequent factor would only apply if the factor were moved ATB.

Given these results, it seems unlikely that binding before movement would be able to account for the anaphor binding assuming the ATB format is correct. If the strong crossover effects in (2.58) are the result of binding before movement, then the two phenomena are clearly distinct. On the other hand, the result can also be interpreted as evidence that, if the ATB formalism is correct, there is a rule of Reconstruction at LF²⁵.

If we derive the strong crossover effects from reconstruction, however, then something else must block reconstruction in (2.55b). Williams suggests that the data in (2.55) exhibit a 'proximity' effect, a term he does not define. If we interpret proximity to be an effect of linear order, then there are many details to be worked out on how such a rule would apply, since we know that in some cases, multiple reconstruction sites are possible for anaphors, as in (2.61).

- (2.61)
- a. Which pictures of himself did John say that Bill liked
 - b. Which pictures of herself did John say that Mary liked
 - c. John bought t, after Mary painted e, a large modern portrait of himself
 - d. *John painted t, before Mary bought e, a large modern portrait of herself

In (2.61a), reconstruction is possible at both the gap site and the intermediate trace site. Similarly in (2.61b) reconstruction is possible

²⁵ Williams has argued against such a rule in other work. (c.f. Williams 1986.)

even though *Mary* is in the same linear position as in (2.55b). In (2.61c) the linear order of *John* and *Mary* is reversed compared to (2.55b), yet reconstruction is still only possible into the 'real' gap site, as the ungrammaticality of (2.61d) shows. It is hard to show that the anaphor reconstruction facts can be easily accounted for simply by appealing to linear order.

A null operator analysis of the facts, however, can plausibly account for the reconstruction effects both in (2.55) and in (2.58). Although it is clearly not feasible to present a complete theory of reconstruction here, I will sketch a solution which can solve the problems at hand.

Under a null operator analysis, the distinction between the real gap and the parasitic gap lies in the fact that there are two separate A-bar chains at S-structure. At LF, however, the operator must not be present, and the real gap and the parasitic gap are members of the same A-bar chain (cf. Browning 1987a, Weinberg 1988).

We can exploit this distinction of levels to account for the anaphor reconstruction effects. I shall adopt the analysis of Barss 1986 and assume that anaphor reconstruction is a case of chain binding at S-structure, where elements of an (A-bar) chain are treated as equivalent for the purposes of binding. This allows binding of the anaphor by any antecedent which c-commands a link in the chain. Given that the parasitic chain is a separate chain at S-structure, no reconstruction of anaphors will be possible. (Similar effects could be achieved by applying Condition A throughout the derivation as in Belletti and Rizzi 1988,

Lebeaux 1988. Since only the real gap will contain the anaphor at D-structure, 'reconstruction' is only possible into the real gap.)²⁶

The strong crossover cases can be accounted for by appealing to Higginbotham's 1983 *Accessibility Condition* on pronoun binding. In order for a pronoun to be dependent on a formal variable²⁷ it must be accessible to the variable. A pronoun is accessible if the tail of the V-chain containing the variable c-commands the pronoun; if the pronoun c-commands the tail of the V-chain, the pronoun is not accessible. Higginbotham defines a formal variable as an empty category in an argument position linked to an operator. A *V-chain* is defined as a sequence of formal variables $(v_1, \dots, v_n)$ such that each v_i , $1 \leq i \leq n-1$, is contained in the binder or v_{i+1} . Thus in (2.58) (repeated here as (2.62) with LF representation as in (2.62b)) the sequence (t_i, t_j, e_j) forms a V-chain.

- (2.62) a. *Whose_i mother did we talk to t before he_i arrested e
 b. [Whose_i [t_i mother]]_j did we talk to t_j before he_i arrested e_j

The pronoun *he* depends on the formal variable t_i , thus it must be accessible to it. The pronoun, however, c-commands e_j , the tail of the V-chain containing t_i , thus the pronoun is not accessible and the binding is

²⁶ The fact that anaphor reconstruction is permitted into other null operator constructions such as *tough* constructions and relative clauses poses problems for an approach to the binding facts which does binding throughout the derivation. The difference between these cases and the parasitic gap cases can be accounted for by the fact that the former are predication structures and plausibly do not constitute separate chains at S-structure. This would allow chain binding in Barss' sense to apply.

²⁷ X is *dependent* on Y if (i) Y is contained in an antecedent of X or (ii) for some Z , X is dependent on Z , and Z is dependent on Y . (Higginbotham 1983:404)

ruled out. Since the Accessibility Condition applies at LF, and the null operator of the parasitic gap is not present at LF, then the parasitic gap will always constitute the tail of the V-chain in the relevant cases, ruling out any cases of strong crossover over either the real gap or the parasitic gap.

The important aspect of the above analysis is in the derivation of the anaphor binding effects. Deriving the strong crossover effects as Higginbotham does would work equally well on Williams' ATB structures. Crucially, however, the ATB formalism has no way of distinguishing the parts of the chain to which anaphor binding can apply. The null operator analysis accounts for this straightforwardly by positing separate chains.

The reconstruction facts are thus of two sorts: reconstruction of an anaphor, which is uniformly disallowed into either parasitic or ATB gaps, and strong crossover effects as described by Williams. Assuming that there is reconstruction into parasitic gaps does not remove the fact that certain types of reconstruction are not permitted, and that both ATB gaps and parasitic gaps behave similarly in this respect. Whatever the exact analysis of reconstruction effects, there is a need to distinguish the real gap from the parasitic gap with respect to anaphor binding. The null operator analysis allows such a distinction to be made, while the ATB analysis does not²⁸.

²⁸ In Munn 1993, I develop another account of the reconstruction facts in the Minimalist framework of Chomsky 1992. In that framework, reconstruction is handled by leaving copies of moved elements in the trace site, with subsequent PF deletion. Under that conception, I argue that the lack of anaphor reconstruction effects is directly attributable to the presence of multiple gaps.

2.4.3.3 ATB gaps and resumptive pronouns

There is one significant difference between parasitic gaps and ATB gaps: in parasitic gaps, but not ATB gaps, a pronoun can be substituted in the parasitic gap site, as in (2.63)

- (2.63) a. Which article did John review t without reading e
b. Which article did John review t without reading it
c. Which article did John review t and read e
d. *Which article did John review t and read it

Under Williams' analysis, this fact can be accounted for by the optionality of interpreting the clausal preposition as coordinating. When it is not coordinated, the pronoun can be present, when it is, the pronoun cannot be. The conjunction, on the other hand, is obligatorily interpreted as coordinating, thus a pronoun is ruled out by the condition on ATB movement.

These data pose an apparent problem for an analysis which treats ATB gaps as case of parasitic gaps, unless an account of the ungrammaticality of (2.63d) can be found.

There is an underlying assumption which drives considering (2.63b) as equivalent to (2.63a): the pronoun is a resumptive pronoun bound by the null operator of the parasitic gap. There is considerable evidence, however that this is not the case, and the two examples are not to be treated on a par.

Chao and Sells 1983 and Sells 1984 distinguish resumptive pronouns from what they call the 'intrusive' pronoun. English, they claim, does not have true resumptive pronouns; rather, the pronouns which save constructions such as found in islands or parasitic gaps are instances of E-type pronouns (as in Evans 1980). There are two parts to this argument: the first is that the pronouns in English 'resumptive' cases are different from true resumptive pronouns in languages such as Hebrew; in the latter the pronouns are true bound variables. This is easily shown.

The main piece of evidence is that intrusive pronouns cannot be quantificationally bound, while true resumptive pronouns can be. This can be shown by the examples in (2.64) from Sells 1984:

- (2.64) a. I'd like to meet the linguist_i that Mary couldn't remember
if she had seen t_i/him_i before
- b. I'd like to meet every linguist_i that Mary couldn't
remember if she had seen t_i/*him_i before

A second example of this comes from the examples in (2.65). When the intrusive pronoun is used, the answer to a question can only be a single individual, whereas with a gap it can be a number of individuals, thus in (2.65a) you can answer "Bill or Fred or Harry", but in (2.65b) only a single name would constitute a felicitous answer.

- (2.65) a. Which_i of the linguists do you think that if Mary marries
t_i then everyone will be happy
- b. Which_i of the linguists do you think that if Mary marries
him_i then everyone will be happy

What is important here is that the same property holds for the apparent bound pronoun which can appear in the parasitic gap position, as in (2.66) which shows that the pronoun cannot be quantificationally bound, and (2.67) which shows that the list reading is available for the parasitic gap but not for the pronoun.

- (2.66) a. John forgot about every paper_i he filed t_i without reading e_i
 b. *John forgot about every paper he filed t_i without reading it_i

- (2.67) a. Which_i of the linguists do you think that Mary thanked t_i without recognising e_i
 b. Which_i of the linguists do you think that Mary thanked without recognising him_i

Crucially this behaviour is different from that of languages with 'true' resumptive pronouns. Sells gives data from Hebrew parallel to (2.64) shown in (2.68):

- (2.68) kol gevev še dina xoševet še hu ohev et rina
 every man who Dina thinks that he loves Rina
 'every man who Dina thinks loves Rina'

A further property of resumptive pronouns is that they allow violations of ATB extraction. (They are also permitted in parasitic gaps in these languages.) This is predicted if they are interpreted as bound variables. There is ample evidence to support this claim: Zaenen, Engdahl and

Maling 1981 give evidence from Swedish; Sells 1984 gives evidence from Hebrew and Irish and Georgopoulos 1985 gives evidence from Palauan. In all cases, a combination of a resumptive pronoun and a real gap is licensed.

The combination of the differences between the gap and the intrusive pronoun and the cross-linguistic evidence which shows that true resumptive pronouns are in fact allowed inside coordinate structures shows that this apparent difference between ATB gaps and PGaps does not impinge on the claim that when multiple gaps arise they are operator bound.

The data above show that English 'resumptive' pronouns are not truly resumptive, and that languages which have resumptive pronouns can apparently violate the CSC. Since the pronoun in the English case is simply that—a pronoun—including it within an ATB structure will violate the CSC.

The mere existence of resumptive pronouns in coordinate structures rules out the possibility that the CSC is a condition on movement out of an ATB structure. I shall return to this point in more detail in the discussion of the CSC in Chapter 3 below.

2.4.4 The BP as an unexceptional adjunction structure

I conclude from the discussion above that ATB gaps are in fact cases of parasitic gaps derived by null operator movement. Until now I have ignored the details of the analysis of parasitic gaps except to argue that they are gaps with different properties to 'real' gaps. In *Barriers*, Chomsky proposed that parasitic gaps arise through a mechanism of

chain composition which forms a complex chain out of the chain containing the real gap and the chain containing the parasitic gap. Certain structural conditions need to be met in order for chain composition to be licensed.²⁹ Since chain composition must also be licensed for ATB gaps, it follows that the same structural conditions should be met.

Given the adjoined BP analysis, coordinating conjunctions and subordinating conjunctions differ semantically but have identical syntactic configurations. (This is on purely structural terms. I am not claiming that conjoined CPs, for example, will behave like subordinate clauses.) Assuming the null operator analysis of parasitic gaps, provides more evidence that the adjoined BP structure is correct, since a Spec position is required to host the null operator. This is shown in (2.69)³⁰.

(2.69) What did [_{IP} [_{IP} John file t] [_{BP} Op [_{B'} and [_{IP} Sue read e]]]

2.4.4.1 Parasitic gaps revisited

Returning to ATB gaps and parasitic gaps, we can summarise briefly the results so far:

²⁹ Two such conditions were suggested by Chomsky: 0-subjacency and anti-c-command. Under the 0-subjacency condition, the real gap need to be 0-subjacent to the real gap (see Chomsky 1986b for details), while the anti-c-command condition stated that the real gap must not c-command the parasitic gap. It is immaterial for the discussion here which of the two conditions is correct. See Contreras 1984 for an argument against the anti-c-command condition, and Safir 1987, and Weinberg 1988 for arguments against Contreras.

³⁰ Given the structure in (2.69), either of the two conditions proposed to license chain composition, 0-subjacency or anti-c-command, will hold, since the real gap will not c-command the parasitic gap, and the null operator will always be 0-subjacent to the real gap (as it will in the adjunct case as well).

- (2.70)
- ATB gaps are parasitic gaps derived by null operator movement
 - Coordinate structures are adjunction structures containing a Boolean Phrase

These results predict a surprising asymmetry between ATB gaps and parasitic gaps.

As discussed by Anderson 1983 and Goodall 1983, depending on word choice and other factors, some ATB gaps in subject positions seem to be allowed, at least by some speakers, even if the first gap is not a subject. In these cases, the argument that subject ATB gaps involve one gap cannot hold. In parasitic gaps, however, a 'matrix' subject gap³¹ is never licensed. Thus we have the contrast in (2.71) and (2.72) where the ATB gaps are significantly better than the parasitic gap cases. These facts are entirely unpredicted by an ATB analysis of the phenomena. Examples like (2.71) should not arise, and in fact should be in principle as bad as the corresponding parasitic gap cases.

³¹ Here I use 'matrix subject' gap to mean a non-embedded subject in the adjunct or second conjunct.

(2.71) the man

- a. ?who John suspected t but e hadn't committed the crime
- a. ?who John said t was innocent but e had committed the crime nonetheless
- c. ?who Bill believed t to be innocent but e had committed the crime nonetheless

(2.72) the man

- a. *who John suspected t after e had committed the crime
- a. *who Bill said t was innocent after e had committed the crime
- b. *who Bill believed t to be innocent (even) after e had been convicted of the crime

Let us first examine the parasitic gap cases in (2.72). Here, these examples seem to be violations of the *that-t* variety. Thus, although embedded subjects can be licensed as parasitic gaps or as ATB gaps (as in the examples in (2.42) presented previously) if the embedded clause retains the complementiser, the sentence becomes sharply ungrammatical:

- (2.73) a. Who did John support t after Mary said (*that) e would win
b. Who did John support t and Mary say (*that) e would win

The examples in (2.72) seem to be of the same type. If we assume that the preposition acts as a complementiser (and therefore selects IP

directly) the preposition will block proper government of a trace in subject position, thus the sentences are ruled out by the ECP. If we assume this to be true for (2.72) then the examples in (2.71) become more problematic. Conjunctions, being non-lexical, are unlikely to be proper governors, thus, we cannot account for the difference between (2.71) and (2.72) on this basis.

There is one fundamental difference between the ATB structures and the corresponding parasitic gaps. We have assumed that prepositions like *before* and *after* etc., which introduce adjunct clauses can never select for a complementiser. In the conjunction case, however, the second conjunct is clearly a CP, since (unlike the adjunct case) we can insert the complementiser, provided the second gap is not in subject position, as (2.74) shows:

- (2.74) the man who John said *t* was innocent but that Fred
prejudged *e*

We now have a structural difference between the two types of structures, namely, the adjunct case has no Comp position, while the conjunct case does. Given the null operator analysis, the only place for the operator is either in Spec of P, or adjoined to it. Compare this to the conjunct case. Assume that the operator moves first to Spec of Comp, and then to its final position in Spec of B. As shown by Lasnik and Saito 1984, intermediate traces do not show *that-t* effects. The difference here then is that the trace in subject position is properly governed by the trace in Spec of Comp. That trace, being intermediate, will not give rise to *that-t*

effects. The relevant structures (corresponding to (2.71, 2.71a) are shown in (2.75) below:

(2.75) the man

- a. *who Bill said t was innocent [_{PP} O_i [_P after [_{IP} e_i had committed the crime]]]
- b. ?who John said t was innocent [_{BP} O_i [_{B'} but [_{CP} t_i [_{C'} [_{IP} e_i had committed the crime nonetheless]]]]]

If the above analysis is correct, it makes a prediction that in cases where we do not have evidence for a CP in the coordinate structure case, the corresponding ATB extraction will be ruled out. Thus if we construct cases which must involve conjoined IPs, the sentences should be ungrammatical. This is the case in the case of the root question corresponding to (2.71a). While in the relative clause, we can always posit a Comp position, this is not possible in a root question. As predicted, (2.76) is ungrammatical.

(2.76) *Who did [_{IP} [_{IP} Bill suspect t [_{BP} O_i [_{B'} but [_{IP} e_i hadn't actually committed the crime]]]]

The preceding examples show how an operator analysis of parasitic gaps is fully compatible with the BP analysis of coordination; furthermore, some interesting asymmetries which arise from the differences between the PP adjuncts and BP adjuncts can be explained.

To complete the discussion of ATB gaps as parasitic gaps, one further fact about ATB extraction can be derived using a combination of the facts above and the anti-c-command condition.

Williams 1978,1981 discusses cases where ATB extraction should be allowed but is not, as shown in (2.77)

- (2.77) a. *Who does John like *t* and *e*
b. *Who does John like pictures of *t* and *e*
c. *Who does John like *t* and pictures of *e*

Goodall 1987 analyses these as violations of Principle C of the Binding theory, assuming that traces are variables and thus the two traces must not c-command each other. Under the BP analysis, and the fact that multiple gap structures are cases of parasitic gaps we can maintain this explanation for (2.77a,c) where the real gap *t* c-commands the parasitic gap, violating the anti-c-command condition assumed to hold for parasitic gaps. Under the BP analysis, however, no c-command exists between the real gap and the parasitic gap in (2.77b). Structural configurations like (2.77b) have already been ruled out as violations of the *that-t* variety as shown above, thus all three sentences are also ruled out by the present analysis.

2.5 Syntactic asymmetries in coordinate structures

The final argument for the adjoined BP structure comes from cases of unlike category coordination. Under the BP analysis, the second conjunct

will play no role in determining the syntactic behaviour of the conjunct pair, since only the first conjunct is in a position to be selected. In addition, since the second conjunct is adjoined to the first, nothing in principle rules out unlike category coordination as long as other grammatical principles remain unviolated. For the moment then, I will assume that unlike category coordination is allowed, thus there is no *syntactic* principle which precludes a BP with YP complement to adjoin to an XP where $X \neq Y$. Assuming this will obviously allow many impossible coordinations which I will show in Chapter 3 can be ruled out by the semantics. Leaving these cases aside, I will focus on cases where unlike category coordination is permitted, yet there is a necessary ordering of the conjuncts. The basic idea is that the first conjunct determines the syntactic properties of the conjoined pair, and the adjoined nature of the second conjunct will make only indirectly accessible to the head which selects the conjoined phrases.

2.5.1 Asymmetries in coordinated clauses

I will first examine cases of sentential conjunction with ECM type verbs. I will assume that a verb such as *expect* c-selects either a CP or an IP which is semantically interpreted as propositional. Further, when the verb selects an IP it may optionally casemark the subject of the embedded clause. The exact details of the ECM construction are not crucial here, although the descriptive fact that the verb must in some way casemark the embedded subject is necessary. Given that *expect* can select both IPs and CPs, we should expect that all possible conjunction possibilities

should be available. The possibilities are outlined in (2.78), (where IP = PRO infinitive; ECM = ECM infinitive):

- | | | | | |
|--------|----|----------|----------|-----------|
| (2.78) | a. | CP & CP | IP & CP | ECM & CP |
| | b. | CP & IP | IP & IP | ECM & IP |
| | c. | CP & ECM | IP & ECM | ECM & ECM |

There are 9 possibilities for conjoining the possible complements of *expect*. These are exemplified in (2.79-2.81) corresponding to the three columns of (2.78) respectively:

- (2.79)
- a. John expects that Perot will run and that he'll win
 - b. *John expects that Perot will run and to vote for him
 - c. *John expects that Perot will run and Bill to vote for him

- (2.80)
- a. Perot expects to run and that he'll win
 - b. Perot expects to run and to win easily
 - c. *Perot expects to run and his wife to vote for him

- (2.81)
- a. John expects Perot to run and that he'll vote for him
 - b. *John expects Perot to run and to vote for him
 - c. John expects Perot to run and his wife to vote for him

Even though there are nine possible combinations, only five are acceptable. Importantly, the unacceptable sentences are not those which involve unlike category coordination necessarily as (2.80a) and (2.81a)

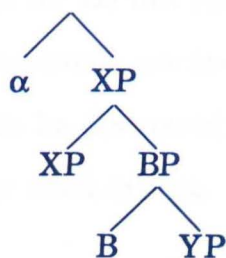
show. However, there is also an ordering to the acceptable unlike coordinations. Although the order IP & CP is permitted in (2.80a), the reverse order is not (2.79b). Similarly, although the order ECM & CP (2.81a), the reverse is not (2.79c). Since the unlike coordination is in principle permitted in these cases, it cannot be the case that the conjunction is semantically ill-formed.

What is most important about the data above is that there are ordering restrictions on the conjuncts which provide evidence for an asymmetrical coordinate structure. Whatever mechanism one uses to account for the licensing of multiple conjuncts, it will have to be able to distinguish among them. The first conjunct will be visible for syntactic processes such as case marking, while the second will not except when it is identical to the first.

The key to accounting for the distribution of coordinable clauses in (2.78) is the fact that there are different licensing requirements for IPs (and ECM clauses) and tensed clauses. Beginning with the ECM clauses, I assume that the subject of the ECM clause must receive case under government by the selecting verb. Since coordination of two ECM clauses is possible, (2.81c) there must be a way to assign case to the subject of the second ECM clause. However, if case is not assigned to the subject of the first conjunct, then it seems that it *cannot* be assigned exceptionally to the second conjunct. This will explain the ungrammaticality of (2.79c) and (2.80c).

These facts follow directly from the asymmetry of the BP coordinate structure if we stipulate (2.83).

(2.82)



(2.83) In a structure like (2.82), if α assigns Φ to XP then B may assign Φ to YP

The stipulation in (2.83) predicts the results that we need in to explain the ECM facts. If we conjoin a CP with an ECM clause, the verb will not assign Case to the CP and then no case will be assigned to the ECM subject. If case is assigned to the ECM subject in the first conjunct, (2.83) will allow it to be assigned to the subject of a subsequent ECM clause as in (2.81c). If the second conjunct is a CP as in (2.81a) then the case need not be assigned since the CP does not require case.

If we assume that case assignment requires adjacency, then (2.83) may be reduced to (2.84). Since B is a syncategorematic head, we may consider it indistinct from the its complement³². Given the profusion of functional heads in the recent literature, there are many questions to be answered with respect to the visibility of lexical heads "through" functional heads. For instance, assuming the DP hypothesis (Abney 1987), one must allow selection to take place between the NP that the D selects and (for example) a verb which selects the DP as a complement, assuming that at least some selection is between the lexical heads alone,

³² This was suggested to me by Juan Uriagereka.

i.e. verbs do not select for Ds but rather Ns. A principle along the lines of (2.84) is probably necessary on independent grounds. Given the data above, and the data to be discussed below, I take this to be a problem of implementation rather than of fact.

(2.84) Adjacency

α is adjacent to β if there is no lexical γ distinct from β which dominates β

One possibility, which I mention here only briefly, is that the B incorporates into the verb at LF. By Baker's 1988 government transparency corollary, the verb+conjunction would govern whatever the conjunction governed. If the verb assigns accusative case to the first conjunct it could then assign accusative case to the second after incorporation. If we assume that case assignment is optional, then it need not be assigned to the CP in the case of (2.81a). However, if we assume that the first conjunct determines the case assigning abilities of the verb, then it will be unable to assign case to the ECM subject if the first conjunct is a CP.

Assuming that the conjunction incorporates is no less of a stipulation than (2.83) though. However, there may be a semantic motivation for such an incorporation. Semantically, each conjunct must receive an interpretation relative to the selecting head (in this case as an argument of the verb). This entails that at the relevant level of representation, the second conjunct cannot really be an adjunct, but must be interpreted as an argument. One way to achieve this would be to incorporate the

conjunction into the verb, thus allowing for both of the conjuncts to be interpreted as arguments.³³

If we treat incorporation as function composition, then the incorporated $V+B$ is the composition of the two functions. Very roughly, a verb like *expect* combines with an S to form an VP (in function notation $V(S) \rightarrow VP$). The conjunction combines takes two S s as arguments³⁴ and creates an S , $(B(S, S) \rightarrow S)$ thus the composition of $V \circ B$ is $V(B(S, S)) = V(S) = VP$.

Although such a solution at first blush has its attraction, I believe that it has at least one serious problem to not warrant being pursued further. Given that coordinated XP s can appear in all syntactic positions that their non-coordinated counterparts can, it would need to be possible to incorporate the conjunction head in all cases. Other cases of incorporation, however, are sensitive to the ECP, thus, if incorporation were really the correct mechanism one would find subject/object/adjunct asymmetries between coordinated NPs , for example, and their non-coordinated counterparts. This is simply false. No such asymmetries exist, to my knowledge. Anticipating the analysis in Chapter 4, there is

³³ Carlson 1983 noted that even though languages often insert more than one instance of the conjunction head, they are interpreted as if there was one instance of the conjunction for the whole set of conjuncts. For the moment I have not dealt with multiple conjunction effects, but if the incorporation analysis is correct there may be a solution to the problem posed by Carlson.

³⁴ Here the term *argument* is not used to mean syntactic argument (i.e. complement), since the BP is adjoined to the first conjunct. The idea that adjoined elements may take the things they are adjoined to as arguments is not unique to conjunctions, however. In the cases of temporal adverbials, the temporal preposition must take two (temporal) arguments—one from the VP to which it is adjoined and one from the clause which it selects. (See Larson 1990, Munn 1991b etc.) This is the same case as in the BP which must take as an argument the first conjunct and the second conjunct.

also reason to believe that *none* of the conjuncts is actually an argument; an incorporation analysis would obviously be at odds with such a claim.

Returning to the data in (2.79-2.81), we find that a PRO and ECM infinitive may not be conjoined in either direction. Given that both PRO and ECM infinitives can conjoin individually with CPs, it is unlikely that this is a semantic fact. If ECM & CP are of the same semantic category, and IP & CP are of same semantic category, ECM & IP must also be of the same semantic category. With respect to the order IP & ECM (2.80c), we may appeal to the same solution that accounted for the CP & ECM conjunction (2.79c). In this case we assume that *expect* does not assign case to the PRO infinitive, and thus cannot assign case to the ECM subject.

This predicts however, that the conjunction of ECM and PRO infinitive (in that order) should be grammatical, since the PRO infinitive does not need case, and case assignment is optional as was assumed for the ECM & CP example. The relevant example is unacceptable, however (2.81b). Under the analysis of control I am assuming, controlled PRO may be governed but not casemarked (see Bouchard 1984, Munn 1991a, Hornstein and Franks 1990, etc.) Since incorporation of the conjunction will result in the PRO being governed, the control should be licit. What is needed to solve this problem is a feature +control, yet this is exactly the solution which the governed PRO approach to control tries to remove. If we assumed that *expect* when a control verb is marked +control, and that feature needed to be marked on the IP complement, then we could rule out both the ECM & IP example because the IP could not be marked +control.

If +control and +case were mutually exclusive, then we would achieve the desired result. This would also explain the ungrammatical CP & IP case (2.79b), provided that +control and selection of a CP were mutually exclusive. Since a feature +control seems unmotivated if control is a property of the anaphoric relations of PRO, then there must be some other solution to the problem³⁵.

Another way to look at the problem is to think that c-selection features are privative, and that the verb discharges the features obligatorily to possible feature bearers which it governs. Assuming that tensed clauses are specified internally, only tenseless clauses are c-selected. (Embedded tensed clauses would be the result of the canonical structural representation of their s-selection properties.) This would entail a privative feature [INF] which would satisfy the tense specification external to the clause. This would give a split between the CPs and the infinitives. If we assume another privative feature [CASE] then we could further divide the ECM from the PRO infinitive. This would predict all of the cases on the assumption that the feature marking is obligatory. What then of the CP cases? If the feature marking is obligatory they should be ruled out. There are a couple of ways out of this problem. If features can only be discharged to possible bearers of the feature, then CPs would in general not be feature bearers because the CP projection protects possible

³⁵ Of course one could use a binary feature $\pm$ case with +case for ECM and -case for Control, but this does not really solve the problem in any more an enlightening way, since -case would really be +control and further it is not clear what it would mean to assign a negatively valued feature. The real problem is how to license PRO infinitives.

bearer. A better alternative would be that the feature is already specified on the relevant bearer.³⁶

Reviewing grammatical and ungrammatical cases below we can derive the pattern given in (2.78):

	<i>expect</i>	<i>expect</i> [INF]	<i>expect</i> [INF, CASE]
(2.85) a.	CP & CP	IP & CP	ECM & CP
b.	*CP & IP	IP & IP	*ECM & IP
c.	*CP & ECM	*IP & ECM	ECM & ECM

In the first column, *expect* is unspecified for c-selection features and thus realises its complement as a CP. Both the PRO IP and ECM clause are dependent³⁷ on the features [INF], and the latter on [CASE], and are therefore ruled out. In the second column, *expect* selects [INF]. A CP can then be adjoined, since the tense of the CP is already specified. An ECM clause cannot be adjoined, because its subject depends on the feature [CASE] to be licensed, but the feature is not specified. Finally in the third column, *expect* is specified as both [INF] and [CASE]. This licenses the ECM clause and allows a CP adjunction since the CP is specified for tense, and there is no appropriate bearer for the CASE feature. Adjunction of the PRO infinitive is ruled out on the assumption that PRO

³⁶ This analogy is taken from the phonological literature in two ways. First of all there is a movement back toward privative feature systems over binary feature systems; second, in feature spreading mechanisms, features only spread to unspecified nodes which can bear the feature. If a node is already specified, then the feature does not spread. In this way, the assignment of [INF] to an already specified tense node would not be possible.

³⁷ To say that something is dependent on a feature entails that nodes which are unspecified for a necessary feature are ruled out by the grammar. There cannot be any default feature filling rules.

cannot be casemarked, but since the verb bears [CASE] and PRO is a possible bearer (i.e. an NP governed by a verb with CASE) then a casemarked PRO will result.³⁸

The data above provide more evidence for the viability of the adjunction analysis of coordinate structures, and provides an account of both their adjunct like status and their argument status. Even if the mechanics of the solution presented above turn out to be wrong, the descriptive generalisation remains clear, although unlike categories can be coordinated, the grammar is sensitive to the hierarchical asymmetry inherent in the coordinate structure. Since the adjunction analysis predicts unlike category coordination, other cases of unlike category coordination should also be accountable for.

2.5.2 Asymmetries in NP / CP coordination

Some standard cases of unlike category coordination are given below (a,b,d from Sag et al. 1985):

- (2.86)
- a. John is a Republican and proud of it
 - b. John is sick and in a foul mood
 - c. John became a lawyer and good at golf
 - d. John remembered the appointment and that it was important to be on time

³⁸ This of course doesn't answer *why* PRO cannot be casemarked.

Sag et al. derive the particular unlike category coordinations by assuming that the conjunction creates a multiply headed constituent the daughters of which are all heads. The head features of the mother of a multiply headed constituent consist of the intersection of the features of the heads of the daughters. Since only certain predicates can accept underspecified categories as complements, unlike category coordination is generally restricted to the complements of verbs like *be*, *become*, or *consider*, although other cases are permissible where the verbs are appropriately specified, as in (2.86d).

One prediction of the GPSG conjunction analysis is that if (for example) a verb selects a conjoined complement, then every conjunct of the coordinate structure must be a possible complement of the verb. As we have seen above, the asymmetries exhibited in clausal conjunction with *expect* pose a severe problem for the GPSG approach. If the grammar licenses a ECM clause or PRO infinitive conjoined with an infinitive, it should also license the reverse order for them. (This is independent of the categorial analysis of such clauses. The fact that they are conjoinable means that the intersection of their respective features must fulfill to selectional properties of *expect*.) However, Sag et al. note the following problematic cases for their analysis: The examples in (2.87) are grammatical even though the *that*-clause cannot be a complement of the verb, as shown in (2.88).

(2.87) a. We talked about Mr. Colson and that he had worked at the White House

b. You can depend on my assistant and that he will be on time

(2.88) a. *We talked about that Mr. Colson had worked at the White House

b. *You can depend on that my assistant will be on time

There is also an asymmetry in these examples which is not predicted by the GPSG analysis. If the clause precedes the NP in the coordinate structure, the sentence is ungrammatical. Sag et al's solution to this problem is to stipulate that accusative heads precede sentential heads.

(2.89) a. ?John remembered that Mary was arriving and the meeting that they had scheduled

b. John remembered the meeting with Mary and that she was arriving at noon

Under the BP analysis, these facts follow naturally. Given that CPs are fully specified for features, they do not rely on any c-selection features from the governing verb, and can be licensed so long as they are interpretable. NPs, on the other hand, need to be licensed by CASE, and thus if the clause preceded the NP, the NP would not receive case. This, however cannot be the whole story, since it predicts that the clause should be licensed independently of the preceding NP, but it is not as (2.88) shows.

The solution to this is not trivial. Goodall 1987 solves the problem by assuming that case is suspended in coordinate structures using facts about case in subject pronouns, but this analysis is rather suspect, given the fact that ECM subjects in the second conjunct cannot receive case as in (2.81). It seems that in these cases the clause is licensed if it is not directly the complement of the preposition. If (complex) verb is passivised, or if the clause is topicalised, then the sentence is grammatical:

- (2.90) a. That Bill would arrive was crucially depended on
 b. That Bill will arrive, we're really depending on

This seems to imply that if the clause is moved or adjoined somewhere else it can be licensed by *depend on*. Given that the clause is in an adjoined position in the conjunct, it meets the right criteria, although *why* it does so remains unclear. Part of the solution to this problem lies in the exact nature of Stowell's 1981 case resistance principle. Stowell argued clauses could not receive case on the basis of data such as (2.88) and on (2.91)³⁹:

³⁹ One might argue that (2.91a) is ruled out because the ECM clause is an IP rather than a CP, and, following Koster 1978, there would be no position to topicalise the clause to. (Although if topicalisation is adjunction to IP (cf. Lasnik and Saito 1992) then this would not necessarily work)). As Juan Uriagereka has pointed out to me, however, the idea that subject clauses are topicalised forces us to say that in exactly those cases, topicalisation is obligatory. If it is obligatory, then one supposes that case resistance may yet be needed to account for this.

- (2.91) a. *I consider that John will arrive early to be obvious
 b. I consider it to be obvious that John will arrive early

Given the data in (2.90), it is clear that chains cannot be subject to case resistance principle; it therefore does not work as a sort of Case Filter in reverse. This leads to separating these two properties—case marking and case checking perhaps as in Chomsky and Lasnik 1991. If we say that Case checking is an LF property (perhaps derivable from the Principle of Full Interpretation) which chains must satisfy, while case assignment is something that verbs must do (perhaps related to morphological case), then a way out of the problem presents itself.

Suppose verbs have some kind of morphological case features which must be discharged at S-structure. Case Resistance applies to the discharge of the features in that a case assigner may not assign case to another case assigner. On the other hand, assume that NPs need (LF) case in order to be visible. This entails that they must be governed by a Case marker at LF. The distinction between the two kinds of examples now follows. In (2.91) and (2.88) the tensed clause is a casemarker and cannot bear the morphological case assigned by the verb or preposition and thus violates the case resistance principle. On the other hand, if we try to conjoin an CP and an ECM clause together, (as in (2.79c) above) the subject NP will fail to get case at LF and violate the Case Filter.

2.5.3 Agreement asymmetries in assorted languages

Agreement facts in a number of languages provide further support for the adjoined BP structure. In many languages, conjoined elements do not

bear the same agreement features. Although such mismatches in agreement are not, strictly speaking, cases of unlike category coordination, the pattern of agreement can be explained straightforwardly with the adjoined BP analysis.

2.5.3.1 Irish

Agreement facts from Irish discussed by McCloskey 1986,1990 provide striking evidence for the adjoined BP structure⁴⁰. In both Modern Irish and Old Irish, when a lexical category (V, P, or N) agrees with an NP that it governs, that NP must be realised as *pro*. Subjects may agree with their verbs, objects of prepositions agree with their prepositions, and possessed NPs agree with their possessor. When NPs are coordinated, Modern Irish and Old Irish appear to diverge: in Modern Irish, the verb, preposition, or possessor agrees *only* with the leftmost conjunct, which accordingly must be realised as *pro* (2.92). In Old Irish, however, the agreement appears to be with the conjoined phrase as a whole, even though the leftmost conjunct must still be realised as *pro* (2.93).

- (2.92) a. Rachainn-se agus Máire go Meiriceá
go-Cond.1Sg and Mary to America
'Mary and I would go to America'

- b. An ndéanfá-féin agus Liam an dinnéar anocht?
Q do-Cond.2Sg.-Emph. and Bill the dinner tonight
'Would you and Bill make the dinner tonight?'

⁴⁰ I thank Randy Hendrick for bringing McCloskey's paper to my attention.

(2.93) a. Con.ráncatar ocus Dubhthach
meet-Past.3Pl and Dubhthach
'He and Dubhthach met'

b. etorro ocus talam
between-3Pl and ground
'between it and the ground'

When the leftmost conjunct is overt, only it receives nominative case; other conjuncts receive accusative in Modern Irish, nominative in Old Irish.

The Modern Irish facts can be analysed straightforwardly with the adjoined BP analysis. The generalisation is that the leftmost conjunct agrees with its governor. Under the BP analysis, this is necessarily true, because the whole conjoined constituent is a projection of the first conjunct. This accounts for both the agreement facts and the case facts.

McCloskey 1986 took (2.93) to be evidence for a multiply headed structure in the Old Irish case, because nominative case is assigned to all NPs in coordinated subjects. The Old Irish facts do not appear to be so amenable to the BP analysis. However, as McCloskey 1990 discusses, there is still one puzzling requirement on the left conjunct in Old Irish—it must still be realised as *pro* just as in Modern Irish. This would, of course, follow from the BP analysis. Crucially, McCloskey shows that despite the agreement facts in (2.93), there is evidence that the first conjunct is the one being agreed with rather than the conjunction as a whole.

The evidence comes from the behaviour of emphatic pronominal suffixes. Both Modern and Old Irish have a series of suffixes which attach to weak pronouns to make strong forms of the pronouns. The suffixes agree in person and number with the pronoun to which they attach. The suffix can either attach to overt pronouns, or to *pro* (see McCloskey and Hale 1984 for details.)

When attached to conjoined NPs, they show up with *plural* agreement rather than singular agreement as would be expected. A form such as *to me -Emph. and Barnabas* shows up as (2.94):

- (2.94) *dún-ni ocus Barnaip*
 to-1Pl.-Emph. and Barnabas
 'to ME and Barnabas'

McCloskey argues that the fact that the emphatic suffix agrees in the plural is evidence that the first conjunct is plural, despite its semantics. This is then entirely consistent with the idea that the verb in (2.93) agrees with just the first conjunct rather than the conjoined pair. This is then consistent with the BP structure, which is the conclusion McCloskey reaches independently: (1990:112)

[These] considerations ... suggest that we interpret the Old Irish data as involving a structure [reference to figure omitted ABM] in which the mother and leftmost daughter share the same person-number features, and in which both, therefore, agree with the governing X^0 . But such a view suggests strongly that the leftmost conjunct is *the sole head of the coordinate structure* [emphasis mine-ABM], since the leftmost conjunct is the daughter which shares all the features of the mother node.

Returning to the fact that in Old Irish, all coordinated NPs received nominative case, McCloskey cites evidence that the default case in Old Irish was nominative rather than accusative, thus removing the last piece of evidence in favour of a multiply headed structure.

2.5.3.2 Arabic

Van Oirsouw 1987, cites the following data from Palestinian Arabic:

(2.95) el-walad we-l-banaat gataluu el-bisse
the-boy and-the-girls killed-3Pl.Masc. the-cat
'The boy and the girls killed the cat'

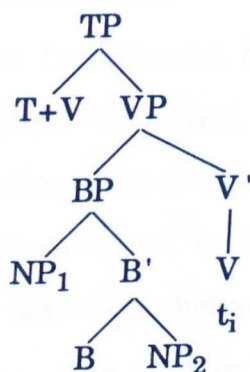
(2.96) el-banaat we-l-walad gataluu el-bisse
the-girls and-the-boy killed-3Pl.Masc. the-cat
'The girls and the boy killed the cat'

(2.97) gatalen el-banaat we-l-walad el-bisse
killed-3Pl.Fem. the-girls and-the-boy the-cat
'The girls and the boys killed the cat'

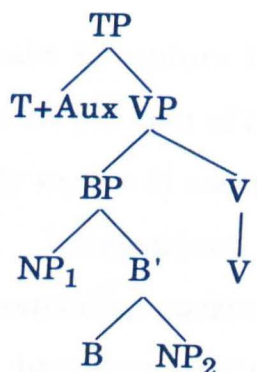
while the first allows only Spec/Head agreement. (See Benmamoun 1992 Ch. 4 for details.)

To capture the agreement facts with coordinate structures, Benmamoun assumes the following structures for (2.99a,b):

(2.100) a.



b.



Under the assumption that the subject agrees with the verb, agreement takes place under government in (2.100a) and under Spec/Head agreement in (2.100b). Crucially, Benmamoun must assume that the verb in (2.100a) governs not only the BP in Spec VP, but also the Spec BP position. This is based on the idea that if A governs B then it governs the Specifier of B. V+T governs VP in (2.100a), and therefore governs BP. By simple recursion, V+T then governs Spec BP, and agreement is between the first conjunct (NP₁) and the verb^{41,42}.

⁴¹ Actually, this entails a further assumption that BP is never a barrier.

⁴² A recursive definition of government, given in (i) below, is argued for by Raposo and Uriagereka (1990:522). By their definition, recursive government is always subject to minimality, i.e. a head can govern long distance provided there is no closer head that governs the projection in question.

(i) α ($=X^0$) governs β iff

a. α is a sister of β or

b. α governs δ , and there is no γ , γ a barrier for β , such that γ excludes δ ; and there is no μ , μ a closer governor of β than α , where μ is a closer governor of β than α , iff μ governs β by fewer steps than α does.

In contrast, V and BP in (2.100b) are in a Spec/Head relation, and therefore agreement is with the entire BP. This entails that the extension of government given above cannot apply to the Spec/Head relation, i.e. a head does not govern the Spec of its *own* Spec, but may govern the Spec of the Spec it governs from outside.

The assumptions Benmamoun has to make to capture the agreement facts are rather problematic. First, there is the problem of assuming that the BP is not a barrier. This is not obviously so, but is necessary to allow the extension of government in (2.100a). Independent of this fact, however, there are reasons to believe that extending government in this way is not possible. The data in (2.101), based on similar data from Johnson 1988 argues against such a proposal.

- (2.101) a. We consider John leaving the company to be a problem
b. *Who do you consider t leaving the country to be a problem

Under standard assumptions that gerunds are IPs (see e.g. Stowell 1981, Milsark 1988, Abney 1987, Munn 1991a), the trace in (2.101b) should be properly governed if exceptional government by *consider* were allowed to

extend into two specifiers, provided both are transparent⁴³. The structure of (2.101b) should be as in (2.102)

- (2.102) Who_i do you consider [_{IP} [_{IP} t_i leaving the country] to be a problem

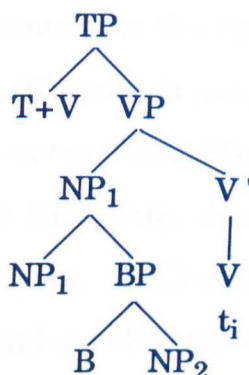
The adjoined BP analysis, however, provides a solution to the government problem, while still allowing us to retain Benmamoun's distinction between government and Spec/Head agreement. Under the adjoined BP analysis, the structure of (2.99a) is as in (2.103):

-
- (ii) α is a barrier only if α is an X" [that is, a functional projection with a specifier]

In (2.100a), the example under discussion, B will govern NP₁ by 2 steps, while T+V will only govern by 3 steps (government of VP, then government of BP, then government of NP₁). Such "exceptional" exceptional government would thus always violate minimality by their definition. I thank Jairo Nunes for discussion of this point.

⁴³ Johnson argues that this data forces us to reanalyse gerunds as CPs, and attempts to provide supporting data for this. I find his arguments on the phrase structure of gerunds unconvincing in light of the large amount of evidence to the contrary. (For some indirect arguments against Johnson, see Munn 1991b) The data in (2.101) however, are a clear indictment against allowing 'exceptional' exceptional government.

(2.103)



The verb now governs NP₁ simply by governing the Spec VP position. This accounts for the fact that the agreement in VSO structures is with the first conjunct. The real question now becomes why the SVO and AuxSVO orders give rise to agreement with the conjoined pair rather than just the first conjunct.

I would like to propose that the difference follows from the difference between the Spec/Head relation and the head government relation. Typically we treat head government as a relation between heads, i.e. if A⁰ governs XP, it governs the head of XP. This is seen in, for example, the c-selection properties of verbs and their complements. On the other hand, the Spec/Head relation is a relation between a head and its specifier, which is necessarily a maximal projection. It is natural to assume, then, head government will target the head of the conjoined NP (namely the first conjunct under the BP analysis), while Spec/Head agreement targets the maximal projection (i.e. all segments of the head, including any adjoined material).⁴⁴ This analysis will extend directly to the SVO order as well, given Benmamoun's claim that the subject is in Spec TP. This

⁴⁴ Alternatively, one might argue that the two relations are checked at different levels of the grammar, head government at PF (following Aoun et al. 1987) and Spec/Head agreement at LF.

will also give rise to agreement via the Spec/Head relation, and agreement with the entire conjoined structure is predicted.

The head government *versus* Spec/Head agreement distinction would similarly explain why the Irish data, discussed above, consistently agree with only the first conjunct: McCloskey's analysis is based on the assumption (arrived at independently) that agreement in Irish is the result of head government by the agreeing head.⁴⁵

2.5.3.3 Portuguese

Further support for the both the adjoined BP analysis, and the distinction between agreement via government and agreement via the Spec/Head relation can be found in adjective agreement in Portuguese.⁴⁶

Adjectives in predicative constructions agree in number and gender, in Portuguese. In addition, there are 2 possible word orders: Subj V Adj or V Adj Subj. Just as in the Arabic, when the subject follows the agreeing head, it agrees with the first conjunct of conjoined NPs. When the subject precedes the Adj, it agrees with the conjoined phrase as a whole. These facts are shown in (2.104) and (2.105), respectively. As in the Arabic, agreement is never possible with the second conjunct alone, independent of the word order. (The 'default' agreement for gender is Masculine.)

⁴⁵ It is interesting to note the typological similarities found in Arabic and Irish, both are VSO languages, and both have agreement with N, P and V. Perhaps it is exactly the ability to license agreement under government that allows VSO order to arise.

⁴⁶ Thanks to Cristina Schmitt and Germán Westphal for bringing this data to my attention. As far as I know, data of this sort was first discussed in the generative literature by G. Westphal (1980), although it is noted in many traditional grammars of Portuguese (e.g. Cunha 1985).

(2.104) a. Estava(F.Sg) aberta a janela(F.Sg) e o portão(M.Sg)

b. ??Estavam(M.Pl) abertos a janela e o portão⁴⁷

c. *Estava aberto a janela e o portão

Was open the window and the gate

(2.105) a. A janela e o portão estavam abertos

b. *A janela e o portão estava aberta

c. *A janela e o portão estava aberto

The window and the gate was open

More marginally, the subject can appear between the verb and the Adjective. As with the SVAdj order, agreement holds between the Adjective and the conjuncts as a whole.

(2.106) a. São os meninos e as meninas educados

b. *São os meninos e as meninas educadas.

c. *São as meninas e os meninos educadas.

⁴⁷ Agreement is also possible with both conjuncts with the VAdjS order. This is also the case for Tunisian Arabic as reported by Benmamoun. Such optionality is a problem for the strict distinction between types of agreement I am proposing, however, speakers' judgements on subject agreement are notoriously unstable. See e.g. Pontes 1986 for a quantitative study of the differences between postposed and preposed subject agreement in Brazilian Portuguese.

Suppose that the subject and adjective form an adjectival small clause. We can derive the SVAdj order by moving the subject to the canonical subject position. Here agreement will be of the Spec/Head sort, and only the entire conjunction can be agreed with. To derive the VAdjS order, we can raise the adjective out of the small clause to some higher functional head so that it head governs the subject. This will force agreement with only the first conjunct. I do not have specific arguments for such an analysis, but the facts are suggestive that it is basically correct.

2.5.3.4 English

Similar pre-verbal/postverbal agreement facts are to be found in English. In general, post-verbal subjects never arise except in *there* constructions, but in exactly these constructions, agreement with conjoined NPs differs, with the same pattern as for Arabic and Portuguese.

- (2.107) a. A man and a woman are in the garden
 b. *A man and a woman is in the garden
 c. *Three men and a woman is in the garden

- (2.108)
- a. There is a man and a woman in the garden
 - b. *There are a man and a woman in the garden
 - c. There are three men and a woman in the garden
 - d. There is a man and three women in the garden
 - e. *There are a man and three women in the garden

Again, the agreement with the first conjunct only arises when the conjunct is head governed rather than in a Spec/Head relation. Assuming that the copula verb in (2.108) governs the conjoined pairs, the agreement pattern is exactly as expected.

2.5.3.5 Some implications

The implications for the analysis of subject/verb agreement presented above are far ranging, especially given certain assumptions current in the field. Discussion of them here would bring us far away from the topic of coordination, but I would like to mention just a few of them here, perhaps as topics for future research.

Recently, Chomsky 1992 has argued for the elimination of both D-structure and S-structure in favour of a so-called 'Minimalist' theory of grammar. There are two notable properties of such a system with respect to the agreement facts discussed above. First, all instances of agreement and case assignment are claimed to be instantiations of the Spec/Head relation. This entails, for example, that objects move at LF to the Spec of some Agr phrase and their case features are 'checked' in that Spec position. Under this view of case assignment, there can be no case under

government, thus the distinction drawn above between agreement under government *versus* agreement by the Spec/Head relation would need to be recast.

Second, on the assumption that expletives such as *there* have no interpretation at LF, Chomsky assumes that the subject in a *there* construction raises at LF to replace the expletive (either by deleting it or adjoining to it in such a way as to render it invisible.) Because there is no S-structure, agreement on the post-verbal subject must be checked at LF after expletive replacement. This, however, would not distinguish the agreement pattern in (2.107) and (2.108).

Obviously there are solutions to be found for the problems raised here. For example, one could assimilate cases of agreement by government to agreement in the Spec of an Agr phrase 'associated' in some way more closely to the verb (for example Spec AgrO). This would mimic the government/Spec-Head distinction, although one would need to weigh the costs associated with such mimicry.

Chapter 3

In this chapter, I explore the nature of the Coordinate Structure Constraint (CSC). The adjoined BP effectively removes the notion of 'coordinate structure' as a syntactic primitive. This is, in part, a welcome result, because there has been a general trend away analysis in terms of specific constructions in favour of general principles that account for syntactic behaviour independently of particular construction types (Chomsky 1981,1986,1992 and references there.) However, removing the notion of coordinate structure also removes the CSC as a possible constraint, at least if it necessarily refers to coordinate structures as constructions. The CSC has remained relatively immune to reduction to other more general principles, especially the ECP which would normally govern extraction out of coordinate structures.

There is probably good reason for this, as there are good reasons to believe that the CSC is *not* a constraint on movement, is much more a semantic constraint which imposes semantic identity on elements that may be conjoined. There are two parts to this argument: one part is largely syntactic, the second, semantic. Syntactically, I will show that the CSC holds in languages where ECP violations may be obviated by resumptive pronouns, i.e. resumptive pronouns are allowed *only* in ATB structures; they cannot 'save' a CSC violation. Data from these languages will also be shown to support the adjoined BP structure directly. In addition, there are apparent violations to the CSC, especially in the form of A movement.

The second part of the argument is to show that there is an independently motivated semantic constraint on identity of *semantic*

rather than *syntactic* categories. This is important for two reasons. First of all, it removes some of the force from one of the more successful accounts of the CSC/ATB facts, namely that of the GPSG literature (cf. Gazdar 1981, Gazdar et al 1985, Sag et al. 1985). Secondly, it provides a more general principle of coordination from which the CSC can be derived. In this Chapter I will be concerned mainly with arguing the necessity of such a constraint for coordination specifically. In Chapter 4 I will try to derive the constraint from even more general principles. Such a constraint also provides more evidence for the BP structure, which, as we have seen above, does *not* require syntactic identity of the conjuncts, provided no principles of syntax are violated.

3.1 The non-syntactic nature of the CSC

3.1.1 The CSC and resumptive pronouns

As noted briefly in §2.4.4.3, languages with resumptive pronouns would appear to violate the CSC. English does not seem to be such a language, since its 'resumptive' pronouns behave differently from other languages' resumptive pronouns. The data from resumptive pronoun languages, however, constitutes important evidence that the CSC cannot be a constraint on movement. This point has been stated in various places before, but I will review it here for completeness. (cf. Zaenen, Engdahl and Maling 1981 for Swedish; Sells 1984 for Hebrew and Irish and Georgopoulos 1985 for Palauan, also Goodall 1987,1983)⁴⁸

⁴⁸ Goodall 1987 shows convincingly that neither the Generalized Left Branch Condition (Gazdar 1981), the Path Containment Condition (Pesetsky 1982) nor the Empty Category Principle (Goodall 1983) can be the correct principle governing the CSC. The most important result of this discussion is that the CSC cannot be a requirement that there be

Resumptive pronouns are essentially A'-bound pronouns that receive a bound variable interpretation. Because they are pronouns and not gaps, they are not subject to the ECP; in fact, they often appear in non-properly governed positions, such as subject position and object of a preposition.

Consider the case of Hebrew, as discussed in Sells 1984. Resumptive pronouns are allowed only in relative clauses in Hebrew, with the following distribution: they are disallowed in the topmost subject position; they are optional in direct object position, and they are obligatory as prepositional objects and inside noun phrases.

- (3.1) a. haʔiš še e /*hu pagaš et Rina
 the-man that e /*he met Rina
 'the man who met Rina'
- b. haʔiš še pagašti e /oto
 the-man that I-met e /him
 'the man that I met'
- c. haʔiš še rakadti *ʔim e /ʔit-o
 the-man that I-danced *with e /with-him
 'the man that I danced with'
- d. haʔiš še im-o ohevet et Rina
 the-man that mother-his loves Rina
 'the man whose mother loves Rina'

The important cases here are the latter two, where the resumptive pronoun is obligatory. Since gaps are ruled out in these structures, we can attribute this to some condition on movement. Under standard

gaps in both conjuncts, but that there is a more general constraint on vacuous quantification that rules the structures out.

assumptions that neither prepositions nor nouns are proper governors, such facts might be attributed to the ECP, although this is not crucial to the argument. Since resumptive pronouns are allowed, then whatever the condition, the resumptive pronoun can save the violation.

Resumptive pronouns, however, can be found in ATB structures. Sells gives the following data:

- (3.2) a. *haiš še Rina roca e ve ohevet oto yoter*
 the-man that Rina wants e and loves him more
 mikulam
 than anyone

'the man that Rina wants, and loves more than anything'

- b. *kol profesor še Dani roce lehazmin e*
 every professor that Dani wants to-invite e
 aval lo maarix oto maspik
 but not esteems him enough

'every professor that Dani wants to invite, but doesn't esteem enough'

Here we have a case of ATB binding which involves both a resumptive pronoun and a gap. The fact that this is possible shows that movement per se cannot be forced to apply "across the board" as Williams suggested. What is true, however, is that operator *binding* must apply across the

board, i.e. a resumptive pronoun cannot 'save' a CSC violation, thus (3.3) is unacceptable⁴⁹.

- (3.3) a. *haiš še Rina roca oto ve ohevet Dani
 the-man that Rina wants *him* and loves Dani
 yoter mikulam
 more than anyone
 'the man that Rina wants and loves Dani more than
 anything'

Georgopoulos 1985 gives similar data for Palauan⁵⁰. She argues that *wh*-words bind either null or overt resumptive pronouns, which behave as variables. If the CSC were a requirement on movement (i.e. that every conjunct contain a trace), then one should expect violations of the CSC in Palauan, since no *wh*-traces are involved. This is not the case, however. The CSC is observed in Palauan as shown in (3.4), where there is a (pronominal) gap in the second conjunct, but not in the first.⁵¹

⁴⁹ Sells notes a discrepancy in this kind of data. In particular, a resumptive pronoun and a lexical NP does not seem to induce a CSC violation in conjoined NPs as in (i):

(i) ha-iš še Rina ohevet et ax-iv ve et Dani
 the-man that Rina loves brother-his and Dani
 the man whose brother Rina loves along with Dani

I do not have any explanation for this fact. Possibly it may be a case of the conjunction used as a committative similar to English *with*, rather than a true conjunction. This would be consistent with the fact that only conjoined NPs show the effect.

⁵⁰ Goodall 1987 uses similar data to defend the union of phrase markers approach. Again, both analyses rely on the same assumption that the CSC is due to the PFI and not some syntactic condition like the ECP.

⁵¹ Palauan is an Austronesian language spoken in the West Caroline Islands. The basic word order is VOS. I have not glossed individual morphemes; see Georgopoulos 1985 for details. Following Georgopoulos' transcription I have glossed prepositions and linkers as simple P and L. In Georgopoulos' analysis, *e_i* is a *pro*.

- (3.4) *a delak a uleker er ngak el kmo ng-ngera_i
 mother-my asked P me Comp CL-what
 a sensei a milskak a buk me a Toki a ulterur e_i
 teacher gave book and Toki sold
 er ngak]
 P me

'My mother asked me what the teacher gave me a book and Toki sold me'

If there are two gaps (i.e. an ATB structure) the sentence becomes grammatical:

- (3.5) a delak a uleker el kmo ngngera_i
 mother asked Comp what
 [a lulterur e_i a Latii el me er ngak] me
 sold Latii L come P me and
 [a Tmerukl a ulterur e_i el mo er a Toiu]
 Tmerukl sold L go P Toiu

'My mother asked what Latii sold to me and Tmerukl sold to Toiu'

If a resumptive pronoun is used, (as is obligatory for prepositional objects), the sentence is still grammatical, even though one conjunct contains a gap and the other an overt pronoun. This is shown in (3.6):

- (3.6) ngngera_i [mirruul er ngii_i a Sie] e
 what make P it Sie and
 [a ʔoʔodal a meʔerar e_i]
 sister buy

'What did Sie make and her sister buy'

Palauan exhibits no subjacency effects, which leads Georgopoulos to argue that *wh*-words are base generated and then must bind a pronominal variable at S-Structure. The Palauan facts show that the CSC hold even for languages where there are no *wh*-traces.

The data from resumptive pronoun languages shows that the CSC is observed (i.e. multiple binding is required in coordinate structures independent of whether there are traces, resumptive pronouns or null pronouns.) Goodall 1987 argues that this constraint follows from the more general constraint on vacuous quantification. Under his parallel structures analysis, the *wh*-operator will must bind into each of the conjuncts in order to satisfy the Principle of Full Interpretation (Chomsky 1986). Descriptively, this is the correct generalisation, and for the moment I shall just assume it to be correct, although I will argue below that the property is probably derivable from a more general constraint on like semantic category conjunction.

The resumptive pronoun data also provide interesting confirmation of the null operator analysis of ATB movement presented in Chapter 2, and thus more evidence for the adjoined BP structure.⁵² Although a

⁵² I thank Joseph Aoun for bringing these facts to my attention. The data to be discussed below also holds for Arabic.

combination of resumptive pronouns and gaps are licensed in Hebrew, Sells notes that there is an asymmetry in the ordering of the conjuncts. If we reverse the order of the conjuncts in (3.2), the sentences are unacceptable:

- (3.7) a. *haiš še Rina roca oto ve ohevet e yoter
 the-man that Rina wants him and loves e more
 mikulam
 than anyone
 'the man that Rina wants and loves more than anyone'

- b. *kol profesor še Dani roce lehazmin oto
 every professor that Dani wants to-invite him
 aval lo maarix e maspik
 but not esteems e enough
 'every professor that Dani wants to invite but doesn't
 esteem enough'

This is entirely predicted under the BP analysis. Extraction is only possible from the first conjunct, and is impossible from the second conjunct because of its adjunct status. The examples in (3.7) are straightforwardly ruled out by the ECP given the BP analysis (as was shown in Chapter 2, §2.4) while the corresponding examples in (3.2) are licensed because they are resumptive pronouns. The same distinction also holds for adjunct parasitic gaps, as the data in (3.8) show, providing

more evidence for treating ATB extraction and parasitic gaps as instances of the same phenomena.

- (3.8) a. ha asirim še hiršenu la nehag
 the prisoners that we-allowed to-the driver
 lešaxrer e bli lir[?]ot otam
 to-free e without to-see them

'the prisoners that we allowed the driver to free without seeing'

- b. *ha asirim še hiršenu la nehag
 the prisoners that we-allowed to-the driver
 lešaxrer otam bli lir[?]ot e
 to-free them without to-see e

'the prisoners that we allowed the driver to free without seeing'

Interestingly, such an asymmetry does not appear in the Palauan example in (3.6). This is also predicted, give Georgopoulos' claim that *all* cases of extraction in Palauan involve A'-bound *pro*. Since there is no "real" extraction in either case, there should be no asymmetry.

3.1.2 On the non-existence of ATB A-movement

A further piece of evidence against the CSC as a constraint on movement is the fact that the CSC does not seem to apply to A movement. The correlation between the possibility of A-movement out of coordinate

structures and possibility that the CSC was a restriction on (vacuous) quantification was first noted explicitly by Clark and Keenan 1983. One result of analysing ATB movement as instances of null operator binding, is that it entails that there is *no* ATB movement of any sort. Because the BP structure is an adjunct, movement out of it should generally be ruled out by the ECP. In particular, if the CSC is a constraint on movement, there should be no A-movement out of coordinate structures. On the surface, however, this does not appear to be the case. One long-standing problem that has been posed for phrasal coordination has been the existence of active/passive coordinated VPs. They have been cited as one of the main reasons for some kind of rule of conjunction reduction, because unless passive movement applies before conjunction reduction, the movement of the passivised object would violate the CSC. (cf. Stockwell, Shachter and Partee 1973 for discussion.)

Two recent articles (Burton and Grimshaw 1992; McNally 1992) have proposed solutions to the problem of active and passive coordinations such as (3.9):

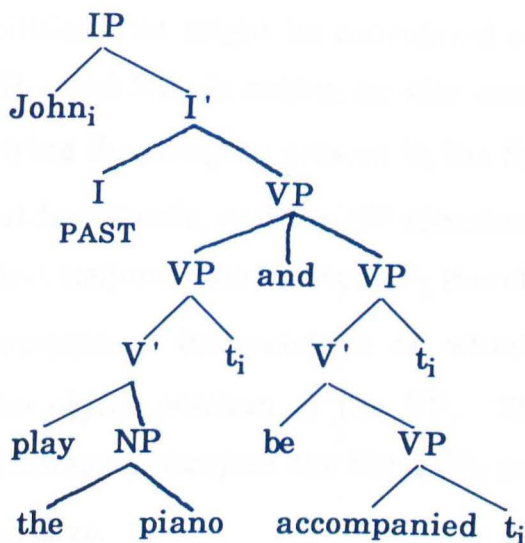
(3.9) John played the flute and was accompanied by Mary

Reviewing other analyses of these facts, Burton and Grimshaw point out that there are two possible routes to take: either passive is transformational, in which case Conjunction Reduction is required to account for (3.9) or, if coordinate structures are base generated, then passive/raising cannot be transformational. Although both sides of the argument have been taken by various researchers, there seem to be

numerous problems associated with conjunction reduction (as we shall see in more detail in Chapter 4), so the second option (i.e. that passive/raising is not transformational) seems to be the most appropriate. An analysis such as that proposed by van Riemsdijk and Williams 1981 or Williams 1986 assumes that passive and raising are not transformationally derived and thus would be compatible with base generated conjunction.

Burton and Grimshaw, however, propose that *both* base generation of coordinate structures *and* movement derived passive can be maintained by appealing to the VP internal subject hypothesis (Fukui 1986, Fukui and Speas 1986, Sportiche 1988, Koopman and Sportiche 1991 among others.) Under the VP internal subject hypothesis, all theta roles are assigned within the government domain of the verb, thus the external theta role is assigned to a position either in the VP projection or as an adjoined position to VP. It then moves to the Spec IP position to receive case. Assuming this hypothesis, the cases of active/passive coordination can be derived by assuming ATB movement of the subject out of conjoined VPs. (3.9) would then have the structure of (3.10) (ignoring the placement of the *by* phrase):

(3.10)



Under the BP analysis, however, there is no ATB movement at all, since cases of ATB movement were shown to instances of null operator binding and chain composition. Burton and Grimshaw's analysis, although reasonable given ATB movement, cannot be maintained in its present form. The BP analysis of coordination is committed to base generating coordinate structures,⁵³ so it would be desirable to maintain the basic idea of the Burton/Grimshaw proposal. Given a BP analysis of (3.10), the only 'real' extraction can be out of the first conjunct. If the VP internal subject hypothesis is correct, however, then some empty category must be generated in the Spec of the second VP⁵⁴.

The BP is an asymmetrical structure. For ease of discussion I will refer to the first conjunct VP as VP₁ and the second conjunct VP as VP₂.

⁵³ I use the term 'base generation' to more precisely to mean a phrase structure analysis which does not rely on Conjunction reduction from sentences, as it seems to be commonly used in the coordination literature. Whether coordinate structures (being adjunction structures) are actually present at D-structure or adjoined later in the derivation is not at issue here.

⁵⁴ For the purposes of the discussion here, it does not matter whether the subject is generated in Spec VP or in some position adjoined to VP.

There are two possibilities that might be considered separately. Either passive applies in VP₁, and VP₂ is active, or vice versa. In fact, these cases reduce to identifying the category present in the Spec of VP₂. Given the VP internal subject hypothesis, and the BP structure, there is always movement out of the first conjunct; the Spec of VP₁ therefore contains NP-t under standard assumptions, independent of whether there is an additional trace in the object position of the VP. The question then reduces to what empty category occupies the Spec VP₂ position when that VP is either active or passive.

Given the typology of empty categories, there are four possible candidates: *pro*, PRO, NP-t and WH-t. If we assume that the latter two categories are the result of movement, and movement out of the second conjunct is blocked by the ECP then both NP-t and WH-t are ruled out. (Assuming the Spec VP position is not casemarked, then WH-t is ruled out independently, even assuming movement of a null operator to the Spec BP position.) If *pro* must be casemarked, then it too is ruled out, or alternatively if *pro* can only be licensed by being A-bar bound (as in Cinque 1990) or by overt agreement, neither is available in (2\$10). This leaves PRO as the only candidate.

Burton and Grimshaw do not discuss this possibility, but implicitly their assumption about ATB movement crucially relies on the assumption that the CSC is a constraint on movement, thus NP-t must be present in both conjuncts. As we have seen above, the CSC is more likely a constraint on *variables* derivable from the constraint on vacuous quantification (ultimately the Principle of Full Interpretation) rather than a constraint on movement.

The basic intuition behind the VP internal subject hypothesis is that all theta role assignment is done locally within the government domain of the VP. Now consider the argument structures in (3.11): (for convenience I shall consider x the external argument by convention).

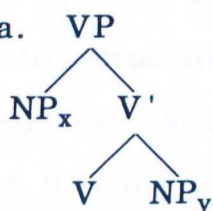
(3.11) a. eat (x , y)

b. arrive (y)

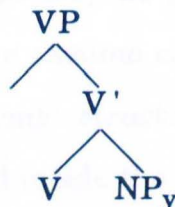
Minimally the argument structures need to be augmented with some sort of case specification, thus (3.11a) would be marked [+ACC] while (3.11b) would not.⁵⁵ The argument structures above project the VPs in (3.12), where NP_x corresponds to x etc.

(3.12)

a.



b.



Conceivably, a lexical NP or PRO could appear in the positions NP_x and NP_y (at S-structure or LF)⁵⁶. Independent principles of the grammar should rule out some realisations but not others. If we insert PRO into NP_y , in (3.12a) then the sentence is ruled out by either the prohibition that

⁵⁵ We may treat [+ACC] simply as a descriptive notation; using Burzio's generalisation, (Burzio 1986) accusative case may be related to having an external argument, but this distinction is not crucial.

⁵⁶ The relevant level of representation here is probably LF, but may be S-structure. I am assuming that D-structure representations are irrelevant for this discussion.

PRO be ungoverned or by the prohibition that PRO not be casemarked⁵⁷. Internal arguments are thus forced to be lexical under these considerations. On the other hand, if we generate PRO in (3.12b), casemarking cannot rule this out, however if governed PRO must be A-bound, the only possible binder would be the expletive *there* which would not have a theta role and thus could not count as an antecedent for the PRO (see Bouchard 1984 for discussion). Again, internal arguments are forced to be lexical under these assumptions.

The possibilities for NP_x , however are different. Assuming that the Spec VP position is not a casemarked position, NP_x may be lexical just in case it can move to a position governed by a casemarker, i.e. Spec IP if governed by TNS or by an external case assigner as in an ECM construction. In any other case, PRO may be generated. Now consider the case of a control structure. If we assume control complements to be clausal, then they have some functional structure (at least IP; perhaps CP). In this case, the PRO generated inside the VP may move to Spec IP to satisfy some requirement of the grammar. It cannot be for Case reasons since PRO cannot receive case. The only thing that prevents PRO from remaining in the Spec VP position is the condition that PRO may not be governed.

Such an assumption is at best highly theory internal. In other work, I have provided evidence in favour of governed PRO (Munn 1991a), supporting arguments independently presented by Koster 1978, Bouchard 1984, Hornstein and Lightfoot 1987, Hornstein and Franks 1990,

⁵⁷ Conceivably, PRO could be generated at D-structure and then move to some A-bar position at S-structure. This is unrelated to the question of whether a particular A position can host a PRO at S-structure or LF.

Sigurðsson 1991. Under these assumptions, nothing prevents PRO from remaining in the Spec VP₂ position in either the active or passive cases.⁵⁸

The net result of the above discussion is that apparent cases of ATB A-movement need not involve movement. Burton and Grimshaw's main argument for movement is that the CSC is a constraint on movement. The data from resumptive pronouns, and the BP analysis of ATB movement shows that this cannot be the case. Since neither binding of PRO nor binding of NP-t involves quantification, the suggestion the CSC is a constraint on vacuous quantification receives further support.

3.2 The semantic nature of the CSC

The BP approach to coordination predicts the existence of unlike category coordination, and this prediction seems to be borne out in the examples discussed in Chapter 2. The degree to which unlike categories can in fact be coordinated is quite limited, however. There are two basic approaches to solving the problem of unlike category coordination. Both approaches make the assumption that only like categories can be conjoined. The first creates new categories which cover the range of coordinable likes. A second possibility is to assume that all cases of unlike category coordination are instances like category conjunction combined with gapping. In what follows I will argue against both of these accounts. I will show that the correct domain for determining the notion 'like' category must be the semantics and not the syntax. This is similar in

⁵⁸ Alternatively, one could assume some functional projection XP higher than the VP to which the PRO moves. In this case, instead of conjoined VPs we would have conjoined XPs. Under such an assumption, PRO might not be governed. For a suggestion along these lines, see Koopman (forthcoming).

spirit to the approach to unlike category coordination proposed by Sag et. al 1985, but differs in the respect that for them there are no distinctions made between semantic and syntactic categories.⁵⁹

3.2.1 Syntactic and semantic categories

The sentences in (3.13) (a-c from Sag et al. 1985) are representative of unlike category coordination:

- (3.13) a. Pat is either stupid or a liar (AP or NP)
- b. Pat is a Republican and proud of it (NP and AP)
- c. I am hoping for an invitation and optimistic about my chances (VP and AP)
- d. John is sick and in a foul mood (AP and PP)

In order to account for these discrepancies, Sag et al. rely on the syntactic feature PRD (predicative). Under the feature system allowed by GPSG, categories may be underspecified for features providing element which selects them does not require the missing features to be present. This is exactly the case of the verb *be* which requires only a predicate complement, independent of category. The Head Feature Convention ensures that the features of the mother node (i.e. that dominating the two conjuncts) bears the features of the intersection of the heads of the conjuncts. This effectively filters out the incompatible categorial features,

⁵⁹ Goodall 1987 proposes a similar solution involving 'archicategories' which are essentially the same as the GPSG underspecified categories.

- (3.15) a. Every acorn grows into a tree (referential)
 b. *An acorn grows into every tree (predicative)
- (3.16) a. John became everything I despise (predicative)
 b. *Everything I despise became a doctor (referential)

These facts rest on the logical distinction between predicative and referential NPs, not on their syntactic type. The second part of the argument is to show that there are no reasons to claim that *syntactically* the two types of NPs are different. First of all, both types of NPs conform to the same phrase structure as in (3.17):

- (3.17) NP = Det AP N PP S
- a. John became the successful doctor his mother always envisioned
- b. The successful doctor John's mother always envisioned died.

Although there are certain NPs which can only appear in predicative positions (e.g. *more of a man*), these NPs are not syntactically different from similar referential expressions (e.g. *more of the book*) (3.18). Distributionally, the two types of NPs appear in the same places except in subject position — this however is due to the c-command restriction on predication not on a difference between the NP categories.

- (3.18) a. John is more of a man than I am
 b. *I met more of a man than I am yesterday
 c. I read more of the book than he did

The other side of the argument is that if PRD is a syntactic feature, one would expect there to be far more syntactic similarity among the internal and external syntax of predicative VPs and APs for example. This turns out not to be the case: APs and VPs do not match the internal syntax of NPs. They cannot take free relatives as in (3.19).

- (3.19) *John seems what I want to be

They cannot be quantified into as in (3.20).

- (3.20) a. *John seems everything
 b. *What does John seem

They cannot be objects of prepositions.

- (3.21) *John turned into happy
 John turned into a fine doctor

Suppose that predicative NPs bear such a feature in common with APs and VPs. All of the facts about distribution would need to be derived using other features, so that if PREDICATE were there it would be, for all intents and purposes, inert in the syntax.

There is a further problem with the use of the predicative feature: since (3.13d) (repeated here as (3.22a)) is grammatical, then the unification of the features of sick and in a foul mood must reduce to PRD. This predicts that any predicative category should also be possible here but it is not as (3.22b) shows. Here one would need to stipulate a further syntactic property of in the park (perhaps LOCATION?) which would then cause the LCL to be violated. There does not seem to be any syntactic motivation to such a feature however, although there is ample reason to assume it as a semantic feature.

(3.22) a. John is sick and in a foul mood

b. *John is sick and in the park

The fact that there is little direct evidence for PRD as a syntactic feature removes much of the force of the argument that the LCL is a syntactic condition. While Sag et al. are correct in identifying that the LCL can be maintained by assuming the PRD feature, the lack of syntactic motivation for it is striking.

3.2.2 Semantic categories constrain the LCL

There are further examples of unlike category coordination which support the semantic based LCL. Both Sag et al. and Goodall 1987 claim that in addition to the feature PRD, the grammar must also include

specifications for Manner and Time. These can then be coordinated as in (3.23).⁶¹

- (3.23) a. John walked slowly and with great care (AdvP & PP)
 b. John wants to leave either today or on Tuesday (NP & PP)

Again, however, there does not seem to be any independent motivation for using these categories as *syntactic* ones, even though they certainly are semantically active. For example, Time adverbials such as *yesterday* are syntactically NPs, (for example they can appear with genitive case in prenominal position) yet they are semantically adverbial. Since other time adverbials cannot appear in such NP positions, an account of their distribution should depend on their syntactic category, even though their selectional properties may overlap with other syntactic categories such as PPs.

Another type of unlike category coordination which can be explained by appealing to a semantic condition of the LCL is the coordination of the basic semantic categories proposed by Grimshaw 1977, 1979. Grimshaw shows that the syntactic features which predicates subcategorise for operate entirely independently of the semantic features which they select

⁶¹ It is possible that the coordination of adverbs with PPs might be instances of like category coordination if we adopt a modified analysis of Larson's 1987 analysis of *-ly* as an adverbial head taking an AP complement as in (i):

(i) [AdvP [*-ly* [AdjP *slow*]]

Assuming that the head *-ly* is a P and not an Adv, then the resulting category would be a PP. There are two objections such an analysis, however. The first is that Ps normally subcategorise for NP complements, thus **with slow*, **in hasty* yet the complements of adverbial *-ly* are definitely adjectives: **funly* vs. *funnily*, etc. A second objection is that such an analysis would need to be used to account for many other types of unlike category conjunction, which would not be so amenable to such a reduction.

for. This is strong support for the autonomy of semantic and syntactic features. A semantically based LCL would predict that Grimshaw's Q, E, and P features should be able to be coordinated, even if they are instantiated with unlike syntactic categories. This turns out to be the case:

- (3.24) a. It's amazing how tall he is and the things he can do (E & E)
 b. John couldn't believe the height of the wall and who had
 built it (E & E)
 c. John asked the time and where the bathroom was (Q & Q)
 d. John doesn't know all the answers nor how to hide
 them. (Q & Q)

There does seem to be an 'aboutness' relation which is needed to make the conjunction felicitous, but this is to be expected if the LCL were a semantic condition rather than a syntactic one. What cannot be disputed however, is that the syntactic categories of the conjoined elements are different.

A similar effect can be found in the following examples. The sentence in (3.25) is ambiguous: it can either have an interpretation of 'John knows who the murderer is', or it can have a referential meaning 'The murderer is someone who John knows'.

- (3.25) John knows the murderer

Now consider the conjoined sentence in (3.26):

(3.26) John knows the murderer and where the body is

Example (3.26) is unambiguous. It can only have the reading of the NP *John knows who the murderer is*. This is predicted if the conjoined NP and question must be of the same semantic type.

3.3 Unlike category coordination as gapping⁶²

There is a second possible approach to unlike category coordination which would account for it as instances of Gapping. Under a Gapping analysis, (3.13) would correspond to the structures in (3.27) where Δ represents a gapped verb:

- | | | |
|--------|--|-------------|
| (3.27) | a. Pat is either stupid or Δ a liar | (AP or NP) |
| | b. Pat is a Republican and Δ proud of it | (NP and AP) |
| | c. I am hoping for an invitation and
Δ optimistic about my chances | (VP and AP) |
| | d. John is sick and Δ in a foul mood | (AP and PP) |

There are number of arguments against this analysis and in favour of a semantically based LCL.

First of all, there would need to be a way, of ruling out independently gapped structures which result in apparent different semantic types

⁶² I thank Dave Lebeaux for raising this issue and discussing it with me.

being conjoined as in the examples (3.22) repeated here: The non-gapped version of (3.22b) is perfectly grammatical however:

(3.22) a. John is sick and in a foul mood

b. *John is sick and in the park

(3.28) John is sick and is in the park

One property of the unlike coordinations is that they generally appear as predicates of copular verbs or raising verbs. A gapping analysis does not predict this fact, since verbs of any type can be gapped. This predicts that a verb which takes complements of different syntactic categories should still allow gapping. This is not the case. Take for example the case of *see* which can take either a bare infinitive or an NP complement. Although the non gapped coordination is possible, the gapped sentence is ungrammatical (with the intended interpretation) as shown in (3.29).

(3.29) a. John saw Mary leave and saw Bill (also)

b. *John saw Mary leave and Bill (also)

However, when the semantic type of the NP in the second conjunct is changed to an eventive nominal, the sentence becomes grammatical:

- (3.30) a. John saw the murderer leave and the murder (also)
 b. John saw the invaders arrive and the destruction of the city

Assuming that *see* s-selects an event or a referential NP, the data in (3.30) are accounted for. A gapping approach would need to rule out (3.29b) while allowing (3.30).

It is also the case that certain coordinations do not have plausible non-gapped counterparts, which poses a problem for any gapping explanation. For example, the coordination of (3.31a) is grammatical although the non-gapped version is not.

- (3.31) a. John knows neither the murderer nor where the body is
 b. *John knows neither the murderer, nor knows where the body is

This is also the case for coordinations of adverbials. We can say:

- (3.32) Slowly and with great care, was how John walked

While the exact analysis of pseudo-clefts is unclear (see Higgins 1973, Heggie 1988, Heycock 1991 for some analyses), a gapping analysis would need to account for gapping out of the following structure:

- (3.33) Walked slowly and walked with great care was how John walked

The biggest problem with this case is the fact that the *wh*-word in the cleft must be of the same syntactic category as the clefted constituents⁶³ thus if (3.32) were derived from (3.33) we would expect the *what ... do* structure as the cleft for a VP as in (3.34a), rather than the ungrammatical (3.34b):

- (3.34) a. Walk out the door was what John did
b. *Walk out the door was how John

Since gapping cannot account for (3.32) there is no reason to assume that it is required to account for other cases of unlike category coordination.

Further evidence for the semantic nature of the LCL is given by Keenan and Faltz 1985. They note that it is odd to conjoin 'negative' adjectives of the sort *fake, false, artificial* with 'restricting' APs such as *heavy, Albanian* etc. (3.35). These are to be contrasted with the comma intonation readings in (3.36) which are fine.

⁶³ Actually the syntactic categoricity of the *wh*-word is not clear. *How* can clearly substitute for both AdvP and PP as long as they are both Manner; *What* replaces predicative NPs even if they are +human, compare *A big man was who John saw* vs. *A big man was what/(*)who John became*. If temporal NPs such as *that time* or *yesterday* are NPs then *when* can also replace both NPs and PPs as long as they are Temporal. This undercuts the argument somewhat, since one might argue that the data show that such categories are present in the syntax. The more places where we need semantic categories in the syntax, the weaker the argument is that the constraint on coordination is semantic and not syntactic. On the other hand the argument I am making is simply that given existing view of syntactic category, the constraints on coordination do not respect them. In this case it seems that the matching of *wh*-words for clefts and the like do not either. There are two options: either *how* and *when* are ambiguous with respect to syntactic category, or they are AdvP and NP respectively and the matching effect is semantic in nature. I do not know how to distinguish between these two positions at the moment.

(3.35) a. ?an artificial and heavy diamond

b. ?a phony and Albanian gun

(3.36) a. an artificial, heavy diamond

b. a phony, Albanian gun

According to the semantics they develop, there is no interpretation of the conjunction in (3.35) in any world. (c.f. Keenan and Faltz 1985:320 ff). On the other hand, if we negate the 'negative' adjective, then the conjunction becomes grammatical. This is to be expected under a semantic account of the LCL.

(3.37) a. a green, but not fake diamond

b. an Albanian, but not phony doctor

All of the data above point to the general fact that the constraint on coordination with respect to categoricity is not syntactic but rather semantic. The BP analysis predicts this result on two grounds: for the BP analysis, there is no phrase structure rule or schema for coordinate structures—they are simply adjunction structures with regular X-bar properties. It would be surprising then if there was a syntactic constraint for the sort "only like syntactic categories can conjoin" because the category of the second conjunct is not directly accessible to the category adjoined to. Secondly, it places any restriction on categoricity on the shoulders of the conjunction head (which must have a particular semantics), since that is the only place such a restriction could reside. On

the other hand, however, the adjoined BP structure does not, as it stands so far, have an obvious way for treating the semantic category restriction which seems to hold. I will address this in detail in Chapter 4.

3.4 Deriving the LCL from Generalised Conjunction

The preceding sections have argued that the features which determine which categories can be conjoined are not features which are present in the syntax. The actual nature of the semantic categories which are relevant for determining what a well-formed coordinate structure is is not exactly clear.

The various examples above have shown that unlike category coordination yields a grammatical coordinate structure provided some sort of semantic parallelism holds of the conjuncts. The semantic parallelism does not exempt the conjuncts from independent syntactic constraints, thus asymmetries are expected, and in fact result.

I have argued that there is little motivation other than from the analysis of coordinate structures themselves for changing the set of syntactic categories to accommodate unlike category coordination. The categories needed seem to be those which are independently needed to state s-selection rather than c-selection. There remain, however, two major unanswered questions with respect to the nature of the parallelism. First, what is the nature of the semantic categories to which the parallelism applies; and second, does the parallelism follow from independently motivated semantic considerations?

I will deal with the questions in reverse order, showing first that generalised conjunction can by and large account for the LCL, but runs into problems the second question is addressed.

3.4.1 Generalised conjunction

The second question, where does the parallelism derive from, is more plausibly accounted for assuming a reasonable theory of semantic types can be constructed. Various researchers (Gazdar 1980, Keenan and Faltz 1978, Partee and Rooth 1983) have shown that conjunction can be generalised to provide a uniform meaning for *and* and *or*. It is assumed in Montague Grammar that the logical connectives $\wedge$ and $\vee$ only connect elements of type $\langle t \rangle$. Given that phrases of any type can be conjoined in natural language, there is then a need to determine what the semantics of the natural language connectives are, since they cannot simply be equivalent to $\wedge$ or $\vee$. The basic idea behind generalised conjunction is that a new operator $\sqcap$ (join) is defined recursively by lambda abstraction of whatever variables are needed to make the conjoined categories interpretable as elements of type $\langle t \rangle$. The relevant definitions are given in (3.38) and (3.39). (from Partee and Rooth 1983):

(3.38) Conjoinable type: definition

- (i) t is a conjoinable type
- (ii) If b is a conjoinable type then for all a , $\langle a, b \rangle$ is a conjoinable type

(3.39) Pointwise definition of $\sqcap$

$X \sqcap Y = X \wedge Y$ if X and Y are truth values

$X \sqcap Y = \{ \langle z, x \sqcap y \rangle : \langle z, x \rangle \in X \text{ and } \langle z, y \rangle \in Y \}$ if X and Y are functions

Fact:

$$\Phi \sqcap \Psi = \lambda z [\Phi(z) \sqcap \Psi(z)]$$

where Φ and Ψ are of a single functional type

The translation of $X_{\langle e, t \rangle}$ and $Y_{\langle e, t \rangle}$ is $\lambda z [X(z) \wedge Y(z)]$ where z is of type $\langle e \rangle$. This has the effect of doing conjunction reduction in reverse. Consider the sentences in (3.40):

(3.40) a. John walks and talks

b. Every man walks and talks

Sentences involving quantifiers such as in (3.40b) constitute the main argument against a rule of conjunction reduction in the syntax. Although (3.40a) means *John walks and John talks*, (3.40b) does not mean *Every man walks and every man talks*, rather, it means *Every man is such that he walks and he talks*. By using generalised conjunction to interpret the conjoined VPs, these results follow.

Conjoined VPs (of type $\langle e, t \rangle$) will be interpreted as lambda abstracted over individual variables of type $\langle e \rangle$. The translation of *walks and talks* is the $\lambda x [\text{walks}(x) \wedge \text{talks}(x)]$. When we combine this with *John* we get $\lambda x [\text{walks}(x) \wedge \text{talks}(x)](j)$ which reduces to $[\text{walks}(j) \text{ and } \text{talks}(j)]$ which is the desired interpretation. In the quantifier case, the type of the quantifier is

$\langle e, t \rangle \rightarrow t$, so the interpretation works differently. The translation of *every man* is $\lambda P \forall y [\text{man}(y) \rightarrow P(y)]$ where P is of type $\langle e, t \rangle$. When we combine this with *walks and talks* $\lambda x [\text{walks}(x) \wedge \text{talks}(x)]$ we get $\forall y [\text{man}(y) \rightarrow \lambda x [\text{walks}(x) \wedge \text{talks}(x)](y)]$ which then yields $\forall y [\text{man}(y) \rightarrow [\text{walks}(y) \wedge \text{talks}(y)]]$ which is the correct translation.

Because of the lambda abstraction, the categories to be conjoined *must* be of identical type. To see why this is so, consider the following two derivations of the sentence in (3.41):

- (3.41) John caught and ate a fish
- a. $= \text{John caught a fish and ate it}$
- b. $\neq \text{John caught } \emptyset \text{ and ate a fish}$

Transitive verbs are of type $\langle e, \langle e, t \rangle \rangle$, thus the correct translation of *catch and eat* is $\lambda x \lambda y [\text{catch}(y)(x) \wedge \text{eat}(y)(x)]$ translates to (3.41a) as desired. However, assume that the categories conjoined were different, thus assume we conjoined the verb with verb phrase (ignoring whether this causes unfortunate syntactic problems). This would give us the following derivation:

- (3.42) $[\text{catch}]_{\langle e, \langle e, t \rangle \rangle}$ and $[\text{eat a fish}]_{\langle e, t \rangle}$
- a. $= \lambda y [[\text{catch}(y)]_{\langle e, t \rangle} \sqcap [[\text{eat a fish}](y)]_{\langle t \rangle}]$
- b. $= \lambda x \lambda y [\text{catch}(y)(x) \wedge [\text{eat a fish}](y)]$

We are plausibly able to lambda abstract the first variable in (3.42a) (although in reality, the translation of (3.42a) is that the fish is eating a

fish, since y represents the subject argument of *eat a fish* but the object argument of *catch*), but if we try to lambda abstract the second variable, there isn't one to abstract in the second predicate.

The only way to get the abstraction to work is to assume that the categories both have the same free variables, then the lambda abstraction will work as required. This follows from the way that the definition of $\sqcap$ is recursively defined.

To see this, it is helpful to work through how the definition in (3.39) works. Consider first the case of conjoining two elements, X and Y of type $\langle e, \langle e, t \rangle \rangle$.

$$(3.43) \quad \langle e, \langle e, t \rangle \rangle \sqcap \langle e, \langle e, t \rangle \rangle$$

$$X \qquad Y$$

Since the elements are not of type $\langle t \rangle$ then we must apply the recursive part of the definition. This says that we form a set of ordered pairs of the form $\langle z, x \sqcap y \rangle$ where $\langle z, x \rangle$ is an element X and $\langle z, y \rangle$ is an element of Y . What this means is that there must be a z which is both an element of X and an element of Y in order to proceed to the next step of the recursion. In the example above, we can create the set in (3.44), if we take z to be $\langle e \rangle$ and x and y to be each $\langle e, t \rangle$.

$$(3.44) \quad \langle e, \langle e, t \rangle \sqcap \langle e, t \rangle \rangle$$

We can then apply the recursive step again to evaluate $\langle e, t \rangle \sqcap \langle e, t \rangle$ in (3.44). Again we can take z as $\langle e \rangle$ and x and y as $\langle t \rangle$, leaving us with

(4.45a) which we can then simplify to (3.45b) by the base step of the definition.

(3.45) a. $\langle e, \langle e, \langle t \rangle \sqcap \langle t \rangle \rangle \rangle$

b. $\langle e, \langle e, \langle t \rangle \wedge \langle t \rangle \rangle \rangle$

Now suppose we were to conjoin two elements of different types. Each time we go through the recursive part of the definition, we must find some z such that z is an element of both of the sets being joined. If the elements are of different type, at some point we will be unable to find an appropriate z and the recursion will crash. This is the case in the example described in (3.41).

3.4.2 Type raising and generalised conjunction

Although the restriction that conjoined elements must be of the same semantic type, some apparent unlike *semantic* category coordination may need to be accounted for by type-raising. Partee and Rooth show that this needs to be the case for conjoining an intensional verb with an extensional as in (3.46):

(3.46) a. John sought and ate a fish

Assuming that *seek* is of type $\langle \langle \langle e, t \rangle, t \rangle, \langle e, t \rangle \rangle$, then we need to type raise the extensional verb *eat* to the same type in order to conjoin it. Obviously there must be some constraints made on type lifting operations

(see e.g. Partee 1987), but we might tentatively assume that the coordinate structure constraint may be stated roughly as follows:

- (\\$N47) For two semantic categories A, B A and B are conjoinable if
- (i) $A = B$ or
 - (ii) $\exists f$, a natural type shifting operator such that $f(A) = B$ or $f(B) = A$

The above discussion would plausibly account for much of the semantic identity requirement placed on the conjuncts. How might this fit into the syntax of the BP structure?

It is also possible that we could allow the semantic identity to be a condition for the licensing of the BP as an adjunct. By Spec/Head agreement, we could allow the category of the second conjunct (and any other conjuncts inside the BP) to percolate up to the BP node. This would make the semantic category of the conjuncts visible to the node to which the BP adjoins. Provided the two nodes matched in features, the adjunction would be licensed.

I merely mention this possibility, although I will not pursue its implications because of certain conceptual problems both with it and with generalised conjunction in general, which I will discuss briefly below. Although the fact that the elements conjoined must be of the same semantic category could stipulated as a condition for adjunction of the BP, this solution would still be stipulative in that it would be restricted to coordination specifically and not to other adjunctions. It would clearly be preferable to derive the condition from the LF properties of the coordinate

structure rather from a somewhat ad hoc condition on adjunction. In Chapter 4, I will show that the LCL can be dispensed with entirely, and in fact follows directly from the appropriate LF of coordinate structures.

3.4.3 Some conceptual problems with generalised conjunction and type theory

There are two basic problems with the generalised conjunction analysis of coordination. One is a problem of standard type theory itself: type theory does not make the right kind of distinctions for capturing the kinds of facts that arise in natural language. In particular, there are many semantic categories that seem to be relevant to the description of language which are all simply entities of type $\langle e \rangle$ in type theory.

The evidence described above seems to require "intuitive" semantic categories such as Question, Exclamation, Proposition, Event, Location, Manner, Time, etc. Under standard Montegovian type theory these categories are not necessarily defined straightforwardly. For example, an Event and a person may both be entities of type $\langle e \rangle$, yet we have seen that event nominals and non-event nominals cannot be conjoined. This calls for a more articulated theory of types which recognises these differences. Whether or not this is a definite problem remains to be seen: if a type theory that recognises the differences is and could fruitfully be applied using the generalised conjunction schema, then many of the problems would be solved.

There is, however, another conceptual problem with generalised conjunction which is more tied to it in particular. It is well known that there are certain types of predicates that take conjoined subjects which do

not have sentential paraphrases. The most obvious example of this sort is the predicate *meet*.

(3.48) John and Mary met

Generalised conjunction is a generalisation of the so-called Boolean connective ' $\wedge$ ', which conjoins elements of type $\langle t \rangle$. In the discussion above, the recursive definition of $\sqcap$ is taken to be the meaning of *and*. However, as Partee and Rooth point out, if we apply the definition to the conjoined NPs in (3.48) we will not get the right result; instead we would get the logical form of (3.49), which is not correct.

(3.49) $\text{meet}(\text{John}) \wedge \text{meet}(\text{Mary})$

What is needed here is some form of group-forming *and*, homophonous with the operator $\sqcap$. Partee and Rooth suggest that this operator conjoins elements of type $\langle e \rangle$ only and is used to derive the collective reading as required.

The main problem with this is that it forces *and* always to be ambiguous between the join operator and the group forming operator. This is, of course, possible, but, as Krifka 1990 points out, it is striking that natural languages never seem to distinguish the two *ands* lexically. In the next chapter I will deal with this issue more carefully, and claim that, in fact, natural language *and* is always the group forming *and* rather than the join operator.

Chapter 4

This chapter deals with providing an adequate LF for coordinate structures, based on the results obtained in the previous two chapters. Those results present two almost contradictory views of coordination: on the one hand, coordinate structures are asymmetrical, and do not impose any syntactic constraints on conjuncts, while on the other hand, coordinate structures impose semantic identity on their conjuncts. Since LF is the level of representation that mediates between purely semantic and purely syntactic representations, it is the logical choice for "repairing" the apparent contradiction of the results in Chapters 2 and 3.⁶⁴

There are three main problems to be addressed with respect to the mapping of the adjoined BP structure to the semantics. The first problem involves the relationship between sentential and phrasal conjunction. With some exceptions, (e.g. predicates such as *meet*, *be similar* etc.) phrasal coordination is interpreted as sentential coordination, i.e. *John and Bill left* has the same truth conditions as *John left and Bill left*. An adequate LF for coordinate structures must reflect this, although it need not do so by positing an LF involving two sentences so long as the LF can be mapped into such a representation in the semantic component. Second, the LF must reflect the fact that, despite the S-structure defended

⁶⁴ In the theory of Chomsky 1992, LF is the *only* level of syntactic representation, hence the distinction drawn above must be stated in slightly different terms. What this amounts to saying is that the effects described in Chapter 2 are properties of SPELL-OUT, i.e. the conditions presence or absence of so-called "strong" functional features. LF is still an interface level, therefore the results of the present chapter will carry over directly. See Munn 1993 for discussion of how minimalism does not easily overcome the problems discussed in Chapter 2, §2.4.3 with respect to parallel structures.

in Chapter 2, all conjuncts are interpreted as equal with respect to the semantics. Third, as argued in Chapter 3, all conjuncts must be of the same semantic category. The second problem is peculiar to the adjoined BP analysis, but the other two problems are ones to be accounted for by any theory of coordination.

4.1 On LF and logical form

Before addressing the problems raised above, I would like to sketch out the conceptual issues with respect to the mapping from LF the semantics. I should first clarify some terms. I shall use "LF" to refer to a *syntactic* level of representation in the form of a phrase marker adhering to principles of syntactic derivation and representation, for example the Empty Category Theory and X-bar theory. Sometimes when talking of principles or rules applying "at LF", this will ambiguously mean "at the level of representation" or "in the mapping between S-structure and LF", although this will not be crucial. I shall use the term "logical form" interchangeably with the term "semantic representation", which I take to have a different vocabulary and representation than the syntax. There are various candidates for what the semantic representation looks like, including an event based representation as in Davidson 1967, or some version of intensional logic. I will make the assumption that the mapping from LF to logical form is essentially simple. This is by no means necessary or obvious, but without such an assumption, much of the motivation for LF becomes weak.

To take a simple example, consider one of the prime arguments for LF as a level of representation, namely the representation quantifier scope.

Semantically, quantifiers need to bind variables if they are to be interpreted. It is an empirical issue whether the scopal properties of quantificational elements are determined (partially) in the syntax. If S-structure were the only level of syntactic representation, then the answer to the question would be negative without positing some sort of scope indexing rule of the sort proposed by Williams 1986. There is substantial evidence, however, that tree-theoretic notions such as c-command play a role in determining the proper interpretation of quantifiers, which puts part of the burden on their interpretation on the syntax, if trees are syntactic objects.

Once tree structure is implicated, then the rule of Quantifier Raising (QR) can be given a motivation (distinct from whatever empirical justification exists, such as the sensitivity of scope marking to syntactic principles such as the ECP) in terms of facilitating semantic translation. If natural language quantifiers are interpreted semantically as generalised quantifiers (i.e. as mappings from sets to truth values), then LF provides a representation that makes such an interpretation simple. Specifically, QR applies at LF to create an open sentence containing a variable which is mapped into one of the sets, while the constituent governed by the quantifier at LF provides the other set, as in May 1985, for example. Government, another syntactic notion, also plays a role in the mapping, since the quantifier must govern the restrictor. As noted in Chierchia 1992, this plausibly accounts for the distinction between selective quantifiers, which govern their restrictors and thus can only quantify over them, and adverbs of quantification, which appear to be unselective.

It is the assumption that the mapping from LF to logical form should be simple that motivates raising the problems above with respect to coordination. One could easily envision a semantics which looks for adjoined BP structures and interprets them as necessary without worrying about their syntax. If the arguments about QR are correct, however, then LF seems to provide a representation that is more closely amenable to interpretation directly. This is the goal that I have in mind with respect to determining the correct LF for coordinate structures.

4.2 Phrasal versus sentential coordination

The BP analysis makes some of the more obvious properties of coordinate structures less obvious. First, there is the (old) problem of phrasal versus sentential coordination. Historically, there have been two approaches to treating coordination phenomena: conjunction reduction (deriving all coordination from deletion within conjoined sentences), and base generated phrasal conjunction. The original conjunction reduction analysis was first proposed by Chomsky 1957 and developed by Gleitman 1965, Ross 1967, Tai 1969, and George 1980 (among others). Subsequently, this approach was revived, although somewhat differently, in the parallel structures approach of Williams 1978 and Goodall 1984,1987. The phrasal approach, developed most thoroughly by Dougherty 1970, was defended partially by Lakoff and Peters 1969, and has been developed most recently in the GPSG literature (Gazdar 1981, Gazdar et. al 1985, Sag et. al 1985). (For a complete overview of much of the literature on coordination, see van Oirsouw 1987.) The BP analysis is clearly a phrasal analysis,

although as noted in Chapter 1, §1.2, there may be need for independent deletion operations such as Gapping and VP deletion.

4.2.1 Sentential coordination and interpretation

One of the supposed advantages of the conjunction reduction analysis was that it derived the fact that apparent phrasal coordination was (almost) always interpreted as sentential coordination. Thus, each of the examples in (4.1) has the same truth conditions as the conjoined sentence paraphrases in (4.2).

- (4.1)
- a. John and Bill went to the store
 - b. John ate cake and drank beer
 - c. Bill is old and fat
 - d. John talked to Bill and Fred

- (4.2)
- a. John went to the store and Bill went to the store
 - b. John ate cake and John drank beer
 - c. Bill is old and Bill is fat
 - d. John talked to Bill and John talked to Fred

There are some well known counterexamples to the conjunction reduction analysis, which we will turn to below, but it is worth pointing out that the so-called advantage of interpreting phrasal conjunctions from their sentential paraphrases is completely illusory under current (in fact post 1977) versions of generative grammar. There are only two ways that

conjunction reduction could achieve its interpretational end. One way (as was originally intended in the *Aspects* model of Chomsky 1965) would be to allow interpretation off of D-structure, i.e. before conjunction reduction. This amounts to reviving the Katz-Postal hypothesis that transformations do not affect meaning. It is generally accepted that the Katz-Postal hypothesis is false, and that interpretation is done at the level of LF rather than D-structure. In the so-called T-model of grammar (Chomsky and Lasnik 1977, Chomsky 1981, 1986a) D-structure properties, to the extent they are required for interpretation are recoverable via traces, whose presence is required by the Projection Principle. Under such a view of the grammar, conjunction reduction would need to leave traces subject to the ECP in all deletion sites, for example. Much of the deleted material in conjunction reduction is non-argumental, and therefore would need to be subject to antecedent government. Given that deletion often *precedes* the deleted material, and that the coordination structure is hierarchical, with preceding material asymmetrically c-commanding following material, antecedent government would clearly be impossible.

If semantic interpretation is done off of LF structures, then the only place for a conjunction reduction transformation to apply, and preserve the interpretational advantage, would be at PF, as a deletion operation. This would entail, however, that the S-structure of coordinate structures would be sentences rather than phrases, and all of the results shown in Chapter 2, especially in §2.5 would need to be accounted for in another

way.⁶⁵ (The discussion of Gapping as an account for unlike category coordination in Chapter 3, §3.3 is also relevant here.)

If neither PF deletion, nor DS interpretation are viable, then the interpretational advantage of conjunction reduction is eliminated entirely. This is in addition to problems that conjunction reduction has always had with respect to interpretation, which we turn to now⁶⁶.

4.2.2 Problems for conjunction reduction and parallel structures

The traditional empirical problem for deriving coordinate structures from conjoined sentences is shown in (4.3).

(4.3) John and Bill met in the park.

Under a conjunction reduction analysis, (4.3) must be derived from (4.4) which is by itself ungrammatical:

(4.4) a. John met in the park and Bill met in the park

Although it is no longer valid to argue that underlying structures must themselves be grammatical, the problem still remains if there are well-

⁶⁵ A. Benmamoun (personal communication) informs me that this is the tack taken to explain the Arabic facts discussed in §2.5.3.2 in unpublished work by him in collaboration with J. Aoun and D. Sportiche. This paper is not available to me at the present time, so I cannot comment on its success on these matters.

⁶⁶ Even within the Minimalist framework of Chomsky 1992, it is far from clear that we can return to a conjunction reduction analysis of coordination without imposing an enormous burden on PF deletion rules. Since PF for Chomsky 1992 is *not* a syntactic level of representation (i.e. it is not a component of the syntax in the way the PF in Chomsky 1981 might have been (as e.g. in Aoun et al. 1987)) then all coordination phenomena would have to be prosodic. See Munn 1993 for further discussion.

formedness conditions on parallel structures which are violated by such sentences. Goodall 1987, assuming a parallel structures account for coordination, argues that such data are not problematic for the parallel representations he proposes. Thus, in Goodall's union phrase markers approach, (4.3) is the union of (4.5a, b):

(4.5) a. John met in the park

b. Bill met in the park

Goodall requires independently that principles of the grammar apply to the component sentences of the union of phrase markers. Goodall maintains that (4.5) is syntactically well-formed, because each of the component sentences are syntactically well-formed even though individually they violate selectional restrictions. As he correctly points out, meet requires a semantically plural subject to satisfy selectional restrictions, but does not require a syntactically plural subject since a syntactically singular subject like *the couple* results in a grammatical sentence, as in (4.6)

(4.6) The couple met in the park.

Goodall's argument rests totally on the distinction between selectional restrictions and syntactic conditions. Because (4.6) is grammatical, (4.5a) must also be grammatical (i.e. syntactically well-formed), even though it violates the semantic condition that the subject of *meet* be semantically plural. This makes the prediction that all cases where conjunction

reduction fails must be due to selection restrictions and not syntactic conditions. This is not the case, however. Predicates such as *similar* require both syntactically and semantically plural subjects, as shown by (4.7):

- (4.7) a. The men are similar
b. *The couple is similar⁶⁷

The ungrammaticality of (4.7b) shows that *similar* requires a syntactic plural, not a semantic one. Thus selectional restrictions cannot rule out the sentence *John is similar* in the same way that they can rule out *John met in the park*. The sentence *John and Bill are similar* is arguably not derivable from the union of *John is similar* and *Bill is similar*.⁶⁸

Similar problems for conjunction reduction have been noted in the semantic literature, (e.g. Partee and Rooth 1983 and references there) specifically, the problem of quantification over conjoined VPs. Sentences

⁶⁷ There is a reading (4.7b) which is acceptable, namely where *similar* refers to some element set up in the discourse, for example the pair of sentences in (i):

(i) This example shows that agreement is important.
The next example is similar.

Following Carlson 1987, I take this to be irrelevant for the present discussion. The intended meaning of (4.7b) is that of 'The couple is similar to each other', which is clearly unavailable.

⁶⁸ McCawley 1968 uses *similar* to argue that syntactic restrictions are not sufficient to rule out *John is similar*, noting that **The scissors are similar* is ill formed, even though *scissors* is syntactically plural. Example (4.7b) shows, however, that semantic restrictions are not sufficient either. Unfortunately there does not seem to be any predicate which requires only syntactically plural subjects. The existence of such a predicate would, of course, strengthen the present argument.

such as (4.8) cannot have interpretations based on their sentential counterparts in (4.9).

- (4.8) a. A man came into the room and sat down
b. No student got an F and passed the course

- (4.9) a. A man came into the room and a man sat down
b. No student got an F and no student passed the course

Data of these sort motivated the generalised conjunction analyses described in Chapter 3. What generalised conjunction does, in effect, is do conjunction reduction in reverse, in the semantics. This is obviously completely consistent with a phrasal analysis of coordination.^{69,70}

4.2.3 Accounting for sentential coordination in the semantics

Since there is no interpretational advantage to having sentential structures in the syntactic representation of phrasal coordination, the

⁶⁹ There are two other arguments in favour of sentential coordination with some form of conjunction reduction. One is the problem already discussed in Chapter 3, §3.1.2 regarding active and passive coordinations. This I take to be a non-problem. The second kind of argument comes from the analysis of Right Node Raising and Gapping which I do not treat here. See the discussion in Chapter 1, §1.2.

⁷⁰ There are two other recent proposals in the literature which provide modified versions of Goodall's parallel structures which overcome some of the difficulties raised above. Muadz 1991 base-generates parallel structures and allows interpretation to be done off of the resulting structure, rather than on each sentence as Goodall does. Moltmann 1992 modifies Muadz's proposal slightly to deal with many of the semantic issues that arise. As far as I can tell, the proposal that I will develop in this chapter will achieve similar empirical coverage as Moltmann's but without parallel structures. I leave a close comparison of the two proposals to future work.

problem of why phrasal coordination generally gets interpreted as sentential coordination must be left up to the semantics. I have already discussed some problems with generalised conjunction, and would like to show how the sentential character of phrasal coordination can be accounted for in another way.

There are various ways in which sentences must be *interpreted* as involving multiple sentences, yet we never posit such sentences in the syntax, or, for that matter in the semantics. The most obvious example of this is the any universally quantified sentence such as (4.10)

(4.10) Every student in the class sat down

Here, *every student* picks out whatever students are in the class in the relevant domain of discourse, thus if the class contains Patrick, Julie, Gus and Charlie, one supposes that each of them sat down. But surely this does not entail that at some level of representation the following sentences are present:

(4.11) a. Patrick sat down

 b. Julie sat down

 c. Gus sat down

 d. Charlie sat down

Rather, we assume that the semantic interpretation involves quantification directly, and that each of the sentences in (4.11) are true provided (4.10) is true.

Now consider another sentence from which the sentences in (4.11) also follow:

(4.12) The students sat down

This is the same problem as before: if *the students* refers to the same four just mentioned, then we can judge (4.12) to be true just in case all of (4.11) are true. However, here we have no more reason to believe that there are four sentences involved explicitly in the logical form, despite the fact that (4.11) follows from the truth of (4.12).

Suppose we push this further, and consider the following sentence:

(4.13) Patrick, Julie, Gus and Charlie sat down

If we treat the coordination as a plural, then we are no more (or less) committed to claiming that (4.13) involves sentential coordination at logical form, since whatever accounts for (4.12) and (4.10) should account for (4.13). Obviously (4.11) will follow from (4.13) just as it does from the other two examples.

4.2.4 Towards a preliminary semantics of conjunctions

The discussion above suffices to show that the sentential interpretation of phrasal conjunction need not be a property of their syntax, or for that matter, their semantics, at least explicitly. The semantics has various ways of forcing multiple sentence entailments without explicitly representing them in the logical form. In what follows, I will argue,

however, that the reduction of (4.13) to (4.12) is the correct one and will adequately account for the sentential readings of phrasal conjunction.

It becomes immediately apparent that if one assimilates the readings of coordinated NPs to plurals, the problem of collective predicates such as in (4.6) and (4.7), which independently pose problems for the sentential coordination approach, become trivial. An account of the plural subject of a collective predicate will allow a coordinated subject to receive the same interpretation directly.

This allows us to come to a first approximation of the meaning of the conjunctions themselves, namely, they are set operators, approximately corresponding to set union (*and*) and 'element of' (*or*)⁷¹. So *John and Bill* will mean "the set containing John and Bill", while *John or Bill* will refer to "one of the set containing John and Bill". This has a number of implications, including the fact that the disjunction operator is necessarily set forming as well, in that *or* must be interpreted in terms of the union of its conjuncts.

There are a two major questions that this approach raises. First, how does it apply to conjoined phrases other than NPs; and second, how are conjoined sentences themselves interpreted? I will address these issues directly in §4.4.2 and §4.8 respectively. If phrasal conjunction is assimilated to group-forming conjunction, then one might suppose that

⁷¹ I will not deal with *but*, which has other curious properties such as being a negative polarity item, but the semantics of it seem similarly amenable to a set theoretic account as an exceptive operator. Thus *John but not Fred left* means that the set of leavers includes John and excludes Fred. Combining this with *or* produces surprising results. *John but not Bill or Fred* seems to make *or* be conjunctive. However, if *or* means "one of", then *not or* translates to "none" which produces exactly the right result: 'John but none of (the set) {Bill (and) Fred}'. This entails that *or* forms a set of its conjuncts just as *and* does.

and (and *or*) are ambiguous, since they can be used to conjoin sentences together. In the latter case, the conjunction would be semantically equivalent to the logical connective ' $\wedge$ '.⁷² It has often been noted (on both sides of the phrasal/sentential coordination fence) that languages do not appear to have different words for group forming and propositional *and*, although some have different words for NP conjunction and XP conjunction. This has been used as an argument for sentential coordination, on the assumption that if propositional conjunction is needed independently to conjoin sentences, then we can avoid positing an ambiguous *and* (apparently not manifested by different lexical *ands*) by treating all cases of *and* as propositional⁷³. Such an argument, however, is easily turned around, if one allows only group-forming conjunction and treats sentential coordination as yet another case of phrasal coordination⁷⁴. I will leave this issue for now, returning to it below.

In this section, I have not attempted to give a full-blown theory of the semantics of phrasal coordination, but have merely addressed the issue of how, in principle, sentential interpretations of phrasal coordination are possible. Given that there are independent reasons to think that phrasal coordination is required, then it is fruitful to pursue the reduction of all coordination to the phrasal type, both syntactically (for which there is

⁷² I will henceforth refer to the two types of conjunction as group-forming conjunction (as in most analyses of *John and Mary are similar*) and propositional conjunction (as in the logical connective ' $\wedge$ '). I will use the terms *phrasal conjunction* and *sentential conjunction* to refer to syntactic conjunction of phrases and sentences respectively.

⁷³ This is the approach taken by Schein 1992, for example. I will return to his proposal below.

⁷⁴ As, for instance, in Krifka 1990, whose approach is very similar to the one I am proposing here.

ample evidence) and semantically. Sentential readings, however, are only one of the problems that the BP analysis faced. As the other problems are solved, a more explicit proposal for the reduction will emerge.

4.3 On treating all conjuncts equally

The second, and most specific problem for the BP analysis is the fact that, although it is a syntactically asymmetrical structure, its semantics are intuitively symmetrical. It is generally thought, for instance, that each of the coordinated constituents acts as if it were selected by the head that selects the conjunction as a whole. The BP analysis makes this idea less obvious because only the first conjunct should bear such a relationship with the selecting head. As we saw in Chapter 2, this is not necessarily a problem, since there is syntactic evidence that this is so. However, given the results in Chapter 3, the general claim that all conjuncts bear the same relation to the selecting head seems to have considerable merit. The only difference is that such a relation is purely in terms of s-selectional properties.

Given the BP analysis, there is reason to believe that the S-structure of the coordinate structure is an adjunction structure where the first conjunct determines many of the c-selectional properties of the head. To the extent that we need c-selection (see Rothstein 1991a, 1992 etc. for arguments to this effect) it would not be surprising if this were satisfied at S-structure. S-selection on the other hand is an interpretive property of complements and would more properly be satisfied at LF or perhaps even

logical form⁷⁵. (Simply the fact that there is no overt wh-movement in a language such as Chinese provides a *prima facie* argument to the fact that s-selection cannot, in principle, be satisfied at S-structure⁷⁶.)

We can restate the problem in another way, by asking why the BP structure arises in the first place as opposed to, for example, a multiply headed structure, or some sort of parallel phrase marker. To a large extent, the answer lies in the nature of syntax, specifically, the phrase structure component, which we hypothesise to be strictly binary branching. Suppose this is true, then such multiple part representations cannot exist in the syntax. This would force something like the BP structure. On the other hand, there may not be reasons to impose such a binarity restriction on the semantic representations; in fact, coordinate structures seem to impose such a lack of binarity, in that each of the elements of a coordinate structure is interpreted as behaving as though it were the selected arguments. If we require syntactic representations to be well formed according to syntactic principles, then there can be *no* level of *syntactic* representation at which the coordinate structure is represented

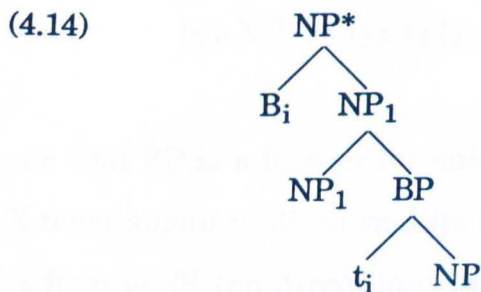
⁷⁵ Whether or not the checking of s-selection features is done at LF or logical form is far from clear. To the extent that the categories play no role in determining the external syntax of the relevant categories (c.f. the discussion in Chapter 3 of Williams 1983) it is not then clear that such categories should be present at LF if LF is a purely syntactic level. I will leave this extremely complicated matter open here. I will assume in the discussion below that s-selection is satisfied at LF.

⁷⁶ The fact that $\pm$ WH selection (which is presumably c-selection) takes place at LF in Chinese (c.f. Lasnik and Saito 1984) is not necessarily a problem for the view that (some) c-selection is at S-structure. It may be preferable to say that all c-selection is at S-structure in which case the Chinese facts would need to be analysed as cases of s-selection. In the Chinese case it is probably not possible to distinguish the two. The fact that a verb such as *wonder* requires embedded Q will force LF movement simply to satisfy the PFI. It is the languages such as English which require the feature $\pm$ WH to force the S-structure movement.

as behaving like multiple arguments. The problem then becomes how to resolve the syntactic peculiarities and end up with a semantics that reflects the multiple argument-like nature of the conjuncts.

4.3.1 The LF of the BP structure

This is where we would like the LF to be a closer reflection of the logical form than the S-structure. I proposed in §4.2.4 that semantically, the conjunctions were set operators. This makes them quantifiers of a sort. Suppose then we raise the Boolean head out of the BP and adjoin it to the first conjunct at LF, yielding the structure in (4.14):



This movement is crucially different from the head movement suggested briefly, and discarded, in Chapter 2. If we assume that NP* is a projection of NP₁, then NP₁ will not be a barrier⁷⁷ for antecedent

⁷⁷ I will adopt without comment, the theoretical machinery of the *Barriers* framework, although to a large extent, nothing hinges on it crucially. The relevant definitions of government and barrier are given below:

(i) α governs β iff α m-commands β and there is no γ , a barrier for β that excludes α

(ii) γ is a Blocking Category (BC) for β iff γ is not L-marked, and γ dominates β

(iii) γ is a barrier for β iff (a) or (b)

(a) γ immediately dominates δ , δ a BC for β

(b) γ is a BC for β , $\gamma \neq \text{IP}$

(iv) α dominates β iff all segments of α dominate β

government of the trace of B. We must further allow the B head to adjoin to a maximal projection. As noted in Kayne 1990, a close reading of Chomsky 1986b allows this. Chomsky makes the assumption that head-to-head movement creates an A-chain, while adjunction of a head to a maximal projection creates an A'-chain. Adjunction of a head to a maximal projection is only barred if the head raises further into another head position after adjunction. In such a case, the resulting chain would violate the condition on improper movement (May 1981). Consider the abstract structure given in (4.15), where a head X moves over some maximal projection ZP without moving through the head of ZP.

$$(4.15) \quad [_{YP} X_i^0 + Y^0 [_{ZP} t'_i [_{ZP} Z [_{XP} t''_i]]]]$$

Assume that ZP is a barrier for antecedent government of t'' (the trace of X^0); X must adjoin to ZP to void its barrierhood. If X subsequently moves on to adjoin to Y^0 (an A-position), an improper chain will arise. By virtue of the adjunction to ZP (an A'-position), the trace t'' of the head in (4.15) is a variable, while its binder (X^0) is in an A-position. Variables, being subject to Principle C of the binding theory, must be A-free, thus (4.15) is ruled out.

In (4.14), however, no such problem arises. The Boolean head is an operator, and, providing that it does not move into an A-position (for example the next higher head) the chain (B^0, t) will be well-formed.

One further problem arises with the structure in (4.14). Chomsky 1986b stipulates that adjunction to arguments is ruled out, on the

(v) α excludes β if no segment of α dominates β

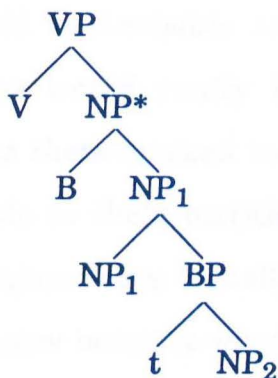
assumption that such adjunction would block theta marking of the argument. The reasoning is the following: adjunction creates a segmented category, and the head of a segmented category is only visible as far as its base generated projection.⁷⁸ If one were to adjoin to an argument, its head would not be visible for theta marking and the result would violate the Theta Criterion⁷⁹.

Clearly, however, the adjunction in (4.14) must be allowed, even if the element adjoined to is an argument. Let us assume that Chomsky's stipulation is in fact the correct one, and for the reason he states. Supposing NP* in (4.14) is a direct object, then NP1 will not be theta-marked by the verb. As a concrete example, consider the structure in (4.16).

⁷⁸ Obviously base generated adjunctions must be distinguished from adjunctions created via movement. I shall assume, as does Chomsky, that such a distinction is able to be made.

⁷⁹ One further potential problem with this analysis, pointed out to me by Anna Szabolsci is that it violates the Projection Principle. Here I take that the arguments put forth in Chomsky 1992 against (especially) D-structure and therefore, the Projection Principle hold, independent of other assumptions made in that paper.

(4.16)



We can turn this to our advantage. The Theta Criterion (Chomsky 1981) requires that every argument receive a theta role and every theta role be discharged. Provided the verb in (4.16) assigns its theta role, and *some* argument receives that theta role, the Theta Criterion is satisfied.

In Chapter 2, I argued that we needed to distinguish government from Spec/Head agreement in that the former, but not the latter, was a relation holding between heads. Since theta roles are assigned under government, theta role assignment is a head/head relation. So long as there is a head visible that can be theta marked by the verb in (4.16), the Theta Criterion will be satisfied. I suggest that the B head is such a visible head, and, by virtue of its adjunction to NP₁ is able to be theta-marked by V.

We now have arrived at somewhat of a paradox. We began this section with the apparent fact that each of the conjuncts was interpreted as being an argument of the head that selected it, yet we have now come to the conclusion that *none* of the conjuncts is theta-marked at all. I think, however, that this is exactly the state of affairs that we need to give each conjunct equal treatment. The real problem of the adjunction structure was that the first conjunct would appear to be theta-marked, while any

other conjunct would be invisible to theta marking. No amount of technical gymnastics would really be able to get the second (and subsequent) conjuncts theta-marked in a satisfying way. By making the first conjunct invisible to theta-marking, we have achieved part of the goal, since now all conjuncts are (equally) not theta-marked.

The real question now becomes what licenses the conjuncts? We have arrived at an LF in which the conjunction head receives the theta role, while the conjuncts do not. The most general licensing condition in the grammar is the Principle of Full Interpretation (Chomsky 1986a) which states that all elements in a phrase marker must be properly licensed, i.e. receive an interpretation at LF.

Looking at things from another angle, we are now in a position to tie the LF more directly to the semantics proposed in §4.2.4. The conjunction acts as a set-forming operator which must identify each of the conjuncts as elements of the set.

I propose that the structure now is interpreted as an appositive structure similar to those in (4.17), pointed out to me by Juan Uriagereka.

(4.17) a. John saw the following people: Bill and Fred

b. They, John, Bill and Fred, left early

There are a couple of notable properties of these examples. First of all, there is no way in which the conjuncts of the coordinate structure can be said to be arguments of the verb, even though they meet its selectional restrictions (i.e. they receive an interpretation as though they were arguments). Obviously the selectional restrictions are satisfied through

the relation that holds between the coordinate structure and that NP *the following people* in (4.17a) or the pronoun *they* in (4.17b). Given that the coordinate structure is not governed by the verb, it also does not follow in any obvious way that the conjuncts are theta marked, even though they are interpreted as instantiating the theta role that the verb assigns. Again, this must somehow be mediated by the relation between the NP and the coordinate structure.

The only difference between (4.17) and (4.16) is that the latter structure arises covertly at LF, while the former is present at S-structure. Under the assumptions made above about the status of NP*, the Boolean head is the head of the NP that receives the theta role, just as *they* in (4.17b) is the head that receives the theta role. Whatever allows the conjoined NPs in (4.17) to satisfy the Principle of Full Interpretation will similarly allow the NPs in (4.16) to be licensed.

Technically, there are a number of ways to achieve this. Taking the appositive structure seriously, the most obvious licensing condition would be predication, especially of the sort found in equative constructions, and I will adopt this here⁸⁰. We can treat this as indexing the appositive head with the adjoined NP, as in (4.18).

⁸⁰ Another possibility, which I will not pursue here, is that the Boolean head acts as an unselective binder much in the manner that adverbs of quantification do (See Lewis 1975, Heim 1982, Chierchia 1992).

(4.18) [NP₁ [NP₁ We_i] [the people]_{NP₂}]

Extending this to plurals, suppose, following Higginbotham 1983, Gorrell 1984, and Lasnik and Uriagereka 1988 that a plural pronoun can bear a set of indices. This allows (4.17b) to have a representation of (4.19):

(4.19) They_{i,j,k} [John_i, Bill_j, and Fred_k] left early

We can now treat the derived BP structure similarly:

(4.20) Mary saw [NP*_{i,j}] and [NP Bill_i] [BP t_{and} [NP Fred_j]]]

Each of the conjuncts satisfies the Principle of Full Interpretation by being predicated of the pronominal appositive head, which receives a theta role.

The proposed LF thus licenses all, and only all of the conjuncts. In order to do this, the NP* must bear an index of each of the conjuncts. This is consonant with the idea that the conjunction operator is a group forming element. In order to interpret any conjunction (*and*, *or*, or *but*) one must first form a set composed of the conjuncts. The role of the conjunction is to specify what operation to perform on the set (union, "one of", "except"), but in all cases, the set must be present.

It may actually be possible to make the LF of the coordinate structure appear even more set-like if a proposal made by Kroch and Heycock 1993 regarding licensing of elements in a phrase marker is correct. Kroch and Heycock argue on the basis of verb second phenomena and coordination in

German, that traces of heads that are deletable because they are independently licensed at the site they raise to, also delete the projection from which they moved. Specifically, in a V2 structure such as (4.21a), the trace of I may delete, along with its projection, yielding a structure as in (4.21b)⁸¹.

(4.21) a. $[_{CP} Er_i [_C rannte_j [_{IP} t_i [_i' [_{VP} zum Ausgang t_j] t_j']]]]$

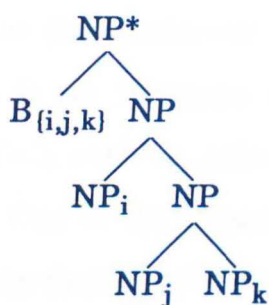
'He ran to the exit'

b. $[_{CP/IP} Er [_{C/I'} rannte_j [_{VP} zum Ausgang t_j]]]]$

If we adopt this proposal, then, by virtue of the fact that the Boolean head is licensed by the predication relation that holds of it and each of the conjuncts, there is no reason not to delete its trace. If Kroch and Heycock are correct, then the whole BP projection may delete, leaving a structure such as (4.22), which instantiates the set directly.

⁸¹ The basic idea of their argument (which is compatible with the adjoined BP analysis) is roughly the following: German gives rise to what appears to be I'/C' coordination because an IP subject can be "shared" by a clause in which V2 has applied. On independent grounds, such an unlike category coordination is not generally licensed, so they propose that verb movement removes the IP allowing like category coordination to apply.

(4.22)



Although this structure looks somewhat unorthodox, it would be allowed provided each of the adjunct NPs was properly licensed (i.e. predicated of the Boolean head.) There are possibly some problems interpreting the projections correctly, so I will not assume this in what follows. If correct, however, it has the not undesirable consequence of removing the indexing relation between the B and its trace, the semantic properties of which are somewhat unclear. Kroch and Heycock argue that their proposal has a number of worthwhile consequences with respect to subject questions in English, and other phenomena related to verb second in various Germanic languages. There are many other implications of their proposal, however, and pursuing them would bring us too far afield.

4.3.2 On the predicate status of the conjoined elements

By treating the elements of the coordinate structure as appositive elements indexed by the Boolean head, I am claiming that the relation that holds of each of the conjuncts and the Boolean head is one of predication. This allows each conjunct to be treated equally. There is some interesting evidence that predication is in fact the correct relationship.

Schein 1992 argues that (contrary to the view we are adopting here) that all conjunction is an instance of propositional conjunction (i.e. propositional *and* ('^'), even in cases of apparent collective or group-forming conjunction. One of the arguments that he presents is based on the observation made by Collins 1987 that modal adverbs such as *possibly*, and *perhaps* can appear inside conjoined NPs. This is shown in (4.23).

(4.23) a. John and perhaps Bill went to the store

b. John saw Bill and perhaps Fred

On the assumption that the modal adverbs are sentential adverbs, one might think that they would be restricted to cases where sentential paraphrases were allowed, as for example the sentences in (4.23). However, Collins shows that they are permitted even when a collective predicate is used, i.e. in the case of group-forming *and*. This is shown in (4.24).

(4.24) The Harvard students and perhaps the Yale students
formed an unbroken chain around the Pentagon

The predicate *form an unbroken chain* is a collective predicate, thus (4.24) is true of the group of Harvard students and Yale students but not any of the individuals. Schein assumes a logical form of the sort proposed by Davidson 1967 and elaborated by Parsons 1990, in which a sentence is a quantification over events, and thematic roles are treated as propositions.

This allows him to treat collective predicates via "conjunction expansion". For Schein, the logical form of (4.25a) would be something like (4.25b)⁸².

- (4.25) a. John and Bill met
 b. $\exists e [\text{meet}(e) \wedge (\text{Subj}(e, \text{John}) \wedge \text{Subj}(e, \text{Bill}))]$

This can be paraphrased roughly as "There was an event such that it was a meeting event and John was a participant and Bill was a participant". One needs merely to state that "meeting" event require more than one participant, and thus *John met* is ruled out while *The couple met* is not.

Since theta roles (glossed as Subj. in (4.25)) are propositional for Schein, an explanation for the facts in (4.23) and (4.24) is immediately apparent. *Perhaps* can modify the theta role that the relevant argument receives, thus, we can give (4.24) a logical form of (4.26), where POSS represents some the modal operator.

- (4.26) $\exists e [\text{form chain}(e) \wedge (\text{Subj}(e, \text{HS}) \wedge \text{POSS}(\text{Subj}(e, \text{YS})))]$
 "There was a chain-forming event and the Harvard students were part of it, and perhaps the Yale students were part of it"

Since collective predicates can be accounted for with propositional theta roles, all conjunction can be treated semantically as sentential conjunction.

⁸² Much of Schein's further arguments are based on a treatment of plurals as second order quantifiers, thus his actual logical forms are significantly simplified in the discussion below. I only intend to present as much of Schein's argument as is necessary to argue for the LF I am proposing.

In the analysis I am proposing, all conjunction is group forming conjunction, thus the analysis of the modal operators would appear to pose a problem. In fact, however, it provides confirming evidence that the conjuncts are predicates rather than arguments. Recall the simpler example given in (4.23a), repeated here as (4.27). This sentence is actually ambiguous between the two paraphrases given in (4.28).

(4.27) John and perhaps Bill went to the store

(4.28) a. John went to the store, and maybe Bill went to the store

b. John went to the store, and someone, maybe Bill, went to the store too

Example (4.28a) can be true if only one person, John, went to the store. However, (4.28b) can only be true if two people, one of whom was John, went to the store.

Schein's account for the appearance of modal adverbs inside conjoined NPs is based on the assumption that if the elements of the conjuncts were individuals, the modal adverb would not be able to modify them. This seems to be a correct assumption, because *perhaps* can not modify a non-conjoined subject, as in (4.29):

(4.29) *[Perhaps Bill] went to the store

The only way of interpreting (4.29) is as expressing the possibility of whether Bill went to the store or not. Crucially it cannot mean that

someone went to the store, and maybe it was Bill.⁸³ However, under Schein's assumption that theta roles are propositional, it is unclear why (4.29) should be ungrammatical on his view.

Modal adverbs can modify predicative NPs, in general, as in (4.30). The adverb does not always modify the whole sentence, as the contrast between (4.31a) and (4.31b) shows.

(4.30) a. John is perhaps a doctor

b. It was perhaps John that I met

(4.31) a. Perhaps the water is a mirage

b. #The water is perhaps a mirage

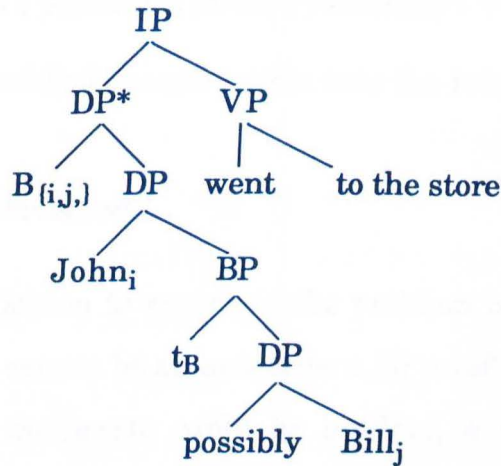
Although judgements are rather subtle, I think that (4.31b) cannot be uttered felicitously without committing the speaker to believing both that the water is water, and that it is a mirage. When the adverb is preposed, no such problem arises. (Actually, (4.31b) may be ambiguous, with one reading as described and the other the same as (4.31a). What is important is that it is ambiguous in a way that (4.31a) is not.)

The difference, then between the appearance of the modal adverb in the coordinate structure, and its inability to appear in with the singular (4.29) will follow directly from the LF I am proposing for the coordinate structure. Since each of the conjuncts is predicated of the conjunction

⁸³ If we put focal stress on Bill, the second reading becomes available. If focused elements are predicates (as seems likely if clefts are focused) then this will be entirely consistent with the analysis to follow.

head at LF, a conjunct can be modified by a modal adverb. If the NP is in an argument position, no such modification is permitted. The structure of (4.27) is given in (4.32).

(4.32)



This structure derives the second reading of (4.27) where the identity of Bill is not known directly. In order to derive the first reading, we need to assume that the adverb can also modify the predication relation that holds between *Bill* and the Boolean head. This may also account for the ambiguity of (4.31) noted above.

Modal adverbs can also modify appositive NPs such as (4.33): The appositive NP is a predicate, while if there is no appositive, the argument cannot be so modified, providing further evidence that the presence of modal adverbs modifying NPs is not a property of conjunctions per se, but rather a property of predicative NPs rather than argument NPs.

- (4.33) a. I met someone, possibly a priest, yesterday
 b. Someone, possibly Bill, came into the room

- (4.34) a. *I met [possibly a priest] yesterday
 b. *[Possibly someone] came into the room

4.3.3 Antecedence revisited

We are now in a position to return to the problem posed in Chapter 2, §2.3 of why a conjunct cannot be an antecedent for a reflexive. Recall that, despite the fact that conjuncts could be binders, a reflexive inside a conjunction could only be bound outside of the coordinate structure as a whole. The relevant data is repeated below.

- (4.35) a. *Either John_i or a picture of himself_i will suffice
 b. Either John_i or his_i picture will suffice

The tentative conclusion reached at the end of §2.3 was that if the conjuncts were non-thematic, then they would not be more referentially complex than the reflexive, and therefore could not serve as an antecedent. It should be immediately apparent that the LF of the BP structure confirms this result. As we have seen in this section, the way that all conjuncts become equal is by *not* being arguments, but rather by being predicated of the Boolean head at LF.

This will achieve the right result for the reflexive data. The LF of (4.35) is (4.36).

(4.36) either or_[i,j] [NP John_i] [BP [NP picture of [himself]_k]_j

Now consider what can constitute an antecedent for *himself*. On the condition that non-thematic elements aren't possible antecedents, the only possible antecedent is the conjunction as a whole. However, this bears the index of both *John* and the picture NP. On the assumption that reflexives must have set identity of indices, the Boolean head is not a valid antecedent either. If (4.36) were in object position, the subject would be a possible antecedent if it bore an index *k*.

Why then, the difference between pronominal binding and reflexive binding? The difference lies in the fact that pronouns do not require identity of set indices in order to have an element count as an antecedent. Consider (4.37) for example:

(4.37) They_[i,j] said he_i was smart

The plural pronoun in (4.37) can act as an antecedent for the singular so long as one of its indices overlaps with the plural. This is not the case for reflexives as (4.38) shows:

(4.38) *They_[i,j] like himself_j

This means that a pronoun in a coordinate structure can always be mediated by reference to the conjunction rather than depending on the non-thematic conjunct, thus when we replace the reflexive with a pronoun in (4.35b) the result is grammatical. The LF is given in (4.39).

(4.39) either $or_{(i,j)}$ [_{NP} John_i] [_{BP} [_{NP} his_k picture]_j

4.4 Deriving the LCL

4.4.1 Conjoined NPs

With the results so far, we now have a way of addressing the third problem with the BP structure, namely, given the adjunction structure, there was no simple or obvious way to impose (even) the semantic identity relation that holds among the conjuncts. This too, needed to be remedied. We know from the discussion in the Chapter 3 that the conjuncts must be of the same semantic category; this I take to be an s-selection fact and therefore satisfied at LF. Given the nature of the adjunction structure, it was far from clear that the S-structure would allow checking of the semantic type of the second conjunct given that the selecting head does not govern it.

The appositive structure I have proposed provides a straightforward account for the semantic identity constraint. Continuing with the analysis of (4.16), we simply need to make the assumption that the Boolean head is a pronominal like element. Since there is only one element being theta marked in a theta marked coordinate structure, it can only be of a single semantic type. On the assumption that pronouns are sortally selective, the semantic identity of each of the conjuncts follows from the predication relation that holds between NP* and each of the conjuncts. We are now in a position to address the problem of extending the analysis to elements other than conjoined NPs.

4.4.2 Extending the analysis to conjoined XPs

Extending the analysis to coordinations of other categories is not problematic. Recall the discussion in Chapter 3 that the categories required for the syntax of coordination were essentially semantic rather than syntactic. The (non-exhaustive) set of categories required include those in (4.40).

- (4.40) a. MANNER
b. TIME
c. PLACE
d. EVENT
e. QUESTION
f. PROPOSITION
g. PREDICATE

We can easily supply pro-forms for each of the categories above, as exemplified by the sentences in (4.41), especially if we include *wh* pro-forms.

(4.41)	a. John wondered <i>how</i> Bill fixed the car	MANNER
	b. John went at 3:00 and Bill went <i>then</i> too	TIME
	c. John went to Paris, and Bill went <i>there</i> too	PLACE
	d. John went to Paris, and <i>so</i> did Bill	EVENT
	e. <i>What</i> Bill asked was the time	QUESTION
	f. <i>It</i> is obvious that Bill is a fool	PROPOSITION
	g. John is intelligent, and <i>so</i> is Bill	PREDICATE

Even if the specific examples listed above are not exactly the correct ones, the fact that *wh* pro-forms exist for all the major categories will probably suffice to make the availability of the relevant pro-forms a certainty.

The general case can then be thought of as the following: the conjunction is always a group forming pro-form which will be of the semantic type of (any one of) the conjuncts. Because the licensing condition on the appositive structure is one of predication, each of the conjuncts must necessarily be interpreted as of the same category. Another way to think of this is that set-forming is in itself category formation⁸⁴.

⁸⁴ This may be a rather deep property of human cognition. Set formation entails categorisation, even on the most minimal evidence, as Borges so eloquently captured:

"On those remote pages it is written that animals are divided into (a) those that belong to the Emperor, (b) embalmed ones, (c) those that are trained, (d) suckling pigs, (e) mermaids, (f) fabulous beasts, (g) stray dogs, (h) those that are included in this classification, (i) those that tremble, as if they were mad, (j) innumerable ones, (k) those drawn with a very fine camels hair brush, (l) others, (m) those that have just broken a flower vase, (n) those that resemble

Without attaching too much significance to them, we may then give paraphrases for conjunction of the various categories as follows:

(4.42) a. John walked slowly and with great care Manner

"John walked these ways: slowly, with great care"

b. John ate beans yesterday and on Tuesday Time

"John ate beans these times: yesterday, on Tuesday"

c. John went to Toronto and to Boston Place

"John went to these places: Toronto, Boston"

d. John ate the cake and drank a beer Event

"John did these: eat the cake, drink a beer"

e. John asked what to buy and where to get it Question

"John asked these questions: what to buy, where to get it"

flies from a distance." *Other Inquisitions* (New York: Washington Square Press, 1966) p. 108

f. John said that Bill was a fool
and that Frank was happy

Proposition

"John said these: that Bill is a fool, that Frank is happy"

g. John is in the park

(Verbal) Predicate

and itching for a fight

"John is these: in the park, itching for a fight"

In most cases, I have used the demonstrative article *these*, as the paraphrase for the pro-form. There is no reason to believe that the relevant operators are demonstrative however. It is also important to note that the pro-forms do not translate as NPs, as might appear from the paraphrases. The pro-form acts exactly as the category required by the selecting head (if it is governed) or as a subject or modifier as required⁸⁵.

⁸⁵ Conjoining quantifiers would appear to be a problem for the analysis just proposed, but this is really a result of there not being an overt paraphrase for the pro-form involved. We know, however, that quantifiers can form relative clauses, and thus *wh* pro-forms exist for them. The real question is how they can receive their interpretations. Suppose we have the conjoined quantifiers in (i).

- (i) Every man and every woman left

What is needed is a way to interpret the pro-form as a plural quantifier. We might think of a set of quantifiers as an absorbed quantifier in the sense of Higginbotham and May 1981. The quantifier will behave with one scope with respect to other quantifiers (i.e. all quantifiers in the set will have the same scope.) As far as I can tell, this will get the right results. (See Hoeksema 1983, Krifka 1990 for explicit proposals for treating conjoined quantifiers as plurals.)

4.5 Summary

I have now sketched the basic proposal for an LF of the coordinate structure that addresses, and solves, the three main problems outlined at the beginning of the chapter. Semantically, all conjunction is treated as group forming conjunction, and the sentential character of phrasal conjunction is reduced to the fact that plurals, and other set forming operators are quantificational, leading to multiple interpretations. The proposal captures the fact that all conjuncts are treated equally by mediating all relations that hold of them through the pro-like Boolean head. The LCL then follows without stipulation, as the pro-form is the only element in direct association with the element that licenses the conjuncts as a whole.

The LF now makes some clear predictions about the behaviour of coordinate structures and plurals (and distributed singulars): they should behave alike on all counts. It further makes a prediction that the so-called propositional *and* (' $\wedge$ ') is never manifested as a lexical item in natural language. Only phrasal (i.e. group forming) *and* is present, and propositional *and* is derived from that. This is an important point, because it goes against almost all of the conventional wisdom about conjunction from (at least) Frege onwards, and I will return to it in §4.8 below.

It is important to point out also, that, although I have suggested a semantics for the conjunctions themselves, I am not proposing a semantics for the treatment of plurals, and the representation of the group, distributed and collective readings themselves. There are many proposals in the semantics literature that deal with exactly these issues,

and I do not want to choose among them here. The proposed LF makes a specific claim that ties the semantics of coordinate structures explicitly to that of plurals and distributed singulars only by proposing that the coordinate structure *is* syntactically a plural or distributed singular. In the next section, I will shore up this empirical claim by examining the so-called "distributive" quantifiers and show that coordinate structures do, in fact, pattern syntactically like their non-coordinated counterparts.

4.6 Distributive quantifiers, plurals and coordinate structures

4.6.1 The distribution of distributive quantifiers

Empirical support for the reduction of coordinate structures to plurals comes from the behaviour and distribution of distributive quantifiers such as *both*, *either*, *neither*, *each*, and *all*. The distribution such quantifiers has often been stipulated in the phrase structure rules of the coordination itself. This is the approach taken, for example, by Gazdar et al 1985, and Sag et al 1985, who propose that the coordinate head is introduced by the following rule schemata, one for iterative coordination, the other involving binary coordination.

(4.43) a. Iterating coordination schema (Gazdar et al. 1985:171)

$$X \rightarrow H[\text{CONJ } \alpha_0], H[\text{CONJ } \alpha_1]^+$$

where $\alpha \in \{ \langle \text{and}, \text{NIL} \rangle, \langle \text{NIL}, \text{and} \rangle, \langle \text{neither}, \text{nor} \rangle, \langle \text{or}, \text{NIL} \rangle, \langle \text{NIL}, \text{or} \rangle \}$

b. Binary coordination schema

$$X \rightarrow H[\text{CONJ } \alpha_0], H[\text{CONJ } \alpha_1]$$

where $\alpha \in \{ \langle \text{both}, \text{and} \rangle, \langle \text{either}, \text{or} \rangle, \langle \text{NIL}, \text{but} \rangle \}$

No mention is given by these authors of the fact that the same elements present in the conjunction schema are also available to modify non-conjoined NPs. Other treatments of coordination, such as Goodall 1987, have ignored the issue of the distributive quantifiers altogether.

Dougherty 1970, however, showed that the distribution of the distributive quantifiers was tied directly to the distribution of plurals and used the distributional argument to argue for phrasal coordination. I have argued on independent grounds for a phrasal coordination, so , Dougherty's proposal is vindicated without relying on his particular instantiation of the syntax.

As the phrase schema in (4.43) shows, certain distributive quantifiers appear with certain coordinating conjunctions. This is exemplified by the sentences in (4.44).

- (4.44) a. John and Bill each will go
b. Either John or Bill will go
c. *John or Bill each will go
d. *Either John and Bill will go

The distributive quantifiers also interact with what Dougherty calls 'distributive adverbs', such as *simultaneously*, *en masse*, *independently* and *together*.

- (4.45) a. John and Bill left simultaneously
b. *John or Bill left simultaneously
c. John, Bill and Tom all left simultaneously
d. *John, Bill and Tom each left simultaneously

Coordinate NPs with *and* can also license plural reflexives, while those with *or* cannot. With singular reflexives, the pattern is the opposite.

- (4.46) a. John and Bill perjured themselves
b. *John or Bill perjured themselves
c. *John and Bill like (each) likes himself
d. Neither John nor Bill saw himself

It should be quite clear that the each of the sets of examples above show an identical pattern if we replace the NPs conjoined with *and* with a plural and the NPs conjoined with *or* with a singular.

(4.47) a. The men each will go

b. Either man will go

c. *The man each will go

d. *Either men will go

(4.48) a. The men left simultaneously

b. *The man left simultaneously

c. The men all left simultaneously

d. *The men each left simultaneously

(4.49) a. The men perjured themselves

b. *The man perjured themselves

c. *The men like (each) likes himself

d. Neither man saw himself

Some distributive quantifiers also can modify almost any type of coordinated categories, as in (4.50)

(4.50)	a. John will both sing a song and dance a jig	VPs
	b. John thinks either that Bill is here or he's not	CPs
	c. John walked both quickly and carefully	APs
	d. The neither tall nor short men wore size 42	APs

The data above points to the fact that specifically tying the distribution of distributive quantifiers to coordinate structures misses a significant generalisation in both the syntax and the semantics. While the arguments presented here are not conclusively syntactic (one might argue that they are semantic restrictions), if such restrictions are checked at LF, then the LF of coordinate structures must be sufficiently similar to the LF of plurals to allow such checking to occur. The LF I am proposing has exactly that property.

There are, however, some predicates which seem to require plural subjects and yet cannot take conjoined subjects. Dougherty mentions two sorts of examples. In (4.51), predicates such as *be numerous*, *be plentiful*, *swarm* do not take conjoined subjects. This fact, however, cannot be attributable to the distinction between coordinate versus plural, but rather between the difference between count and non-count.

- (4.51) a. *John, Bill and Harry were numerous
b. The men were numerous
c. *The wasp, the bee and the mosquito swarmed
d. The insects swarmed

If we replace plurals with countable plurals, the sentences becomes unacceptable.

- (4.52) a. The three men were numerous
b. The three insects swarmed

In the case of *swarm*, countable may not even be the correct restriction, because one can plausibly say (4.53).

- (4.53) The 3000 bees swarmed

Here, it would be difficult to come up with a coordinate structure that would be sufficiently large to allow it to be the subject of *swarm*, but I take this to be a performance problem (literally), as we are unlikely to evaluate such a set, although in principle we could.

With respect to predicate such as *be numerous* which clearly seem to require uncountable (not just large) subjects, the semantics I have proposed for the coordinating conjunction will necessarily force the *and* to be countable, since it exhaustively enumerates the members of a set, which must be finite. (Perhaps we can simulate infinity by using

expressions such as *and so forth and so on* but this amounts to including a plural in the coordinate structure itself.)

The second type of example Dougherty presents is given in (4.54).

- (4.54) a. Half of the men wanted to quit
b. *Half of John, Bill, Tom, and Fred wanted to quit

Here, I do not have much too say, since I do not find (4.54b) unacceptable at all, although it seems mildly infelicitous. It seems difficult to construct a situation in which you know the names of the four people, but not the names of those who want to quit. I suppose however, if you received anonymous notes from two of the group, you might be able to say (4.54b).

Neither of these cases seem to require anything to distinguish coordinate structures *per se* from plurals.

4.6.2 The syntax of the distributive quantifiers

So far, I have just shown that the distributive quantifiers pattern the same way with both plurals and coordinate structures. Recall in the discussion of the semantics of *or*, I took *or* to be a set operator which semantically created a set, and then was interpreted as roughly *one of*. This allows for an explanation of why the use of *either* with singular nouns always implicitly sets up a set. For example, (4.55) can only be evaluated relative to a (pre-specified) set of professors in the discourse.

(4.55) Either professor can teach this course

The corresponding sentence with an overt conjunction would be (4.56). According to the semantics I am proposing, this is translated roughly as in (4.56b).

- (4.56) a. Either Chomsky or Halle can teach this course
 b. Either (one of) {Chomsky, Halle} can teach this course

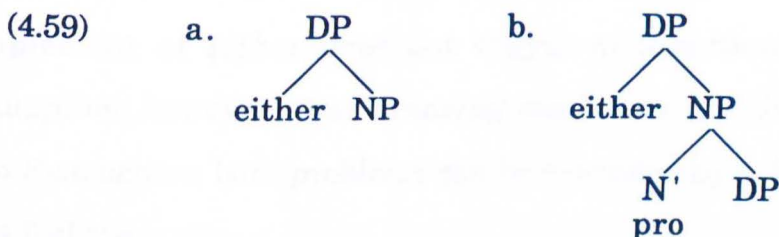
There is a curious restriction on *either* with singular nouns: the noun must always be a bare noun. None of the examples in (4.57) is licit.

- (4.57) a. *Either a man can do it
 b. *Either the man can do it
 c. *Either this man can do it
 d. *Either no man can do it

This contrasts with the use of *either* with plural NPs, a fact that I have not mentioned explicitly in the discussion so far.

- (4.58) a. Either of the men
 b. *Either of the man
 c. Either of two solutions
 d. *Either of men

The data in (4.57) suggest that *either* is in fact a determiner of sorts, since it cannot appear with an overt determiner. The data in (4.58), however, further show that it can apparently function as a full NP, whose complement is a (definite) plural. We can explain this data quite simply with the following structures:⁸⁶

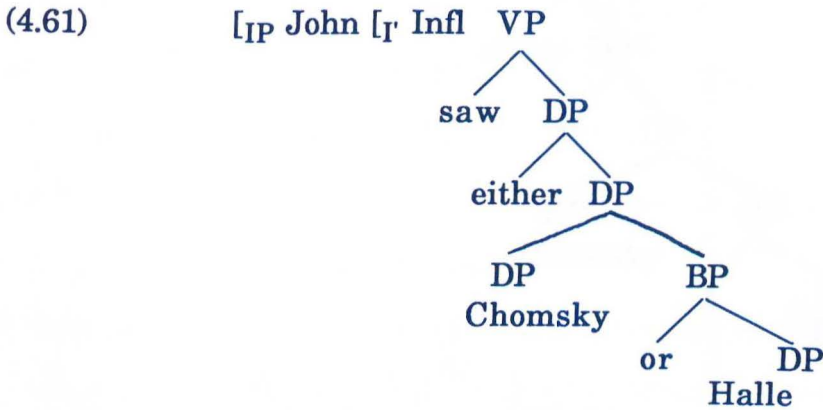


In (4.59b), the NP projects a *pro* head which is interpreted as 'one'; this *pro* is optionally present, although somewhat redundant. In this case, the DP complement must be plural, and because the *pro* cannot assign Case to it, *of* is inserted.

Now consider the use of *either* with conjoined NPs. According to the BP analysis, and the structures just assigned to *ether*, (4.60) has the S-structure of (4.61).

⁸⁶ *Either* also seems to behave as a negative polarity item, a fact that I do not address here. The analysis presented here is compatible with the semantic account of *either* given in Higginbotham 1991.

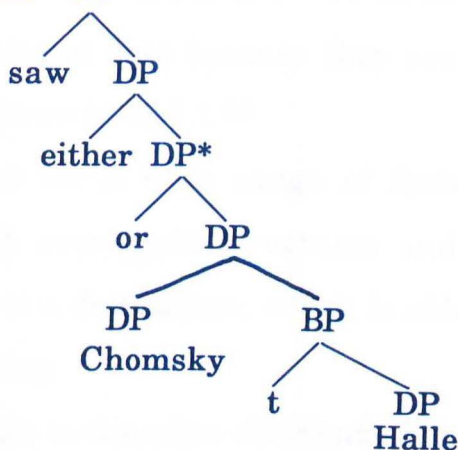
(4.60) John saw either Chomsky or Halle



As it stands, this structure seems to have a lot of problems. Two in particular stand out: *either* is selecting a DP rather than an NP; the DP complement of *either* does not trigger *of*-insertion. If we make the assumption, however, that licensing conditions are checked at LF rather than S-structure, both problems can be overcome by using the LF proposed in §4.3 above.

After raising the Boolean head, to adjoin to the topmost DP, the structure in (4.61) looks like (4.62):

(4.62)

[_{IP} John [_{I'} Infl VP

Now, we know from the discussion of unlike category coordination that the selectional restriction to be satisfied between *either* and DP* in (4.62) must be a semantic rather than syntactic one. This is mediated by the pro-form that is the conjunction. This allows us to treat DP* as an NP rather than a DP.⁸⁷ We know also, that the Boolean head acts as the head of DP*, and is a proform. At LF, then, (4.62) actually instantiates the structure for *either* given in (4.59b), with the Boolean head being the *pro*. And, in fact, given the proposed semantics for *or* as "one of", we get the conjoined NPs to mean to mean the same thing as the meaning of *either* with a plural NP.

This leaves the problem of Case. Why is there no *of*-insertion in coordinate structures. The difference lies in the level that Case is assigned versus the level that it is checked. Under the Visibility Hypothesis (Chomsky 1986a), Case is checked at LF as a requirement for theta role assignment. But what gets case? At LF, only the *pro* head requires case, but it does not require morphological case, and thus does

⁸⁷ We might follow Grimshaw 1990 here, and assume that DPs and NPs are all +N, -V categories, and therefore indistinct at LF.

not trigger *of* insertion. On the other hand, the DPs in the coordinate structure are assigned morphological case because they are adjacent to the verb at S-structure, as was shown in §2.5.1.⁸⁸

We are now able to account for a wide range of facts about the distribution of *either* with both coordinate structures and other NPs simply by assuming that *either* is a determiner, which is able to s-select the Boolean head at LF after raising.

We can now extend our analysis to the other distributive quantifiers as well. In all cases, the distributive quantifier can be stranded with an implied *pro* head, as in the examples in (4.63).

- (4.63) a. Which toy do you want? I want both.
b. Which toy do you want? I don't want either.
c. Did you like the two movies? No, neither was any good.

It is also possible that *each* can be assimilated to this group as well. Independently, Safir and Stowell 1988 propose that binominal *each* (see Burzio 1981 for initial discussion), as in (4.64) has the same structure proposed in (4.59). Their structure is given in (4.64b).

⁸⁸ For an independently arrived at argument that both PF and LF case is required, see Nunes (forthcoming).

(4.64) a. John and Bill read three books each

b. $[_{NP} \text{two books}_i [_{QP} \text{PRO}_i [_{Q'} \text{each } [_{NP} \text{pro}]]]]$

To the extent that binominal *each* is related to the other uses of *each* suggests that the structures motivated on independent grounds in (4.59) are on the right track.

4.7 Phrasal coordination and the scope of conjunctions

4.7.1 Scope of *and*

Further evidence for the LF proposed in §4.3 comes from the scopal properties of coordinators. In that section we assumed that conjunctions were operators of a sort, and had quantificational properties. Given the discussion above of *either*, this does not seem exactly right. I think the two views can be reconciled by assuming that if no overt distributor is present, then one is filled in by default. This allows us to maintain the account in §4.6 in full generality.

However, conjunctions are commonly thought to be scope-taking elements. Evidence for this comes from data of the sort in (4.65). (See also Moltmann 1992.)

(4.65) a. John believes that Bill and Fred went to Toronto

b. John believes the rumour that Bill and Fred went to
Toronto

In (4.65a), *and* seems to have the scope of the IP, since its interpretation is that of (4.66a). Notice that the scope does not extend past the IP, since

(4.66a) does not mean the same thing as (4.66b), nor can (4.65a) mean (4.66b).

- (4.66) a. John believes that Bill went to Toronto and Fred went to Toronto
- b. John believes that Bill went to Toronto and that Fred went to Toronto

This becomes more obvious if we replace the conjoined sentences with contradictory ones, as in (4.67).

- (4.67) a. #On alternate days, John believes that the Earth is flat and the Earth is round
- b. On alternate days, John believes that the Earth is flat and that the Earth is round

While (4.67a) entails that John has a contradictory belief, (4.67b) is felicitous; it simply means that John can't make up his mind from one day to the other.

This scope fact falls out from the Scope Principle of May 1985. Scope for May is determined by m-command, thus the scope of the conjunction is everything that the conjunction m-commands. Since the Boolean head creates an adjunction structure, its scope will always be the first maximal projection dominating it. On the assumption that IP is a maximal projection, the scope of *and* in (4.65a) will be the IP dominating the subject, yielding an interpretation of (4.66a) rather than (4.66b) as predicted.

Similar results obtain in object position, where *and* takes scope only over the VP rather than the whole sentence, as in (4.68).

(4.68) a. Someone saw Bill and Fred

b. Bill and Fred saw someone

In (4.68a) *someone* can only have wide scope over *and*, while in (4.68b) *someone* can take either scope. Thus (4.68a) can only mean "someone is such that he saw Bill and he saw Fred", while (4.68b) can mean either "Someone is such that Bill saw him and Fred saw him" (the wide scope reading) or "Bill saw someone and Fred saw someone" (the narrow scope reading). The scope of *and* in (4.69a) (corresponding to (4.68a) is the VP, because it is the first maximal projection dominating *and*, while the scope of *someone* is the matrix CP (not labeled below). This forces a wide scope reading on *someone*. The scope of *and* in (4.69b) however, is IP, because the all segments of DP do not dominate *and*. If *someone* raises, it will take scope over *and* yielding the wide scope reading of (4.68b) as in (4.69a) because the maximal projection exhaustively dominating *someone* is the matrix CP. However, under May's analysis, *someone* has the option of adjoining to VP, thus the narrow scope reading of (4.68b) is reflected by the LF in (4.69b).

- (4.69) a. [_{IP} someone_i [_{IP} t_i [_{VP} saw [_{DP} and_j [_{DP} [Bill] [_{BP} t_j Fred]]]]]]]
 b. [_{IP} someone_i [_{IP} [_{DP} and_j [_{DP} [Bill] [_{BP} t_j Fred]]]] [_{VP} saw t_i]]

4.7.2 Scope of *or*

Larson 1985 showed that *and* and *or* have different scopal properties. His account is fully compatible with the one developed here, and I will briefly summarise the key points. As Partee and Rooth 1983 showed, *or* appears to be a scope taking element in the way that *and* is not. Consider (4.70).

- (4.70) Mary is looking for a maid or a cook

This sentence appears to be three ways ambiguous. There is a *de dicto* reading of the indefinite meaning "Mary is looking for an x such that x is a maid or x is a cook.". There is also a *de re* reading, meaning "There is someone particular person x who is either a maid or a cook, and Mary is looking for x". The third reading is one where Mary is looking for someone who is a cook or she is looking for someone who is a maid. Following the previous authors, I will refer to this as the "wide scope" reading.

Larson shows that the scopal properties of (4.70) are mirrored by distribution of *either* in the overt syntax. Thus there are various possibilities for placing *either* overtly.

- (4.71) a. Mary is looking for either a maid or a cook
b. Mary is either looking for a maid or a cook
c. Mary either is looking for a maid or a cook
d. Either Mary is looking for a maid or a cook

The main generalisation is the following: when *either* is displaced from the coordinate structure, it must take clausal scope. Thus, while (4.71) allows all three of the readings described above, in each of (4.71) (b,c and d) the narrow scope reading is unavailable.

Larson argues that *either* is a scope marker which raises out of the conjoined phrase and determines its scope. Translating this into the discussion of *either* above, what this amounts to saying is that *either* is a quantificational determiner which can undergo QR at LF. The main difference is that *either* can mark its scope at S-structure. We can then treat the scope facts in the same way that the scope of *ne* 'not' in French *ne...personne* constructions. (See Aoun, Hornstein and Sportiche 1980, Rizzi 1982, Kayne 1984). According to Aoun, Hornstein and Sportiche, *ne* can mark wide or narrow scope for the negative quantifier *personne* 'noone' as shown in (4.72):

- (4.72) a. Je n'exige que Jean voit personne
 I not require that Jean see noone
 'I do not require that John see anyone'
- b. J'exige que Jean ne voit personne
 I require that Jean not see noone
 'I require that Jean see noone'

They argue that *personne* raises at LF to the position of *ne*. Support for this analysis comes from the fact that the construction exhibits ECP effects: if *personne* is in subject position, *ne* must remain in the embedded clause. Movement of *personne* to the higher clause would violate the ECP because the trace in subject position would not be properly governed.

We can apply the same logic to the scope of *either*, modifying Larson's analysis slightly. Assuming that *either* is base generated in its S-structure position, we can then raise the whole conjunction phrase (after raising the Boolean head) to the position of *either*. This will account for the fact that the *de dicto* reading of the indefinite disappears. The relevant LFs for (4.71a) and (4.71b) (which generalises to the other cases) are given in (4.73):

- (4.73) a. Mary is looking for [_{DP} either [_{NP} or [_{DP} a cook [_{BP} a maid]]]]]
 b. Mary is [_{DP} either [_{NP} or [_{DP} a cook [_{BP} a maid]]]]_i]
 looking for t_i

On the assumption that the *de dicto* reading of the indefinite needs to be in the scope of the intensional verb, (4.73b) will lack that reading, while (4.73a) will allow it.

Under this analysis, we can explain why, when the scope marker is displaced, movement of the conjoined phrase is forced. If we assume that the s-selectional restrictions of *either* as a quantifier must be satisfied at LF, then it must govern an appropriate restrictor at that level. But at S-structure, *either* is governing a VP which is not of the appropriate type to restrict it. Only by raising the coordinated phrase, with its indefinite head will the s-selectional restriction be satisfied.⁸⁹

It is interesting to note that scope markers of this sort seem to have similar properties: they appear to be heads, and to a large extent they are syncategorematic. Perhaps these properties are what allow them to be licensed at S-structure in different places, while at LF requiring movement of their restrictors to be interpreted semantically.⁹⁰

⁸⁹ It should be obvious here that this analysis extends straightforwardly to disjunctions of other categories. Consider disjoined VPs. The LF of the disjoined VP is actually a *pro*-VP. Here we need to make a distinction among VPs similar to the distinction between NP and DP. *Either* really takes NPs (not DPs), so by analogy, it takes VPs not FPs, where F is some functional projection dominating the VP analogous to D. There are various candidates for this functional head, AgrO, Aspect, perhaps even Tense. I will leave these details to further research. For discussion on the relationship of functional categories with respect to their semantics, along similar lines, see Zwarts 1992.

⁹⁰ It might even be possible to extend this idea to the treatment of clitics, if we assume (as suggested by Torrego 1990) that clitics are determiners, they adjoin to verbal

4.8 On treating all conjunction as group forming

The syntax I have proposed for coordinate structures at LF treats all coordination as phrasal coordination, and supposes a unified treatment of all conjunctions as group forming conjunctions. This goes against much work on both the syntax and semantic of coordination which has traditionally tried to explain coordination in terms of the conjunction ' $\wedge$ ' found in the propositional logic. In recognising that collective readings of conjoined NPs posed problems for treating all instances of natural language conjunction as propositional, most semantic accounts of the phenomena have assumed that conjunctions are always ambiguous between the group forming conjunction and the propositional conjunction. (See e.g. Partee and Rooth 1983.) In particular, group forming *and* is assumed to conjoin elements of type $\langle e \rangle$, while propositional *and* is assumed to conjoin elements of type $\langle t \rangle$. As we saw in the discussion of type raising in Chapter 3, the fact that propositional *and* can conjoin elements smaller than a sentence in the syntax would require extensive type shifting operations to apply in the semantics in order to obtain a propositional interpretation.

Krifka 1990 points out that there are two distinct problems for approaches such as this: first, both phrasal (what he refers to as non-Boolean) *and* and propositional *and* can conjoin elements of types other

projections leaving a *pro* in their argument position of category NP (rather than DP). On the assumption that verbs require DP complements rather than NP complements, the NP must raise to the position of the clitic (its determiner) in order to receive an interpretation. The trace it leaves behind, however, will be a DP trace, and thus interpretation of the clitic chain is licensed. I will not pursue this very complex issue here, however.

than <e> and <t>. Second, many languages have only one word for both types of conjunction. In fact, I believe we can make this statement stronger. Languages *never* make the distinction between group-forming and propositional *and* because there is no propositional *and* overtly expressed in natural language. The prediction of the present theory is that any cases of apparent propositional conjunction would really be syntactically distinguishable along the lines of S versus NP conjunction rather than group versus propositional conjunction.

Link 1983 showed that group-forming *and* appears with elements that are not simply NPs of type <e>, as in the examples below involving predicates.

(4.74) That couple are husband and wife

The predicate *be husband and wife* is inherently collective, and has no sentential paraphrase. Notice that it does not require a conjoined subject but simply a semantic plural that has two members. Krifka shows that similar examples can be constructed as in (4.75):

- (4.75) a. This drink is beer and lemonade
 b. The dogs and roosters barked and crowed all night
 c. The flag is green and white

The ubiquity of collective conjunction is quite clear. The approach I have taken in analysing coordination is to stay close to the syntax and use it as a guide to presenting a basic semantics for conjunction. The syntax

points to treating all conjunction as phrasal (i.e. group forming), and since the semantics of propositional conjunction seems to be derivable from properties of plurals (as in the discussion in §4.2.3) there does not seem to be any need to complicate the grammar by positing both a propositional *and* and a group-forming *and*.

What then of the propositional *and*? One thing that is striking about the propositional connective is its own ubiquity in the metalanguage of predicate calculus. The propositional conjunction seems to be implicit in almost every logical translation of even the simplest grammatical objects.

Consider the following somewhat random sampling of translations of common grammatical forms. All employ propositional *and* in their logical forms, yet syntactically the relation is not one of conjunction.

- (4.76) a. John saw a red car

$$\exists x [\text{car}(x) \wedge \text{red}(x) \wedge \text{saw}(\text{John}, x)]$$

- b. The man that John saw

$$\text{the } x [\text{man}(x) \wedge \text{saw}(\text{John}, x)]$$

- c. Every farmer who owns a donkey beats it

$$\forall x [\text{farmer}(x) \wedge \exists y [\text{donkey}(y) \wedge \text{own}(x, y)] \rightarrow \text{beats}(x, y)]$$

Since *and* is implicated in so many places in the logical language, yet it is realised syntactically in different ways, it would not be surprising if the lexical item we know as *and* were something entirely different.

This is, of course, simply a conceptual argument, but one which is amply motivated empirically by syntactic evidence that coordinate structures are syntactically phrasal and have the properties of plurals and distributed singulars.

Conclusion

Much of recent work in Government Binding theory has striven to reduce construction specific rules to more general properties of the grammar. This dissertation has been an attempt to achieve such a reduction for the syntax of coordinate structures. There are a number of results which have been achieved:

- coordinate structures are unexceptional with respect to X-bar theory
- coordinate structures are hierarchical adjunct structures
- ATB movement reduces to instances of parasitic gaps bound by a null operator
- The CSC reduces to the LCL, and the LCL is semantic, not syntactic
- Coordinate structures are appositive structures at LF and behave as plurals or distributed singulars
- Conjuncts are licensed by predication with the conjunction head, which is a pro-form; they are never arguments
- The LCL reduces to the singularity of the Boolean head which is the sole argument taking element in a coordination
- All natural language conjunction is group-forming conjunction rather than propositional conjunction

To a large extent, the results follow without making significant modifications to the principles in the grammar. In addition, the syntax and the semantics are now much more closely allied than in many

previous accounts: conjunctions are univocally group-forming rather than ambiguous between propositional and group-forming; coordinate structures behave like plurals both syntactically and semantically. Any stipulation about their semantics either lies in the lexical head itself, or in independently needed properties of plurals.

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