COORDINATION AND COMPARATIVES

by

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ABSTRACT

This thesis deals with three topics, coordination (chapter 1-3), comparatives (chapter 4) and exception phrases (chapter 5).

In the first three chapters, I will present a new three-dimensional theory of coordination and a particular way of compositionally interpreting three-dimensional syntactic structures. The theory is applied to ATB constructions in chapter 1 and to constructions with split antecedents in different conjuncts of coordinate in chapter 2. I propose that both ATB extraction and the constructions with split antecedents involve a new construction type of implicit coordination. In chapter 3, I will discuss the possibility of implicit coordination in constructions other than 'and'-coordination and ATB extraction.

Chapter 4 presents a general syntactic and semantic analysis of comparative constructions. In particular, it presents answers to the following three questions. First, how do quantifier scope interactions come about in comparative clauses and other wh constructions. Second, how is the empty element in comparative deletion contexts identified, Third, what is the syntactic basis for evaluating comparative clauses the way they are most plausibly evaluated, namely as universal quantifiers over degree. In the fourth chapter, I will also address the issue of whether comparatives involve coordination. I will argue that comparative sentences may have two syntactic structures simultaneously, a coordinate structure and a subordinate structure. This also holds for phrasal comparatives.

Chapter 5 deals with various kinds of exception phrases and a number of other constructions which are either semantically or syntactically related to exception constructions, namely 'extent clauses', 'almost'-phrases and amount relatives. I propose a general semantic condition to account for the quantifier constraint imposed by exception phrases and semantically related constructions. Furthermore, I will argue that exception constructions may involve polyadic quantification. Regarding the syntax of exception phrases, I will discuss the issue of whether exception constructions syntactically involve coordination, but argue against this possibility.

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Chapter 1:
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1.1. Introduction

This and the following two chapters present a theory of coordination within generative syntax which focusses on three properties of coordination. On the one hand, coordination exhibits phenomena in which conjuncts or parts of conjuncts act as units, and on the other hand, it exhibits phenomena that are indicative of the independence of conjuncts. Another aspect of coordination that will be discussed are certain equivalences between phrasal and clausal coordination. After presenting the relevant types of phenomena in the next section, I will discuss approaches to coordination, which have been motivated mainly by the independent behavior of conjuncts and the equivalence between phrasal and clausal coordination, namely theories of three-dimensional phrase markers. There are two such theories, one by Goodall (1985) and a second one by Muadz (1991). I will show that both theories are defective in a number of respects as general theories of coordination. I will then present a three-dimensional theory of coordination which overcomes a number of the shortcomings of Goodall's and Muadz's theories and is also able to account for the behavior of conjuncts as units.

1.2. General requirements on a theory of coordination

1.2.1. Parallelism and independence in coordinate structures

There are two kinds of phenomena that are characteristic of coordination. The first ones are phenomena in which coordinated phrases behave as units. In particular, there are phenomena that indicate that parallel parts of coordinated phrases behave as units - either in syntactic or in semantic respects or in both.

Syntactically, the conjuncts of a coordination may act as unit, for instance with respect to agreeement or binding as in (1):

(1) a. John and Mary are dancing.

b. John and Mary like themselves.

Furthermore, constituents of distinct conjuncts may act as units in Across-the-board extraction, as in (2).

(2) Whom did John meet t and Mary invite t?

Semantically coordinated NPs may act as units in providing a group referent for a collective predicate as in (3):

(3) John and Bill met.

Furthermore parallel singular NPs (or other constituents denoting single entities) in distinct conjuncts may act together as antecedents of elements taking plural antecedents, as in (4).

(4) a. Which pictures of *themselves* did John like and Mary hate?
b. How many pictures *each* did John like and Mary hate?

The second characteristic of coordinate structures is that the coordinated phrases exhibit a certain degree of syntactic or semantic independence from each other. An instance of syntactic independence is the possibility of NP-movement in one conjunct independently of the other one, as in (5):

(5) John drove his car to his house and seemed t to be exhausted.

As an instance of semantic independence, sentences with phrasal coordinations may receive a 'respectively' interpretation in which one conjunct plays an independent semantic role in a proposition from other conjuncts:

(6) John and Bill met Mary and Sue respectively.

Furthermore, binding theory may apply in coordinated sentences in two ways. It may take into consideration either only individual conjuncts or conjoined phrases. An example of the latter case was (1b). As an example of the former case, an anaphor in one conjunct of a phrasal coordination may take an antecedent in only one conjunct in another phrasal coordination in the same sentence as in (7):

(7) *John* and *Mary* admire pictures of *himself* and stories about *herself* respectively.

Alternatively, a conjoined NP may act as a plural antecedent as in (1b).

Within generative syntax, there are two types of proposals for coordinate structures. We will see that these two approaches, however, do not capture the full range of properties of coordination. Rather one can roughly say that one of the approaches captures only the first characteristic of coordinated sentence, the behavior of conjuncts as units, whereas the second one captures only the second characteristic, the independence of conjuncts. The first approach is Williams' (1978) theory of simultaneous factorization. This theory is designed to capture the syntactic parallelism between elements in different conjuncts with respect to movement and deletion (though it says nothing about the behavior of conjuncts or parts of conjuncts as units for semantic purposes). The second approach are theories based on three-dimensional phrase markers, in particular the theories of Goodall (1987) and Muadz (1991). Williams' theory stresses the behavior of parts of coordinated phrases as units for the application of syntactic operations of movement and deletion. In contrast, Goodall's and Muadz's theories stress the independence of coordinated phrases or the clauses for the purpose of the application of syntactic principles such as those of binding theory or theta theory and syntactic movement. In order to account for the full range of phenomena in coordinated sentences, however, the insights of both approaches have to be combined. This is what I will attempt when I present a different three-dimensional theory of coordination in a later section.

1.1.2. The relation between phrasal and clausal coordination

Coordinate structures with clausal coordination behave in many ways equivalent to coordinate structures with phrasal coordination. For instance, 'respectively'-sentences seem semantically equivalent to clausal coordinations:

(8) a. John and Mary saw Sue and Bill respectively.
b. John saw Sue and Mary saw Bill.

Moreover, these two structures behave parallel in providing an antecedent for elements taking a plural antecedent, as in (9).

(9) a. One after the other, John and Mary saw Sue and Bill respectively.
b. One after the other, John saw Sue and Mary saw Bill.

The equivalence between clausal and phrasal coordinations as in 'respectively'-sentences was one of the motivations for three-dimensional conceptions of phrase markers, and it is generally not captured in traditional theories of constituent coordination, where phrasal coordinations receive only a local semantic evaluation.

1.3. Three-dimensional theories of phrase markers

1.3.1. The basic idea and motivation for three-dimensional phrase markers

There are two main motivations for employing three-dimensional phrase markers to coordination, which are more or less independent of each other.

First, each plane in such a phrase marker should represent the 'semantic conjuncts' of a coordination. This allows wide scope interpretation of phrasal coordinations and an adequate representation of 'respectively'-sentences.

Second, three-dimensional phrase markers are in some way 'composed' of two-dimensional phrase markers in such a way that grammatical principles apply to those two-dimensional phrase markers in the standard way. Thus, coordination does not require any special grammatical rules. Rather, the grammar of coordinate sentences can in this way be reduced to the grammar of noncoordinate sentences.

There are two formal proposals for three-dimensional phrase markers in the literature, which differ not only in the formal structure of phrase markers, but also in particular analyses of coordinate constructions. The first proposal was made by Goodall (1987), who takes three-dimensional phrase markers to be the result of the union of independent two-dimensional phrase markers. The second proposal was made by Muadz (1991), who takes three-dimensional phrase markers to be base-generated. In Muadz' theory, 'planes', two-dimensional sub-phrase markers of three-dimensional phrase markers play an equivalent role to the independent base-generated phrase markers in Goodall's theory. They provide the basis of the application of grammmatical principles and for semantic interpretation.

We will see that implementing the two motivation for three-dimensional phrase markers in the way Goodall and Muadz do leads to a number of serious problems. That is, Goodall's independent phrase markers or Muadz's planes cannot serve as the basis for both the application of syntactic conditions in the standard way and for semantic interpretation. Rather it is necessary to separate two distinct notions of 'planes', planes that have a purely formal motivation, and planes that provide the units for semantic interpretation and represent the scope of coordinators, that is, meaningful planes.

When comparing Goodall's and Muadz's theoies of coordination, I will argue that Muadz's proposal, though as presented almost equivalent to Goodall's theory, is to be preferred because only it provides the basis for an adequate account of the general problems that arise with three-dimensional phrase markers such as the problem of scope and the syntactic and semantic treatment of coordinators. I will later present a theory of coordination which takes over a number of features of Muadz's proposal, though it differs from it in its general format and in a number of details.

1.3.2. The formal proposals

1.3.2.1. Goodall (1985): coordination as phrase marker union

The fundamental idea in Goodall's theory is that coordinated sentences are the result of the union of standard, two-dimensional phrase markers. More precisely, the phrase markers for coordinated sentences are three-dimensional objects resulting from pasting together phrase markers corresponding to the individual conjuncts. Goodall adopts the notion of phrase marker in Lasnik/Kupin (1972). In this conception, phrase markers are **sets** of strings of elements (so-called monostrings). I will not go into the details of Lasnik and Kupin's conception of phrase markers. What is important in the present context is only the following. Phrase marker as sets of monostrings allow for a treatment of three-dimensional phrase markers as the set-theoretic union of standard phrase markers. This is the way Goodall conceives of three-diemsnional phrase markers. The terminal elements of a three-diemsnional phrase marker are only partially ordered by precedence. In particular, the conjuncts of a coordination are not ordered with respect to each other. But an operation at PF ensures the right linearization of conjuncts.

The crucial assumption in Goodall's theory is that grammatical principles and, generally, semantic interpretation apply to individual phrase markers before phrase marker union. This allows a reduction of the syntax of coordinate sentences to the syntax of noncoordinate sentences.

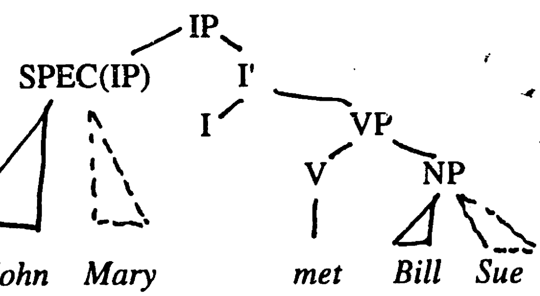
To illustrate this theory with a concrete example, the phrase marker for the sentence in (12)a. consists of the union of the phrase markers for the sentences in (12)b., which are two-dimensional phrase markers of the usual kind. Thus (12a) is has the three-dimensional phrase marker in (12)c.

(12) a. John and Mary met Bill and Sue (respectively).

b. phrase marker 1: John met Bill.

phrase marker 2: Mary met Sue.

c.



The crucial point in Goodall's theory is that syntactic principles, in particular those of Binding Theory, Theta Theory, and Case theory, apply to the individual phrase markers before phrase marker union. The grammaticality of a coordinate sentences depends on whether the relevant syntactic principles are satisfied in the individual clauses before phrase marker union. For example, (12a) is well-formed because, for instance, the theta-criterion is satisfied by the clauses corresponding to the conjuncts in (12b).

Thus, in Goodall's theory, coordinate structures are treated without special syntactic conditions or rules for coordination. The only respect in which coordinate sentences differ from ordinary sentences is that coordinate sentences involve the operation of phrase marker union.

Goodall's theory raises a number of general problems. In particular, let me mention four such problems and discuss whether, and if yes, how they can be solved within his approach.

[1] The first problem arises from the fact that in Goodall's theory, as it is presented, syntactic operations and conditions apply only to the individual two-dimensional phrase markers before phrase marker union. They cannot apply to parallel elements in the coordinated sentence. Even phrasal coordinations are not accessible to the application of syntactic conditions.

The decision to let grammatical principle apply only to phrase markers before phrase marker union is syntactically and semantically inadequate in a number of respects. First, on the syntactic side, there are a number of cases in which syntactic conditions or rules must have access to phrasal coordinations, for instance agreement. Second, semantic interpretation certainly has to sometimes evaluate phrasal coordinations, for instance in the case of collective predicates, as in (13).1

(13) John and Bill met.

Of course, these problems are not fatal ones for Goodall's theory. One can easily modify the theory such that certain syntactic conditions and rules of semantic interpretation may also apply to the result of phrase marker union.

[2] The second problem with Goodall's theory is a more grave one. It concerns the representation and interpretation of coordinators. As Goodall conceives them, phrase markers cannot themselves represent coordinators and thus distinguish between different kinds of coordination (this was noted by Muadz 1991). Goodall himself conceives of coordinators as relations between terminal units, namely the terminal units of the different individual phrase markers. Thus in (12a) we would have *and(Bill met Sue, Mary met John)*. This treatment remains quite obscure. For instance, it is not at all clear where the coordinator should have come from. There does not seem to be any natural way to integrate the representation of coordinators into Goodall's conception of three-dimensional phrase markers.

[3] Another equally important problem concerns the treatment of the scope of coordinators in Goodall's theory and related to that, the application of rules for semantic interpretation. It is a general fact that coordinators do not always have maximal scope, for instance in group-referring coordinated NPs. However, in Goodall's theory coordinators are always given maximal scope, since coordinate sentences arise from the

union of individual phrase markers, which represent the semantic conjuncts. Thus, a sentence such as (14) can only arise from the union of the phrase markers for the sentences in (13).

(14) Some man believes that Sue and Bill won the race.
(15) a. Some man believes that Sue won the race.
 b. Some man believes that Bill won the race.

There does not seem to be natural way in Goodall's theory to account for nonmaximal scope of coordinators without losing part of the motivation of the theory itself: If scope were to be determined on the basis of the result of phrase marker union, then there would be no real need to start out with distinct phrase markers, but rather it would be more reasonable to base-generate a three-dimensional phrase marker right away. This is the approach Muadz (1991) takes.

1.3.2.2. Muadz (1991): base-generation of three-dimensional phrase markers

This section serves two purposes. On the one hand, I will outline Muadz's (1991) theory of coordination. On the other hand, I will present a number of general assumptions about the treatment of coordination phenomena that I will adopt from Muadz's theory and that will be maintained throughout the first three chapters of this dissertation.

In Muadz's (1991) theory, three-dimensional phrase markers are base-generated, rather than resulting from phrase marker union. Muadz presents his theory in a rather informal way and a lot of formal details are left out. As far as he develops his theory in any detail, Muadz assumes that three-dimensional phrase markers are generated by a modification of traditional PS rules. Ordinary phrasal and clausal coordinations are generated by the phrase structure rule given in (16), according to which a node may be expanded into several expansions and a coordinator.

(16) $Y \dashrightarrow \langle X_1, ..., X_n \rangle J$, where X_i is a legal expansion of Y.

As in Goodall's theory, grammatical principles apply for three-dimensional phrase markers in the standard way. However, the basis for the satisfaction of grammatical principles in three-dimanional phrase markers in Muadz's theory are **'planes'**. Planes are certain two-dimensional sub-phrase markers of three-dimensional phrase markers. A plane is construed from a three-dimensional phrase marker by selecting one of the expansions of each node that dominates more than one expansion.

Let me introduce two important notions that will be used throughout this and the next two chapters. I will say that nodes that dominate more than one expansion (in different planes) are **'splitting nodes'** and, following Muadz, nodes that belong to each of the planes of a three-dimensional phrase marker **'shared nodes'**.

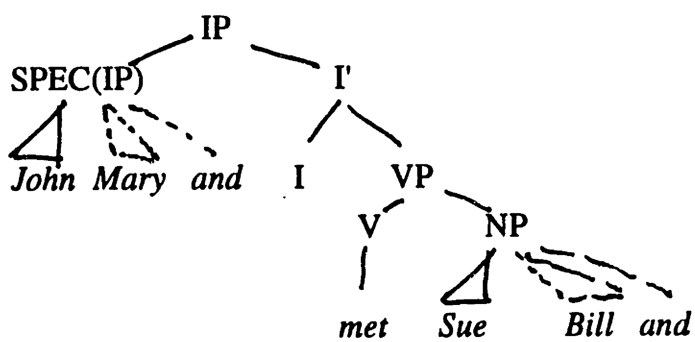
A plane cane now be defined as in (17):

(17) A **plane** P of a phrase marker P' is a sub-phrase marker of P' such that there is exactly one expansion in P of each splitting node of P'.

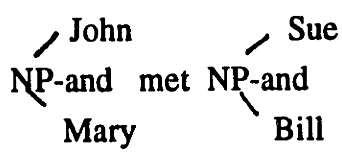
In Muadz's theory, (18a) has the phrase marker given in (18b). In a more simplified notation, the same phrase marker is given in (18c). This is the notation I will henceforth use when representing three-dimensional phrase markers. The phrase marker for (18a) has four planes. These planes are represented by their terminal nodes in (18c).

(18) a. John and Mary met Sue and Bill.

b.



c.



d. plane 1: John met Sue.
plane 2: John met Bill.
plane 3: Mary met Sue.
plane 4: Mary met Bill.

Whereas in Goodall's theory syntactic principles have to be satisfied by individual two-dimensional phrase markers before phrase marker union, in Muadz's theory syntactic principles have to be satisfied in the separate planes that belong to one and the same phrase marker of a coordinate clause. Thus, like Goodall, Muadz can derive the well-formedness of three-dimensional phrase markers from the well-formedness of two-dimensional phrase markers, where syntactic conditions are satisfied in the usual way. Thus, like Goodall, Muadz tries to reduce the grammar of coordination to the grammar of noncoordinate syntactic structures.

Let me briefly present the main applications of Muadz's theory, namely gapping and Right Node Raising (RNR). This is particularly important because Muadz's treatment of gapping and RNR will be adopted henceforth.

Gapping as in (19a) is analysed syntactically as in (19b) and, again in simplified notation as in (19).

(19) a. John met Sue and Mary Bill.

b.
```
            John        Sue
IP-and      NP    met   NP
            Mary        Bill
```

Thus, in this analysis, gapping crucially involves two splitting nodes which do not dominate a coordinator and a coordinator which is dominated by the next higher IP node which itself is not a splitting node.

In order to generate gapped sentences, Muadz assumes a modification of phrase structure rules, as roughly indicated in (20). The rule in (20) is intended to apply in such a way that the first subrule must apply prior to the application of the second subrule (this condition is formulated in rather obscure way in Muadz; I therefore name the relevant condition simply by 'C').

(20) (i) Y --> <X> J, where X is a legal expansion of Y.

(ii) X --> <Z_1, ..., Z_n>, where Z_i is a legal expansion of X and C.

The brackets around X serve to distinguish proper expansions of Y from the coordinator J, which is not an expansion. Apart from this notation, the nature of this distinction remains rather unclear.

An important property of phrase markers for gapped sentences is the following. Phrase markers for gapped sentences allow for fewer planes than sentences with phrasal coordinations. (19a), unlike (12a) (but like 'respectively'-sentences), allows for two specific planes, namely the planes given in (21), since (19a) only means that John met Sue and Mary met Bill.

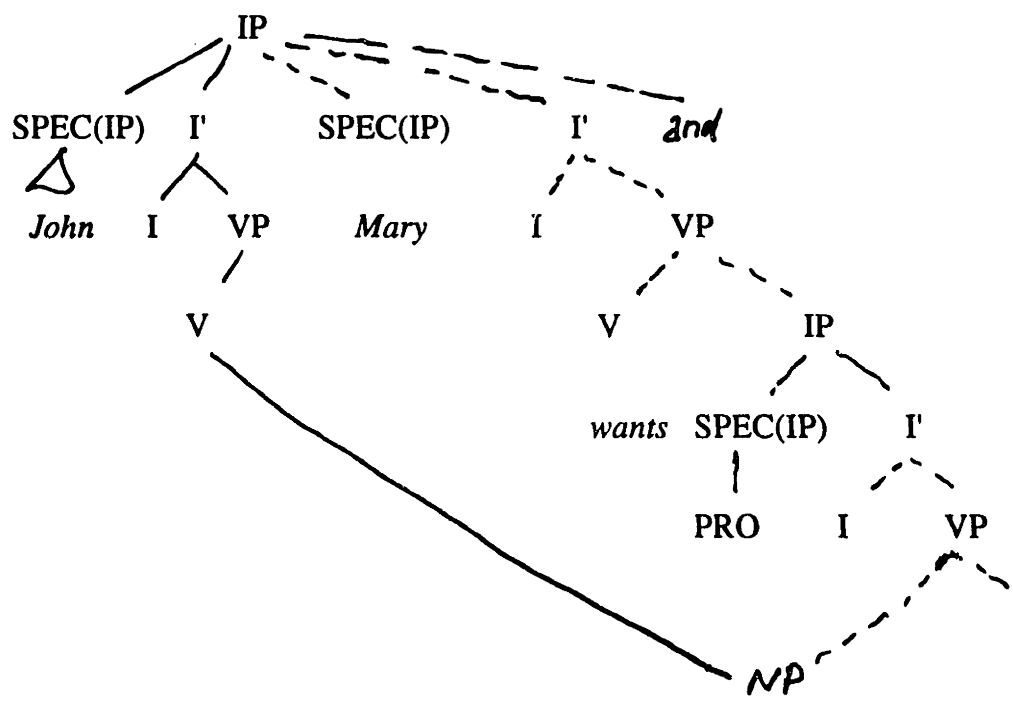
(21) plane 1: John met Sue
plane 2: Mary met Bill

This requires a special plane construal rule for gapping (which is not explicitly given by Muadz). This rule has to make reference to an ordering of the expansions of the splitting nodes. The rule would have to look as in (22):

(22) <u>Plane construal rule for splitting nodes without overt coordinator</u>
For a tree T with splitting X and Y nodes without coordinator, if a plane of T contains the nth expansion of X, it must also contain the nth expansion of Y.

Right Node Raising is in Muadz's theory represented by nodes that are dominated by more than one node. Thus (23b) and, in the simplified notation, (23c) is the phrase marker for (23a). In (23b), the NP node dominating *this man* is dominated by two VP nodes, one VP node with *saw* as its head and a second one with *meet* as its head.

(23) a. John saw and Mary wants to meet this man.

b.


NP   V

this man   *to meet*

c.   John saw

IP-and   this man

Mary wants to meet

I will call a node that is dominated by more that one node a **'joining node'**. Like splitting nodes, joining nodes are base-generated. Muadz assumes that joining nodes (in English) be subject to the well-formedness condition in (24):

(24) <u>Well-formedness condition on joining nodes</u>

A joining node is rightmost in a tree.

Muadz's theory raises similar problems as Goodall's theory. However, unlike Goodall's theory, his theory can easily be modified so as to accommodate those problems. Let me now discuss the three problems I mentioned in relation to Goodall's theory with respect to Muadz's theory and in addition four other problems or issues that arise with Muadz's theory.

[1] Muadz takes the same view as Goodall in that grammatical principles and - this is at least the implicit assumption - semantic interpretation should apply to individual planes, not to three-dimensional syntactic units. This raises the same problems, as were mentioned in relation to Goodall's theory.

[2] One of the chief advantages of Muadz's theory over Goodall's theory is the representation and interpretation of coordinators. Coordinators are base-generated as part of three-dimensional trees. Thus, different coordinate sentences can be distinct both with respect to the position and the kind of coordinator.

[3] The theory as presented by Muadz raises the same questions about scope as Goodall's theory, since here semantic conjuncts are conceived as the planes of the phrase marker, and planes are always maximal two-dimensional subtrees. However, unlike Goodall's theory, Muadz's theory can straightforwardly be altered in this respect so as to allow for nonmaximal scope of coordinators. The modification that is required is to change the rule for the construal of planes as the basis for semantic interpretation so that a meaningful

plane need not extend over the whole tree. That is, not every plane need to be rooted in the root node of the entire tree. Even group-referring NPs can be treated that way if one allows planes to be rooted only in the splitting NP node.

[4] One of the advantages that Muadz claims for his theory comes from the analysis of gapping. In Goodall's theory, a sentence with gapping results from phrase marker union of two clauses with the same verb. In Muadz's theory, a gapped sentence such as (25)a. is analysed as in (25)b., where *John* and *Mary*, which belong to different planes, are dominated by the same NP-node.

(25)a. John met Bill and Mary Sue.

```
              / John      / Bill
   b. IP - and  NP   met  NP
                  \         \
                  Mary       Sue
```

Muadz's analysis of gapping predicts that the remnants in a gapped cojunct have to match in category with the corresponding constituents in the first conjunct. This rules out sentences such as (26), which are admitted in Goodall's theory, since here the two clauses corresponding to the two conjuncts only have to share the same verb.

(26) * John played tennis and Bill in the garden.

There are counterexamples to this matching requirement, for instance (27).

(27) a. John asked the time and Bill what to do next.
b. John plays at night and Bill every Sunday.

However, cases violating the matching requirement occur in the same way with phrasal coordination as in (28).

(28) a. John does not know the time and what to do next.
b. John plays at night and every Sunday.

Thus the counterexamples pose a general problem for coordination as multidominance of a node of more than one expansion, rather than constituting a particular problem for Muadz's account of gapping.

[5] A conceptual problem with Muadz's theory concerns X'-theory. Planes serve as the basis for satisfying grammatical principles including X'-theory in three-dimensional phrase markers. However, the PS rule in (16) itself is a direct stipulation as to how to satisfy X'-theory in a three-dimensional phrase marker.

[6] Like Goodall's theory, Muadz's theory does not provide any means for representing the behavior of parallel parts of conjuncts as units (except for the case of gapping). However, one can straightforwardly modify the rules for generating three-dimensional trees by allowing for 'connections' among parts of conjuncts, namely by allowing constituents of conjuncts to be dominated by the same node. This construction type is what I will call 'implicit coordination' and will be introduced in section 1.5.

[7] An issue that is left open in Muadz's dissertation is the generation of Right Node Raising sentences, that is, the generation of joining nodes. Muadz assumes that joining nodes are freely generated, subject only to the filter (for English) that they be rightmost in the tree. However, it is not possible to generate joining nodes by phrase structure rules, which Muadz otherwise assumes in order to define three-dimensional phrase markers. However, there are alternative ways of defining phrase markers beside PS rules. In particular, joining nodes can be accounted for on the basis of node admissability conditions, as we will see later.

Both Muadz's and Goodall's theories are inadequate in two other general respects. First, they both are unable to deal with nested coordinate sentences. Second, they are unable to cope with asymmetries that may may show up among different conjuncts of a coordinate structures. These two issues are simply neglected in both Goodall's and Muadz's treatments and they will play a major role in motivating a different theory of coordination that I will present later. Let me briefly illustrate what the basic problems are.

1.3.2.3. The problem of nested coordination

Both Goodall and Muadz did not take nested coordinate sentences into consideration, that is, sentences such as those in (29).

(29) a. John or Mary separated the oil and the vinegar
b. John or Mary saw Sue or Bill.
c. John and Mary believe that Sue or Bill won the race.

For Goodall's and Muadz's theories nested coordinate sentences pose again the problem of the scope of coordinators. Different coordinators clearly cannot take the same maximal scope.

Furthermore, nested coordinate sentences pose a problem for Muadz's notion of a plane. If planes should serve as the basis for semantic interpretation, as Muadz assumes, then (29c) as a whole should be associated with exactly two planes, one corresponding to *John believed that Sue or Bill won the race* and another corresponding to *Mary believed that Sue or Bill won the race*. The conjunction of the interpretations of these two planes gives the right meaning of (29). However, Muadz's rules generate the following four planes:

(30) a. John believed that Sue won the race.
b. John believed that Bill won the race.
c. Mary believed that Sue won the race.
d. Mary believed that Bill won the race.

Clearly, the conjunction of the interpretations of these four planes does not represent the the meaning of (29c).

The only way to account for nested coordinate sentence in Muadz's approach and to maintain the function of planes as the basis for semantic interpretation is to allow for **'nested planes'**. The planes for *or* in (29c) must be subplanes of each of the planes for *and*. Clearly, this requires that planes are not conceived as two-dimensional trees. The two 'planes' associated with *and* in (29c) would themselves be three-dimensional. 'Planes' then cannot be construed by selecting an expansion of **each** splitting node in the tree, rather they are construed by selecting an expansion of only one splitting node or - in the case of 'respectively'-sentences or gapping - of only two splitting nodes. Thus for (29c) the planes are construed by either selecting an expansion of the splitting node dominating *and* or by selecting an expansion of a splitting node dominating *and*.

I will later argue that within an approach in which three-diemsnional phrase markers are base-generated two distinct notions of plane should be distinguished each of which is required for different reasons, first planes in basically the way they are defined by Muadz's rules and second planes that represent the scope of coordinators and provide the basis for semantic interpretation. Planes in the first sense serve only as the basis for the satisfaction of certain syntactic conditions, and only planes in the second sense serve as the basis of semantic interpretation.

1.3.2.4. The problem of asymmetries among conjuncts

It has often been noted that conjuncts in a coordinate structure do not always behave totally symmetrically, but may display asymmetries. For instance, a quantifier in a first conjunct may bind a variable in the second conjunct, but not conversely. Consider the contrast between (31a) and (31b).

(31) a. *Every man* and *his* dog left.
b. **His* dog and *every man* left.

At first sight, three-dimensional theories in general are not in any obvious way able to account for the either the acceptability of (31a) or the unacceptability of (31b). First, it is not clear how quantifier binding across different conjuncts should be possible, allowing for (31a). Second, it is unclear asymmetries between conjuncts can be represented in a three-dimensional theory of coordination, which would account for the contrast between (31a) and (31b). In a three-dimensional approach, each conjunct is an expansion of the same node. Thus it is not obvious that there can be a hierarchical relation between different conjuncts.

Asymmetries between conjuncts have not been explicitly discussed by either Goodall or Muadz. Muadz, however, is aware of the example (31a) as a problem for how binding theory should apply in three-dimensional phrase markers. Recall that in Muadz view, syntactic conditions hold only in individual planes. Hence, binding theory should not be able to apply 'across planes', as it apparently does in (31a). Maintaining the assumption that Binding Theory applies only in individual planes, Muadz proposes the following account for why *every man* can bind *his* in (31a). *Every man* in (31a) undergoes Quantifier Raising at LF. *Every man* now has to satisfy the prohibition against vacuous quantification in both planes. That is, *every man* has to bind a variable in both planes. In the plane corresponding to the first conjunct, the trace provides the variable. But also the second plane provides a variable, namely the pronoun *his*. Thus, *every man* applies nonvacuously in both planes. The LF of (31a) looks as in (32):

t_i
(32) IP-*every man*$_i$ NP-*and* left.
his$_i$ *dog*

However, this proposal accounts for only part of the problems posed by the data in (31). It can only explain why binding relations are possible from one conjunct to another; it cannot explain why conjuncts behave asymmetrically in this respect, that is, why only (31a), but not (31b) is possible. In Muadz's account, the order of the conjuncts does not matter. Hence (32) would also be the LF for (31b), which has yet to be ruled out.

Moreover, the proposal seems in itself fundamentally inadequate because it predicts that whenever a coordinate structure contains a quantifier in one conjunct, it has to contain a variable in every other conjunct. But no such requirement holds:

(32') a. every man and every woman
b. every man and Mary
c. every man, his dog and Mary

Thus the possibility that a quantifier in one conjunct binds a pronoun in another conjunct is better treated as a phenomenon independent of the CSC. I will come back to this later.

I will show later how the problem of asymmetries among conjuncts can be solved within a three-dimensional theory of coordination without losing any of the advantages of such an approach. The idea is that the coordinator is treated formally as an adjunct to the following conjunct. This will give rise to a hierarchical structure of coordination, while different conjuncts will still belong to different planes.

1.4. An new theory of coordination

1.4.1. A reformulation of Muadz's theory in terms of node admissability conditions

We have seen good arguments for a base-generation approach to coordination. Among those were the requirement that the coordinator be present in the coordinate structure and the requirement that scope be adequately represented. However, we also have seen several problems with one implementation of this idea, namely Muadz's theory. Muadz uses traditional phrase structure rules in order to base-generate three-dimensional phrase markers. But phrase structure rules are themselves inadequate for generating three-dimensional phrase markers, in particular because they are incapable of generating multidominance, that is, joining nodes. As was mentioned, Muadz does not give any rules for generating the joining nodes in RNR structures.

Phrase structure rules, however, are not the only way of defining phrase markers. An alternative are **node admissability conditions** as proposed by McCawley (1968, 1982) for discontinuous constituents (see also Higginbotham 1983). The purpose of the following will be to give a reconstruction of Muadz's theory in terms of node admissability conditions. Node admissability conditions in McCawley's sense are general formal conditions on phrase markers. I will take up McCawley's general idea of defining phrase markers, but disregard the issue of discontinuous constituents. Let me first introduce a number of basic notion and then show how Muadz's theory can be recast in terms of node admissability conditions.

Phrase markers in this account are conceived of as structures (N, D, P), where N is a set of nodes, D the dominance relation (xDy 'x dominates y') and P the relation of precedence (xPy 'x precedes y') and certain axioms about D and P are satisfied.

I will first introduce a notion more general than a phrase marker. This notion will be used also later on. This notion is the one of a precedence/dominance tree. The dominance relation in a precedence/dominance tree should be a reflexive and transitive relation which does not allow for 'loops', i.e. for two distinct nodes each dominating the other. Furthermore, a precedence/dominance tree should have a root node, i.e. a node dominating all the other nodes in the tree. The precedence relation in a precedence/dominance tree is an asymmetric, transitive relation. A number of axioms govern the relation between dominance and precedence. In particular, if elements stand in the relation of dominance to each other, they cannot stand in the relation of precedence to each other. Furthermore, a node x that precedes a node y should precede all nodes that are dominated by y. Finally, if two distinct nodes dominate the same node, then these nodes should not stand in the relation of precedence to each other. (This basically has the effect that the only cases of multidominance that is admitted in precedence/dominance trees are joining nodes that are dominated by nodes that belong to distinct planes.)

Formally this notion of precedence/dominance tree is defined in (33).

(33) A **precedence/dominance tree (PD tree)** is a triple (N, D, P), where N is a set of nodes and D and P binary relations on N x N satisfying the following axioms:

a. (i) xDx.

(ii) xDy, yDz, then xDz.

(iii) xDy, yDx, then $x \neq y$.

(iv) There is an $x \notin N$ such that for all $y \notin N$, xDy.

b. (i) xPy, then not yPx.

(ii) xPy, yPz, then xPz.

c. (i) If xDy, then neither xPy nor yPx.

(ii) If xPy and yDz, then xPz.

(iii) If xDz and yDz, then neither xPy nor yPx.

For the purpose of the following discussions, I will define the following auxiliary notions

(34) Let (N, D, P) be a precedence/dominance tree.

a. x **immediately dominates** y (**xD_iy**) in (N, D, P) iff xDy and for no z in N, $z \neq x$, $z \neq y$, xDz and zDy.

b. x **immediately precedes** y (**xP_iy**) in (N, D, P) iff xPy and for no z in N, xPz and zPy.

c. x is a **terminal node** in (N, D, P) iff there is no y in N, $y \neq x$, such that xDy.

d. x is the **root node** of (N, D, P) iff for all y in N', xDy.

e. x is **rightmost** in (N, D, P) iff there is no y in N such that xPy.

f. (N, D, P) is **binary branching** iff for any subset X of N such that for any y and z in X, xD_iy, xD_iz and yPz or zPy, X has at most two members.

g. x is a **splitting node** in (N, D, P) iff there are y and z in N, $y \neq z$, xD_iy and xD_iz such that neither yPz nor zPy and neither y nor z is a coordinator.

h. x is a **joining node** in (N, D, P) iff there are nodes y and z in N, $y \neq z$, such that yD_ix and zD_ix and neither yPz nor zPy.

i. x is a **branching node** in (N, D, P) iff there are nodes y and z in N, $x \neq y$, such that xD_iy and xD_iz and yPz.

j. A set of nodes X is an **expansion** of a node x in (N, D, P) iff (i) - (iv):

(i) x is in N
(ii) for every y in X, xDiy
(iii) for any y and y' in X, $y \neq y'$, either yPy' or y'Py
(iv) for every x in X and for every y in N, if yPx or xPy, then y is in X.

The theory proposed by Muadz can now be reformulated in terms of node admissability conditions. A phrase marker in the sense in which it is intended by Muadz can be defined by imposing further conditions on a PD tree. I will introduce these conditions in the following.

First, two conditions hold of coordinators. In order to formulate these conditions, a general remark about **coordinators** are in order. I will conceive of the term 'coordinator' as denoting a lexical class of expression which includes *and, but* and *or.*: Thus 'coordinator' does not denote a syntactic function. In the theory that I will propose later, coordinators in fact do not have a special syntactic function, but rather have the ordinary syntactic function of adjuncts (though with a different semantics than adjuncts generally have). However, in contrast to this theory, in Muadz's theory, coordinators are treated as having a special status in a phrase marker.

It is sufficient to characterize the notion of a coordinator as in (35').

(34') **Coordinators** are a lexical class of expressions including *and, but* and *or.*

I will henceforth use the variables '**j, j'**' as a variable standing for coordinators.

One of conditions on coordinators that Muadz's theory would impose says that coordinators do not stand in the relation of precedence to any other element immediately dominated by the same node. Another condition says that for any splitting node x, either x has to immediately dominate a coordinator or the lowest IP node dominating x has to immediately dominate a coordinator. The two cases, of course, represent explicit phrasal coordination and gapping or bare argument ellipsis respectively.

These two conditions on coordinators are formulated in the following axioms.

(35) Axioms on coordinators

Let (N, D, P) be a precedence/dominance tree.

(i) For any j in N, for no x in N such that there is a y in N, yDix, yDij, xPj or jPx.
(ii) For any splitting node x in (N, D, P), there is a j in N such that either xDij or for the lowest w in (N, D, P) that dominates x and has the label IP, wDij.

Furthermore, Muadz imposes a 'rightmost condition' on joining nodes. This condition is formulated in (36).

(36) Axiom on joining nodes
Let (N, D, P) be a precedence/dominance tree.
If y is a joining node in (N, D, P), then y is rightmost in (N, D, P).

A three-dimensional phrase marker in Muadz's sense can now be defined as in (37):

(37) A **(Muadzian) three-dimensional phrase marker** is a PD tree (N, D, P) satisfying (35) and (36).

A notion of a subphrase marker can now be defined as in (37').

(37') A triple (N', D', P') is a **(three-dimensional) subphrase marker** of a three-dimensional phrase marker (N, D, P) iff $N' \subseteq N$, $D' \subseteq D$, $P' \subseteq P$, and (N', D', P') is a three-dimensional phrase marker.

Let us now turn to how grammatical principles apply to three-dimensional phrase markers. Muadz's idea was that the well-formedness of a three-dimensional phrase marker should be based on the wellformedness of the planes of the three-dimensional phrase marker. This first requires a definition of the notion of a plane. A plane should be a two-dimensional subtree of a three-dimensional phrase marker rooted in the same node. But a plane should not contain any coordinators. Furthermore, a plane should be a maximal two-dimensional subtree of this sort. That is, if a plane contains a node x, then this plane should contain any nodes dominated by x as long as those nodes stand in the precedence relation to each other. (More simply, a plane should 'go down' to the terminal nodes.)

(38) A **plane** of a three-dimensional phrase marker (N, D, P) is a maximal precedence/dominance tree (N', D', P') such that the following holds:
(i) (N', D', P') has a root node x such that x is the root node of (N, D, P).

(ii) $N' \subseteq N$.

(iii) $D' \subseteq D$.

(iv) $P' \subseteq P$.

(iv) for any x and y in N', either xDy, yDx, xPy or yPx.

(v) N' does not contain any coordinator.

We can now define a plane assignment to a three-dimensional phrase marker. A plane assignment to a phrase marker can be conceived as the set of all planes of the phrase marker. The definition is given in (39):

(39) Let (N, D, P) be a three-dimensional phrase marker.
A **plane assignment** to (N, D, P) (**PA(N, D, P)**) is the set of all triples (N', D', P') such that (N', D', P') is a plane of (N, D, P).

According to Muadz, a three-dimensional phrase marker is wellformed iff each of its planes is well-formed. The syntactic conditions he had in mind were basically those of X'-theory, Case-theory and Binding theory. Thus we can say the following:

(40) A three-dimensional phrase marker (N, D, P) is **syntactically well-formed** iff
each triple (N', D', P') in PA(N, D, P) satisfies X'-theory, Case theory and Binding Theory.

More generally, we have the following definition of the satisfaction of a syntactic condition in a three-dimensonal tree.

(41) A three-dimensional phrase marker (N, D, P) **satisfies a syntactic condition X** iff each triple (N', D', P') in PA(N, D, P) satisfies X.

The three-dimensional theory of coordination that I will propose differs from Muadz's theory in several respects.

First, a problem with three-dimensional phrase markers in general was the representation of asymmetries between conjuncts. In my proposal, the asymmetry of conjuncts will be represented without losing the three-dimensionality of coordinate structures. This is achieved by treating coordinators syntactically as adjuncts of one of the conjuncts. As another advantage of this treatment, coordinators will not have any special syntactic status in a phrase marker, as they did in Muadz's theory. Thus, no axioms governing the syntactic position of coordinators are required in the new theory.

Second, a general problem with Muadz's theory (and in a similar way with Goodall's theory) concerns the notion of a plane. Planes in Muadz's theory, and similarly, independent phrase markers in Goodall's theory, have two motivations. First, they serve as the basis for the application of grammatical principles and conditions; thus, they allow for reducing the phenomenon of coordination to ordinary grammar. Second, they serve as the basis for the semantic interpretation of three-dimensional phrase markers and represent the scope of coordinators. I will argue that it is not possible to maintain the same notion of plane to satisfy both requirements, the requirement of providing a syntactic basis for applying syntactic principle in the standard way as well as the requirement of providing a representation of scope. A purely formal notion of plane has to be distinguished from the notion of a meaningful plane, a plane that plays a role for semantic interpretation. A meaningful plane, though, may also be three-dimensional tree. Therefore, the term 'plane' in this case is used only in a somewhat metaphoric sense.

In this theory, the interpretation of a (coordinate) sentence has to be relativized not only to a phrase marker, but also to a plane assignment to that phrase marker, more precisely, an assignment of 'meaningful planes'. Assignments of meaningful planes, moreover, do not only play a role in semantic interpretation; they also influence the linearization of a sentence at PF.

The distinction between formal and meaningful planes raises the question whether formal planes are necessary at all, that is, whether the relevant syntactic conditions can be satisfied independently of formal planes. Syntactic conditions could be satisfied in two other ways. They could be satisfied in the three-dimensional phrase marker either directly without reference to any notion of plane or with reference just to meaningful planes. I will later pursue this question in detail and come to the conclusion that f-planes are in fact required for the satisfaction of certain types of syntactic conditions. These syntactic conditions include the Coordinate Structure Constraint, a part of Binding Theory, and presumably the biuniqueness condition of Case Theory.

I will first give arguments for the distinction between purely formal planes and meaningful planes. Then I present rules for the construal of meaningful planes and define the notion of an assignment of meaningful planes. I will then show how semantic interpretation can be conceived in such a way that it applies to sentences relative to a three-dimensional phrse marker. Finally, based on the latter notion, PF linearization rules for a coordinate sentence will be formulated.

1.4.3. The distinction between formal and meaningful planes

Planes in Muadz's theory have two motivations. First, they are the syntactic objects that provide the basis for the application of certain syntactic principles including those of X'-theory, binding theory and Case theory. Second, they serve as the basis for semantic interpretation, providing the 'semantic' conjuncts of coordinators and thus representing the scope of coordinators. However, there are a number of conceptual and empirical arguments that one and the same notion of plane cannot satisfy both functions at the same time. Rather, a distinction is required between planes that have a purely formal motivation and planes that have a semantic motivation by providing the input for semantic interpretation. I will call planes of the former type **'f(ormal)-planes'** and planes of the latter type **'m(eaningful)-planes'**.

The first argument for the separation between the two notions of plane comes from sentences with narrow scope of coordinators and with nested coordinations. Consider first the simple example in (36).

(36) John and Mary met.

The two m-planes that should be associated with *and* and provide the basis for semantic interpretation should correspond to *John* and *Mary*, not to *John met* and *Mary met.* Planes corresponding to *John met* and *Mary met* will be only f-planes. As such they will be disregarded for the purpose of semantic interpretation.

In fact, the notions of f-planes and m-planes that I will define later provide two distinct plane assignments for (36). Let me show what exactly these two plane assignments to (36) are. The assignment of f-planes consists of subtrees of the phrase marker for (36) as given in (37a); the set of m-planes consists of subtrees of the phrase markers for (36) rooted only in the NP node. This plane assignment is given in (37b).

(37) a. f-plane 1: John met.
f-plane 2: Mary met.
b. m-plane 1: John
m-plane 2: Mary

However, this means that the syntactic well-formedness of (36) cannot be based on syntactic principles being satisfied in the m-planes. For instance, from the fact that X'-theory, Binding Theory, perhaps Case theory, and other syntactic requirements are satisfied in the individual m-planes, it does not follow that the entire sentence is therefore wellformed. It would not rule out a sentence such as (38), which could be assigned the same m-planes as (36).

(38) * John and Mary happy.

Let us assume that (38) is assigned the same m-planes as (36). Then if the wellformedness of (38) were to be derived from the wellformedness of m-planes only, (38) might come out as wellformed. Therefore, in order to derive the wellformedness of (36) from individual planes being well-formed, one has to assume maximal planes corresponding to *John met* and *Mary met*. But these planes, of course, cannot serve as the basis for semantic interpretation.

A similar reason for the distinction between f-planes and m-planes comes from nested coordinate structures such as (39):

(39) John or Mary compared Sue and Bill.

Here, in one reasonable interpretation of (39), the planes associated with *or* would correspond to *John compared Sue and Bill* and to *Mary compared Sue and Bill.* But these two planes are not two-dimensional. They are three-dimensional themselves.

For the sake of convenience, I will still call such three-dimensional syntactic objects 'm-planes'; though clearly, the concept 'plane', which applies only to two-dimensional syntactic objects, is not to be taken literally in this case.

Again, if syntactic wellformedness of a three-dimensional phrase marker should be based on the syntactic wellformedness of two-dimensional planes (where syntactic condition apply in the standard way), then (39) should also be assigned two-dimensional subphrase markers as planes. These planes would correspond to *John compared Sue*, *John compared Bill*, *Mary compared Sue* and *Mary compared Bill.* Of course, they must also be disregarded for semantic interpretation.

Thus, we will have two plane assignments for (39). The m-planes of (39) are represented by their terminal nodes in (40) and the f-planes are in the same way represented in (41).

(40) m-planes associated with *and*:
plane 1: Sue
plane 2: Bill
m-planes associated with *or*:
plane 1: John compared Sue and Bill
plane 2: Mary compared Sue and Bill

(41) the assignment of f-planes:
plane 1: John compared Sue
plane 2: John compared Bill
plane 3: Mary compared Sue
plane 4: Mary compared Bill

To summarize, since the m-planes for (39) in part are three-dimensional (the m-planes associated with *or*), it is impossible to apply grammatical principles to these planes in the standard way; and hence the syntactic well-formedness of (39) cannot be based on the standard notion of well-formedness holding in individual planes. In order to derive the wellformedness of (39) from the well-formedness of planes, one has to assume purely formal planes, which cannot be interpreted as part of the sentence meaning. If planes should serve as the basis of semantic interpretation, one has to assume a different set of planes, m-planes. These planes would include two-dimensional planes as well as 'three-dimensional planes'.

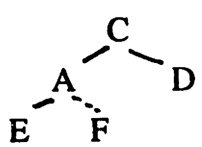
M-planes serve as the basis of interpretation and represent the scope of coordinators. In the next section, I show how m-planes are in fact required in order to allow for a compositional interpretation of a three-dimensional syntactic tree.

1.4.4. The necessity of m-planes

Conceptually, m-planes implement the scope of coordinators. But clearly, the scope of coordinators can also be represented in some other way, for instance by scope indexing. However, m-planes are in fact conceptually required as the syntactic basis for semantic interpretation, because they determine the syntactic units of interpretation of a three-dimensional tree and resolve an ambiguity in the possible direction of compositional interpretation of a three-dimensional tree. Let me show exactly why.

Unlike two-dimensional syntactic trees, three-dimensional syntactic trees are ambiguous with respect to which direction the compositional interpretation of the sentence should take. Consider the three-dimensional tree in (42) and assume for the sake of the argument that the terminal nodes E, F and D are lexical items with particular meanings.

(42)



There are two ways in which the set of terminal nodes of (42) could be evaluated. First, E and F could be evaluated as a unit. Then the evaluation of E and F would be subject to a semantic operation together with the evaluation of D. Second, E and D could first be evaluated as a unit as well as F and D. Then the evaluation of E and D and of F and D would be subject to a semantic operation.

These two ways of evaluating (42) can be based on two different assignments of m-planes to (42). The first m-plane assignment would contain two **'small' planes** terminating in E and F. The second m-plane assignment would contain two **'big' planes** terminating in ED and in FD.

Without an assignment of m-planes, it would not be clear at all what to evaluate as a unit among the terminal elements in a tree such as (42). Thus m-planes are essential for providing the basis for an unambiguous compositional semantic interpretation of a coordinate sentence within a three-dimensional phrase marker approach.

At the same time as m-planes provide the basis for the evaluation of three-dimensional syntactic structures, they reflect the scope of a coordinator. Thus the first m-plane assignment to (42) implements a narrow scope of the coordinator *and*, whereas the second m-plane assignment to (42) implements a wide scope of *and*.

In this way, m-planes provide a new way of representing the scope of a coordinator with different predictions than in traditional syntactic theories of coordination. In the planar account of scope, there are no reason based on the format of the theory why a coordinator should be associated with smaller or bigger planes. Both kinds of planes are equally 'natural' given the syntactic structure. In contrast, traditional theories in which conjuncts constitute constituents with internal linear order in the same way as the surrounding elements, only narrow scope would be the natural choice. Wide scope would require special rules or devices such as movement of the coordinator.

1.4.6. Syntactic conditions that can be satisfied in a three-dimensional phrase marker directly without reference to planes

A number of syntactic conditions can be satisfied in three-dimensional phrase markers directly, without any reference to planes. X'-bar theory is one example that actually does not require reference to planes. X'-theory consists in local conditions which can be checked simply by considering any node in the phrase marker and all of its daughter nodes which are ordered by the relation of precedence to see whether they have the relevant category labels. Later, I will give a formal definition along these lines of what it means for a three-dimensional phrase marker to satisfy X'-theory.

Among the other syntactic conditions that can be satisfied directly in a three-dimensional phrase marker is syntactic selection. To see whether a three-dimensional phrase marker satisfies syntactic selectional requirements, it is sufficient to check each expression and its arguments (in whatever plane they may be) to see whether the arguments are of the relevant syntactic catgories.

1.4.4. The necessity of f-planes

In Muadz's and Goodall's theories, the correlates of f-planes ('planes' or independent phrase markers before phrase marker union) form the basis of the satisfaction of syntactic principles. However, we have seen that certain syntactic conditions can also be satisfied locally in a three-dimensional tree, without requiring any notion of plane, for example X'-theory. But then, since the notion of m-plane is required independently, the question is, are f-planes really necessary? I will now show that there are syntactic conditions that in fact require f-planes. These syntactic conditions can neither be established directly in a three-dimensional tree, nor can they be established in m-planes only.

The most important among those syntactic conditions is the one underlying the Coordinate Structure Constraint (CSC), namely the prohibition against vacuous quantification. In the three-dimensional theories of coordination of Muadz and Goodall, the CSC is derived from the requirement that the prohibition against vacuous quantification be satisfied in each plane or in the individual phrase markers before phrase marker union (see also section).

The crucial observation in the present context is that the condition against vacuous quantification applies to quantifiers outside the 'scope' of coordinators with conjuncts containing bound variables, that is, outside of small m-planes. Thus the planes for *and* in (41a) and (41b) do not extend beyond the object NPs. But still the wh operator outside these planes requires variables to bind in each of the planes.

(41) a. Who did John compare a picture of t and a photograph of t.
b. * Who did John compare a picture of t and a photograph.

Does the prohibition against vacuous quantification have to be satisfied in the same way with quantifiers such as *every man*? Here it seems that the prohibition against vacuous quantification need not be satisfied in each f-plane if Quantifier Raising is assumed. That is, a quantifier originating in one conjunct at D-structure does not require a variable in every other conjunct. This is seen in (41').

(41') a. John met every student and Mary.
b. John met all students and a lot of professors.

If one would assume Quantifier Raising, *every student* in (41'a) and *all students* (41'b) would have to raise to a position in which it will belong to both f-planes. For instance in (41'a) *every student* might adjoin to the VP, as in (41").

(41") John [$_{VP}$[every student][$_{VP}$met t and Mary]].

But one of the f-planes of (41'a) will not contain a variable for the quantifier to bind.

Without Quantifier Raising, there would not be any obvious need for the quantifier to bind a variable in the conjunct. In fact, in this dissertation, I will assume scope-indexing in the sense of Williams (1986), rather than Quantifier Raising, and hence the counterexample to the prohibition against vacuous quantification being satisfied in the individual f-planes will not arise.

Other syntactic conditions that require f-planes are biuniqueness conditions. Among those, arguably, is the biuniqueness condition for Case assignment. A Case assigner can assign Case only exactly once. This condition cannot be satisfied in a three-dimensional tree directly, because then it may in fact be violated in many cases. For instance, it would be violated in (42) because *compared* assigns accusative case twice, namely to *the picture* and to *the photograph.*

(42) John compared the picture and the photograph.

Also the condition cannot be satisfied in m-planes, if m-planes are small as in (42). Rather, the biuniqueness condition can generally be satisfied only in f-planes. The two f-planes of (42) are given in (43).

(43) f-plane 1: John compared the picture.
f-plane 2: John compared the photograph.

Clearly, in these two planes, the biuniqueness condition is satisfied.

More generally, it appears that any syntactic condition involving a 1-1 relation between syntactic elements can be satisfied in three-dimensional trees only by being satisfied in f-planes, for instance also the Bijection Principle (Koopman/Sportiche 1983).

What about other meaningful relations beside the prohibition against vacuous quantification? Generally, it holds that a syntactic element x that requires a relation to another element has to satisfy this relation in all f-planes to which x belongs. Thus reflexives and other elements requiring an antecedent require an antecedent in all f-planes. This is seen in (44a), where the reflexive is dominated by a joining node. The reflexive requires an antecedent in each f-plane to which it belongs and thus in each of the two conjuncts. But this condition is not satisfied in (44a) because the second conjunct does not provide an antecedent for *themselves*.. The condition, however, is satisfied in (44a'), a split antecedent construction discussed in chapter 2. similar example are given for binominal *each* in (44b) and (44b').

(44) a. * *The men* praised and the woman criticized pictures of *themselves*.
  a'. *The men* praised and *the women* criticized pictures of *themselves*.
  b. * On two days *each* [*the men* played piano and it rained].
  b'. On two days *each* [*the men* played piano and *the women* played violin].

But the converse, of course, does not hold. The antecedent of a reflexive does not require a reflexive in all f-planes, as seen in (45).

(45) *John* played and entertained *himself.*

The same condition also holds for NPIs. If an NPI is in a position in which it belongs to several f-planes, it requires a licencer in each of those f-planes. This condition is not satisfied in (46a) and (46b) because here only the second conjunct provides an NPI licencer.

(46) a. *Mary claimed and John denied that they ever met.
  b. * Mary saw, but John did not see anybody.

Thus we have the following condition on how required syntactic relations must be established in three-dimensional phrase markers.

(47) <u>The condition on establishing required syntactic relations in three-dimensional phrase markers (CRS)</u>
  If an element x (because of its lexically specified function) must stand in a

syntactic relation to another element, it must stand in such a relation to such an element in each f-plane.

Clearly, the condition (47) now also subsumes the Coordinate Structure Constraint, that is, the requirement that the prohibition against vacuous quantification be satisfied in each f-plane to which the relevant operator belongs. An operator is a syntactic element that must stand in a relation to a variable which it binds. Hence it falls under (47).

The CRS requires a certain modification. This is due to the following fact.
On the view that there is no Quantifier Raising, a quantifier in one conjunct may a variable in another conjunct, both as a pronominal or a reflexive, as in (48).

(48) a. *every man* and *his* dog
b. *every man* and a picture of *himself*

This present a problem for the principle CRS. According to the CSR , *his* as a variable in (48a) and *himself* as a reflexive and a variable in (48b) require an antecedent in each f-plane to which they belong. But the only f-planes to which they belong will not contain an antecedent, given that no Quantifier Raising takes place. The only antecedent they take belong to other f-planes. This suggests that the CSR should be modified in the following way. An element x that enters a required syntactic relation R to an elemeny y in one f-plane to which x belongs has to enter this relation to an element in each f-plane to which x belongs. That way, it will be possible that an element x only takes an antecedent in an f-plane to which x does not belong. This modification of the CRS is given in (49).

(49) <u>The condition on establishing required syntactic relations in three-dimensional phrase markers (CRS) (modified version)</u>
If an element x (because of its lexically specified function) must stand in a syntactic relation to another element and it stands in this relation in some f-plane to which x belongs, then it must stand in this relation to an element in each f-plane.

Furthermore, the possibility that an anaphor takes an antecedent in an f-plane to which the anaphor does not belong suggests the following principle for establishing anaphoric relationships and variable binding in three-dimensional phrase markers:

(50) Anaphoric relations and variable binding may be established directly in three-dimensional phrase markers, subject only to CSR.

Later, within a particular proposal about the internal structure of coordinate sentences, I will show how binding of an element in one conjunct by a quantifier in another conjunct can be established. This will only require a modification of the notion of c-command in order to be applicable to three-dimensional phrase markers. According to this notion, *every man* in will c-command *his* in (48a) and *himself* in (48b).

The last principle and the CRS give sufficient information about how Condition A of Binding theory is can be satisfied in three-dimensional phrase markers. But how do the other conditions of Binding Theory apply in three-dimensional phrase markers? Should the conditions B and C hold in f-planes, relative to m-planes, or can they be satisfied directly in three-dimensional phrase markers? Let us first consider condition B. Goodall argued that condition B has to be satisfied in the individual phrase markers before phrase marker union. This would mean that condition B would have to be satisfied in m-planes. Goodall's arguments come from 'respectively'-sentences such as in (51).

(51) a. *John* and Mary admired Sue and *him* respectively.
b. * *John* and Mary admired *him* and Sue respectively.

(51a) is acceptable. But this means that condition B need not be satisfied in all f-planes. In (51a), it is not satisfied in the f-plane corresponding to *John admired him*. This might suggests that condition B must be satisfied in m-planes, rather than f-planes. But again this cannot be right. If this were so, then (52) could not be derived as a condition B violation:

(52) *John* compared *him* and Mary.

In (52), the two m-planes are small, terminating in *him* and *Mary*. In those m-planes, Condition B is clearly not violated. A way to derive a Condition B violation in (51b) and the lack of it in (52) would be by reformulated condition B in such a way that it requires a pronominal to be free in some f-plane (not necessarily all f-planes). This is given in (53).

(53) <u>Condition B for three-dimensional phrase markers</u>

A pronominal must be free in its domain in some f-plane and in every m-plane.

However, (53) would predict that the following would be acceptable:

(54) * *John* and Mary compared *him* and Sue.

Let us now turn to Condition C. With a similar condition as (53) we would expect (55a) to be acceptable, but not (55b), which seems to be the case.

(55) a. Mary and John admired Bill's picture and Mary's picture respectively.

b. * Mary and John admired Mary's picture and Bill's picture respectively.

Thus we can give the following reformulation of Condition C:

(56) <u>Condition C for three-dimensional phrase markers</u>

An R-expression must be free in some f-plane and in all m-planes.

Note, however, that also (57) will come out as acceptable:

(57) * Mary and John compared Mary's picture and Bill's picture (respectively).

Thus the question of how Condition B and Condition C are satisfied in three-dimensional phrase markers is yet not satisfactorily answered. But I will pursue this issue further.

I will not attempt to give an exhaustive classification of syntactic conditions which have to be satisfied in f-planes. The purpose of this section was only to suggest that certain conditions cannot be satisfied directly in a three-dimensional tree and to show how they have to be satisfied in f-planes.

To summarize the main points of the last sections, we need two notions of a plane. Planes of the first kind, f-planes, can be conceived as maximal two-dimensional subtrees and serve as the basis for the satisfaction of a number of syntactic principles including the CRS and the biuniqueness condition of Case theory. Since f-planes certainly cannot serve as the basis for semantic interpretation, m-planes are required, as well. M-planes need not extend over the entire phrase marker, that is, they need not be rooted in the root node of the phrase marker. Furthermore, m-planes may themselves be three-dimensional, namely in cases of nested coordination.

1.4.5. Syntactic conditions that cannot be satisfied in f-planes

One of the chief motivations of the three-dimensional phrase marker approach to coordination was that the syntax of coordinate sentences can be reduced to the syntax of noncoordinated sentence by applying grammatical principles to independent phrase markers whose union yields the coordinate structure or to planes (ordinary phrase markers) obtained from a three-dimensional phrase markers for the coordinate sentence. However, certain syntactic conditions are clearly not satisfied in f-planes in coordinate sentences. For instance, agreement must take into account elements that belong to distinct planes. Consider (58).

(58) John and Mary are singing.

Verb agreement in (44) must take into account a plural feature on the NP node which comes from the NP having two distinct noun heads in different f-planes. Thus in general, the assignment of features to a projection may have to take into account features assigned to expansions in different f-planes. This holds regardless of what kind of m-planes are assigned. For instance, the principle holds even for 'respectively'-sentences, as in (59), which involve 'big' m-planes, m-planes rooted in the IP node.

(59) John and Mary are seeing Sue and Bill respectively.

1.4.7. The assignment of m-planes to sentences with gapping and bare argument ellipsis

Let me add a few remarks about the treatment of gapping. In the analysis of gapping, Muadz assumes two interdependent rules for the generation of multiply dominating nodes without overt coordinator, where the application of the second rule depends on the prior application of the first rule and the application of the first rule depends on the later application of the second. This proposal understood that way certainly does not make sense. But there are a number of alternatives one can conceive of for generating multidominance without overt coordinator. First, one might think of generating an empty coordinator in the relevant position, which then has to be identified by an overt coordinator higher in the tree. Thus (60a) would have the representation in (60b):

(60) a. John met Mary and Bill Sue

b.
```
                    John              Mary
        IP-andi   NP-ei      met    NP-ei
                    Bill              Sue
```

This way, gapping would not require splitting nodes not immediately dominating coordinators. The alternative is to freely generate multiply dominating nodes without overt coordinator, but to rule out the unacceptable structures as a matter of m-plane construal or interpretation. A structure with a multiply dominating node without overt coordinator higher in the tree might be ruled out semantically because the interpretations of separate planes have to be combined, which would be possible only by semantically evaluating an overt coordinator. This seems to be prima facie the most plausible and simplest account, which I will therefore adopt.

There is an important difference between phrasal coordination on the one hand and gapping and bare argument ellipsis on the other hand. Unlike with phrasal coordination, the remnant and the correlate in a gapped sentence may never form a group term providing an argument for a collective predicate:

(61) # John shared the coffee and Bill the cake.

The same holds for bare argument ellipsis: the remnant and the correlate cannot constitute a group term providing an argument of a collective predicate:

(62) # John met and Bill (too).

A natural account for this phenomenon can be given on the basis of rules of plane construal. That is to say, gapping and bare argument ellipsis obligatorily involve the construal of 'big planes'. Thus (61) has to be associated with the planes with the terminal nodes *John shared the coffee* and *Bill shared the cake* and (62) has to be assigned the planes with the terminal nodes *John met* and *Bill met*. Then, since these planes must be semantically evaluated, the unacceptability of (61) and (62) follows.

But why do the planes for (61) and (62) have to be 'big'. The answer can be implemented in the rules of m-plane construal. Distinct m-planes construed on the basis of splitting nodes without overt coordinator have to 'meet' in a node immediately dominating an overt coordinator. In (61) and (62), this node would be the IP node.

An interesting question is, should the expansions of a splitting node 'distinguish' only one complete set of m-planes? It might be that a sentence can be assigned two distinct complete set of m-planes each of which is associated with one and the same splitting node, but which differ in which node they are rooted in. Thus (60a) might have two m-plane assignments, one given in (63a) and another one given in (63b).

(63) a. plane 1: John met Bill.
plane 2: Mary met Sue.
b. plane 1a: John   plane 2a: Bill
plane 1b: Mary   plane 2b: Mary

I will argue that two plane assignments such as the ones in (63a) and in (63b) can in fact be assigned to a sentence simultaneously. The analysis of certain constructions in chapter 2 relies crucially on the idea that a three-dimensional tree may be assigned two different m-plane assignments. They both are simultaneously evaluated semantically and thereby constitute the syntactic basis for part of the full meaning of the sentence. However, multiple plane assignments are generally not obligatory. In the case of gapping, only the assignment of big m-planes is obligatory.

1.4.7. Representing asymmetries among conjuncts

A general problem is for a three-dimensional approach to coordination (as well as for syntactic theories of coordination in general), how can a coordinator be represented in a three-dimensional tree and X'-theory be satisfied? The coordinator should certainly not belong to a distinct plane from the conjuncts. In this section, I will give an account of the position of the coordinator, which at the same time provides a way of representing asymmetries among conjuncts.

Let me start with a number of general remarks about asymmetries among conjuncts. In three-dimensional theories of coordination, conjuncts are represented in a completely symmetric way. However, this poses problems for phenomena of asymmetries among conjuncts, in particular with respect to Binding Theory. Thus a quantifier in the first conjunct may bind a pronoun in the second conjunct, but not vice versa.

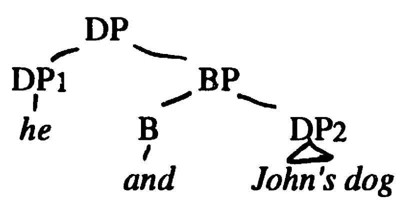
(64) a. *every man* and *his* wife
b. *every man* and two of *his* children
c. *every man* and a picture of *himself*

(65) a. * *his* wife and *every man*
b. * two of *his* children and *every man*
c. * a picture of *himself* and *every man*

Two further binding asymmetries are mentioned by Munn (1991). In the first case, an R-expression in the first conjunct may be coreferential with a pronoun in the second, but not vice versa.

(66) a. *John's* dog and *he/him* went for a walk.
b. * *He* and *John's* dog went for a walk.

In order to account for these asymmetries (as well as for a reinterpretation of ATB extraction as parasitic gaps), Munn proposes a subordinate structure of coordination. In this theory, the coordinator is the head of a new category BP ('Boolean phrase'). In (66b) this category is adjoined to the first conjunct. The second conjunct is the complement of the coordinator. This is seen in (67).

(67)


DP$_1$ asymmetrically c-commands DP$_2$. Hence the unacceptability of (66b) is derived as a Condition C violation.

Another case of a binding asymmetry noted by Munn is given in (68).

(68) a. They$_i$ liked stories about them$_i$ and each other$_i$.

b. * They$_i$ liked stories about each other$_i$ and them$_i$.

Munn accounts for the contrast between (68a) and (68b) in the following way. Given the subordinate structure of coordination, *them* is free in its binding domain (the entire picture NP) in (68a), but not in (68b), where it is bound by *each other* in its domain.

Further evidence for the BP analysis of coordination comes from phenomena that indicate that the coordinator forms a constituent with the last conjunct. Such phenomena were noted by Ross (1967)

(69) a. John left; and he didn't even say goodbye.
b. John left. And he didn't even say goodbye.
c. * John left and. He didn't even say goodbye.

In Munn's theory, the coordinator forms a constituent with the following conjunct, but not with the preceding one; hence the contrast between (69b) and (69c). In traditional theories of coordination, the coordinator does not form a constituent with a conjunct at all.

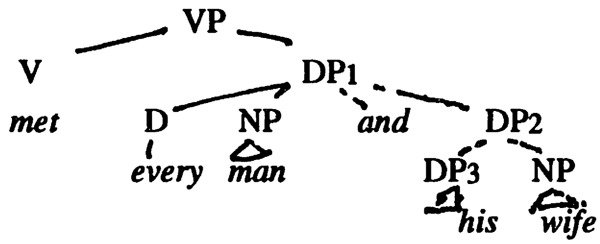
Munn's proposal, however, is problematic in several respects. First, it is not capable to predict a number of properties of coordination, for instance the Law of the Coordination of Likes and parallelism phenomena holding among conjuncts. Furthermore, it is unclear how the DP dominated by the BP node should enter syntactic relations to elements outside the coordinate DP in the standard way. For instance, it quite unclear how this NP should be governed by a verb outside the DP in order to be assigned Case.

The binding asymmetries are problematic for the three-dimensional theories of coordination of Muadz or Goodall. In those theories, either syntactic relations such as those of Binding Theory are disallowed across planes, that is, among elements belonging to different planes or different two-dimensional phrase markers. In this case, an assumption that Goodall and Muadz in fact make, any application of Binding Theory across planes or after phrase marker union is incorrectly excluded. Alternatively, one may allow the application of Binding Theory also across planes or after phrase marker union. Then, however, one would expect a complete symmetry among the conjuncts in this respect, which is not borne out by the facts.

There is, however, a way to implement asymmetry among conjuncts within a three-dimensional phrase marker approach. The idea is that coordinators are formal adjuncts of (at least) one of the conjuncts. Thus the VP of (70a) has the following structure:

(70) a. John met *every man* and *his* wife.

b.



Unlike Muadz, I will not assume that Binding Theory can apply only in individual planes. Rather I will assume that Binding theory can apply directly in three-dimensional phrase markers regardless of planes. In particular, a quantifier in one conjunct can bind directly a variable in another conjunct, without undergoining QR. Clearly, then also notions such as 'c-command' must be defined for nodes which may be contained in different planes.

I will assume the following definition of c-command (cf. Reinhart 1976), where the prohibition against domination is restricted to nodes belonging to the same f-planes.

(71) <u>C-command in three-dimensional phrase markers</u>

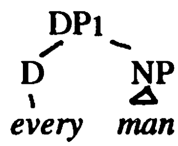
Let (N, D, P) be a three-dimensional phrase marker.

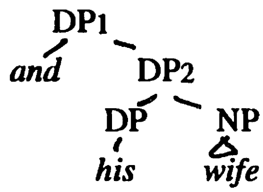
x **c-commands** y in (N, D, P) iff x does not dominates y in all f-planes (N', D', P') of (N, D, P) such that x N', and every branching node z that dominates x dominates y.

Recall that dominance is reflexive. Hence according to (71), no node will c-command itself.

According to (71), DP$_1$ c-commands DP$_3$ in (70b) because every branching node dominating DP$_1$ also dominates DP$_3$ and DP$_1$ does not dominate DP$_3$ in all f-planes to which DP$_1$ belongs (DP$_3$ not being contained in one of the two f-planes which contain DP$_1$). But DP$_3$ does not c-command DP$_1$, since it is dominated by a branching node DP$_2$ which does not dominate DP$_1$.

Let us assume that planes are to be construed and the well-formedness of three-dimensional phrase markers is determined in the way outlined in the previous section. Then the phrase marker rooted in the DP1 node in (70b) comes out as well-formed in the following way. It can be divided into the following subtrees, each of which satisfies X'-theory:

(72) a.


b.


(72b) is well formed because it is an ordinary adjunction structure satisfying X'-theory.

In this account, the asymmetry among the conjuncts crucially depends on the presence of the overt coordinator. Note, though, that the asymmetries also show up among (noninitial) conjuncts without overt coordinator. There does not seem to be a significant difference between the following a-sentences and b.-sentences.

(73) a. *every man*, *his* car and *his* dog
b. *every man* and *his* car and *his* dog
(74) a. *John*'s dog, *he* and Mary left for a walk.
b. *John*'s dog and *he* and Mary left for a walk.
(75) a. *They* told stories about *each other, them* and *each other*'s friends.
b. *They* told stories about *each other* and *them* and *each other*'s friends.

Therefore, I will assume that every conjunct but the first one will be generated as containing a coordinator. Only a late PF rule optionally deletes all but the last coordinator in (73a), (74a) and (75a). Thus in this analysis of coordination, there will be asymmetric binding possibilities only with adjoined coordinators.

Furthermore, the asymmetries do not only hold between the initial conjunct and any subsequent conjunct. They hold among any two conjuncts where one precedes the other:

(76) a. John and *every professor*, and *his* assistant

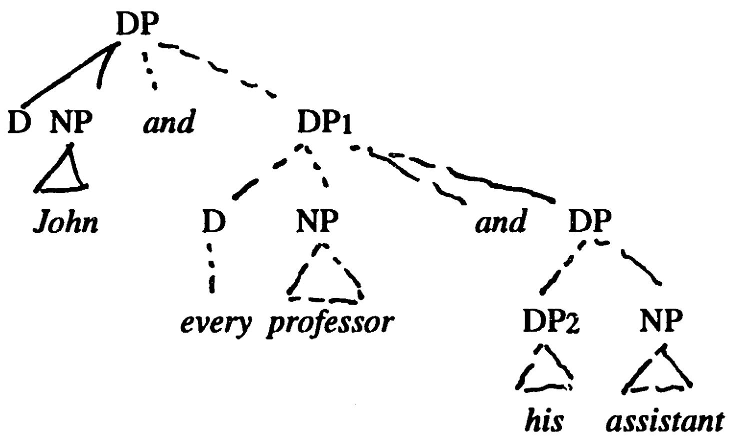
b. John, *every professor*, Mary, and *his* assistant

c. * John, *his* assistant, *every professor*, and Mary

d. * John, *his* assistant, Mary, and *every professor*

This requires extending the hierarchical structure to all conjuncts. This is in fact unproblematic. Thus the structure of (76a) would be as in (77).

(77)



The possibility of binding and the c-command asymmetries hold for the more embedded structure in (77) in the same way as for (70a). Thus, in (77), DP1 c-commands DP2.

In this account, one and the same structure for coordination accounts for both asymmetries among conjuncts and for phenomena that have motivated the assumption that conjuncts belong to different planes. An alternative to this account would be to assume that coordinate structures displaying asymmetries among conjuncts have a different syntactic structure than coordinate structures displaying the behavior that motivates distinct planes for conjuncts, for example ATB extraction. In such an approach, one would say that coordinate structures may receive either a three-dimensional symmetric analysis or a Munn-type analysis with subordination. However, there is evidence that the present account, in which the two aspects of coordination are combined, is on the right track. It appears that the phenomena that have motivated the symmetric three-dimensional account of coordination such as ATB extraction may cooccur with phenomena involving binding asymmetries in the same structure:

(78) a. A man t and his wife t entered the room from Germany.

b. * A man t and his wife from France entered the room from Germany.

(79) * Who did John meet a daughter of t and her husband?

Thus (78a) is fine where *a man* in the first conjunct binds *his* in the second conjunct and extraction of *from Germany* has taken place from both conjuncts across-the-board.

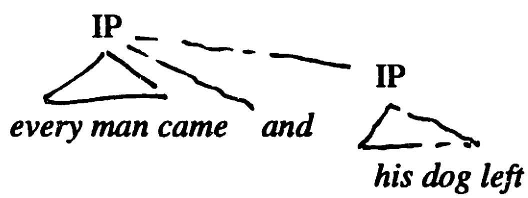
Binding across planes is not possible in all coordinate structures. Generally, a quantifier contained in a clausal conjunct cannot bind a pronoun contained in another clausal conjunct, though mysteriously, the same is possible for VP coordination:

(80) a. * *Every man* came and *his* dog left.

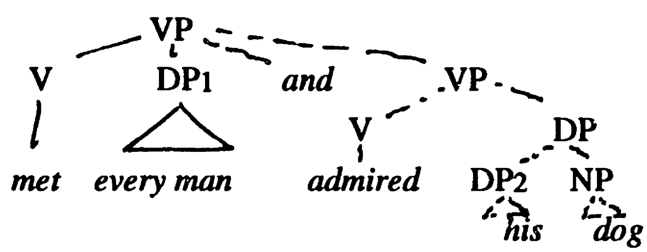
b. Mary met *every man* and admired *his* dog.

The inacceptability of (80a) does not follow straightforwardly from the proposed account, though the acceptability of (80b) does. The structure for (80a) would be as in (81a), and the one for (80b) as in (81b).

(81) a.



b.



Clearly, in (81b) DP1 c-commands DP2; but this is also the case for *every man* and *his* in (81a). Thus the inacceptability of (60a) still requires an explanation.[2]

To sum up so far, in the proposed account of coordination, I have introduced an adjunction structure for coordinators. This way, binding asymmetries can be accounted for within a three-dimensional theory of coordination. Clearly, the account also explains why the coordinator behaves as a constituent together with the following conjunct. The analysis allows X'-bar theory, Case theory etc. to apply to planes in a coordinate structure in the standard way without raising any problems concerning the status of the coordinator. The account, however, presupposes that X'-theory does not directly mirror semantic functions. The semantic function of coordinators certainly differs from the semantic function of adjuncts. Coordinators are semantically argument-takers, but adjuncts are not.

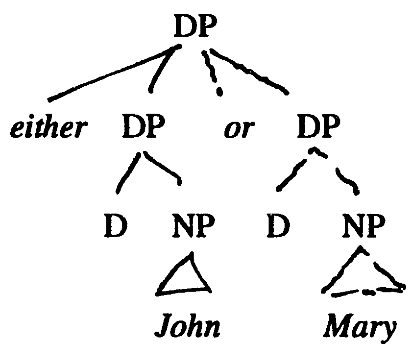
This account still has to answer a number of questions. First, why are coordinators as adjuncts excluded in initial conjuncts, as in (82)?

(82) * And John and Mary met.

However, coordinators preceding initail conjuncts do not generally seem to be prohibited. Many languages have constructions in which also the initial conjunct may be preceded by a coordinator. This is the case, for instance, in the construction *et-et* in Latin or *ou-ou* in French. Also *either* or *whether* in English can be considered coordinators adjoining to intial conjuncts. Obviously, they are restricted to occurring in a position adjoined to the intial conjunct of a coordination. If this is right, (83a) would have the structure in (83b).

(83) a. either John or Mary.

b.



Clearly, each of the two f-planes of (83b) satisfies X'-theory:

Thus coordinators as adjuncts to the intial conjuncts do in fact occur. The only difference between coordinators adjoining to initial conjuncts and coordinators adjoining to noninitial conjuncts is that there are generally more conditions on which coordinators may or must occur as adjuncts to initial conjuncts.

A second question is, what requires *and* to occur in only the final conjunct or in all but the initial conjunct of a coordination:

(84) * John, Mary, Sue or Bill or Joe

I will later show that these properties of coordination can be made to follow from general conditions on the linearization of coordinate structures and the rule of coordinator deletion at PF.

1.5. A new formalization

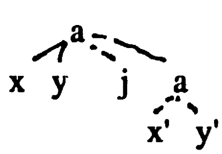
I will now formally present a theory of three-dimensional phrase markers which differs from the theory presented in section (1.4.) in the relevant respects. This theory is also based on the notion of a precedence/dominance tree. However, it differs with respect to the possibility of joining nodes, the relation between coordinators and splitting nodes, the status of coordinators and with respect to the role of planes.

1.5.1. The definition of phrase markers

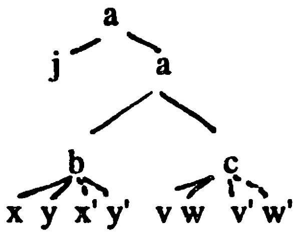
The assumption about phrase markers that differ from Muadz's theory concern first the status of joining nodes and second the status of splitting nodes. Basically, I will not impose any structural condition on joining nodes (such as the condition of being rightmost in the tree). Rather the relevant restrictions follow from rules of linearization. I will impose a single condition on coordinators.

Let me first graphically list the set of tree configurations for coordination that a three-dimensional phrase marker should allow. It should allow for the following configurations. Not all of those configurations have been motivated yet. I will motivate the configurations in (85c) and (85d) only at the end of this chapter (85c) and in chapter 2 (85d).

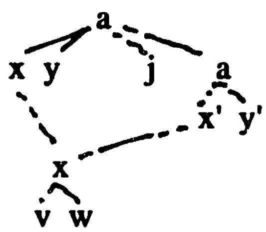
(85) a. explicit phrasal/clausal coordination (e.g. *John and Mary came*)



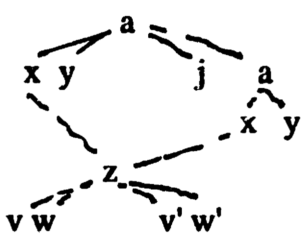
b. gapping and bare argument ellipsis (e.g. *John saw Sue and Bill Mary*)



c. <u>joining nodes for RNR and ATB extraction</u> (cf. section 1.7.) (e.g. *who did Mary see and Sue meet* and *Mary saw and Sue met this man*)



d. <u>joining nodes for implicit coordination with group formation</u> (cf. chapter 2) (e.g. *John praised and Mary criticized the same person*)



Thus, in contrast to what is allowed in Muadz's theory, the present theory allows for more possibilities for joining nodes. In particular, joining nodes need not be rightmost in the tree, as seen in the structures (85c) and (85d). In order to allow for all these configuraions, we can simply adopt the definition of a precedence/dominance tree, which is sufficiently liberal.

Muadz's theory was reformulated on the basis of the notion of a precedence/dominance tree and certain conditions on joining nodes and on coordinators. Unlike in Muadz's theory coordinators in the present theory do not have a special syntactic status. They are simply adjuncts to one of the conjuncts. In particular, they always belong to one of the f-planes of a three-dimensional phrase marker. In contrast to the reformulation of Muadz's theory, I will impose only one conditions on the occurrence of coordinators. Even this condition might be derivable from something else, for instance from conditions on the construal of m-planes or general conditions of the interpretability the sentence. The condition I will impose requires that each splitting node either immediately dominate a coordinator or be dominated by a node immediately dominating a coordinator so that no other splitting node intervenes between the splitting and the node dominating the coordinator.

(86) Axiom on coordinators

Let (N, D, P) be a precedence/dominance tree.
If x is a splitting node in (N, D, P), then there is a j in N such that either x Dij or there is a y in N such that yDx and yDij and for no splitting node z in N, $z \neq x$, $z \neq y$, yDz and zDx, there is a coordinator j' in N such that zDij'.

Note that (86) does not say anything about whether the node y has to itself be a splitting node or not. y is a splitting node in the configuration (85c) and (85d), but not in the case of gapping and bare argument ellipsis in (85b).

I now define a three-dimensional phrase marker simply as a DP tree satisfying the condition on coordinators.

(86) A **three-dimensional phrase marker** is a DP tree satisfying the condition (86).

What I have done in this section was basically presenting a weaker theory of three-dimensional phrase markers than Muadz's theory. However, this does not mean that the theory is necessarily too unrestrictive. A number of restrictions that the general theory of coordination should impose will not follow from the definition of a phrase marker itself, but rather from other components of the theory, in particular, conditions on the satisfaction of syntactic principles in three-dimensional phrase markers, rules for the construal of m-planes, the general requirement that a three-dimensional phrase marker be interpretable and rules of the linearization of a coordinate sentence at PF.

Earlier I have classified a number of syntactic principles as to whether they can be satisfied in a three-dimensional phrase marker directly (without reference to a notion of plane) or in f-planes or, perhaps, by reference to m-planes. In the next section, I will show formally how certain syntactic conditions can be satisfied in three-dimensional phrase markers.

1.5.2. The wellformedness of a three-dimensional phrase marker

As was said earlier, certain syntactic principles can be satisfied locally in a three-dimensional tree. I will now show how such a direct satisfaction of syntactic conditions will look like formally in the case of X'-theory. Let assume for the sake of simplicity that a three-dimensional tree satisfies binary branching in the sense of definition (34f). We can then check whether a three-dimensional tree satisfies X'-theory iff any three nodes x, y and z in the tree such that z immediately dominates x and y and x and y are ordered by precedence are in one of the following three forms: z is an X' and x and z are the head and the complement or z is a maximal projection and x and y are the specifier and the X' or we have an adjunction structure, i.e. z has the same label as x and y is a maximal projection.

Formally, the satisfaction of X'-theory in a three-dimensional phrase marker can now be defined as in (87):

(87) A precedence/dominance tree (N, D, P) **satisfies X'-theory** iff for any x, y and z in N such that zDix and zDiy and xPy or yPx in (N, D, P), either (i), (ii) or (iii)
(i) z has the label XP, x has the label YP and y has the label X'.
(ii) z has the label X' and x has the label X and y has the label YP.
(iii) z has the label XP and y has the label XP and y has the label YP.

(87)(i) accounts for the case in which z is a maximal projection, x its specifier and y an X'. (87)(ii) accounts for the case where x is the head and y the complement and z an X'. (87)(iii) accounts for adjunction, where y is an adjunct to the maximal projection z.

We have seen that the CSC requires the notion of an f-plane. That is, the prohibition against vacuous quantification must be satisfied in f-planes and cannot directly be satisfied in three-dimensional trees. An f-planes can be defined as a plane in the sense of definition (38) in the reformulation of Muadz's theory:

(88) (i) An **f-plane** is a plane in the sense of definition (38).
(ii) An **f-plane assignment** to (N, D, P) (FPA(N, D, P)) is a plane assignment to (N, D, P) in the sense of definition (39).

Assuming that the biuniqueness condition of Case theory also can be satisfied only in individual f-planes, the following should hold:

(89) A three-dimensional phrase marker (N, D, P) **satisfies the biuniqueness condition of Case theory** iff every f-plane in PA(N, D, P) satisfies the biuniqueness condition of Case theory.

The satisfaction of the prohibition against vacuous quantification can be stated as in (90):

(90) A three-dimensional P marker (N, D, P) **satisfies the prohibition against vacuous quantification** iff every f-plane in PA(N, D, P) satisfies the prohibition against vacuous quantification.

More generally, the requirement that elements requiring a syntactic relation to another element have to enter that relation to such an element in each f-plane can be stated as in (91):

(91) A three-dimensional phrase marker (N, D, P) **satisfies the condition on required syntactic relations** iff for any x in N which requires a syntactic relation R to an another element the following holds: for each (N', D', P') in FPA(N, D, P) such that x is in N', there is an element y in N' such that R(x, y) in (N', D', P').

Finally we can define the satisfaction of Condition B and Condition C in a three-dimensional phrase marker approximately as in (92) (but recall the problems with this formulation pointed out earlier).

(92) (i) A three-dimensional phrase marker (N, D, P) **satisfies condition B** of Binding Theory iff Condition C is satisfied in some f-plane of (N, D, P) and all m-planes of (N, D, P).

(ii) A three-dimensional phrase marker (N, D, P) **satisfies condition C** of Binding Theory iff Condition is satisfied in some f-plane in (N, D, P) and all m-planes of (N, D, P).

I will now turn to how m-planes are construed and how a sentence can be interpretetd with respect to a three-dimensional phrase marker.

1.5.3. The construal of m-planes and the interpretation of a sentence relative to an m-plane assignment

M-planes determine the units of semantic interpretation of three-dimensional phrase markers. At the same time, m-planes represent the scope of coordinators. However, since I will discuss the conditions governing the scope of coordinators only in later sections, I will restrict the discussion of m-planes in this section to simple cases of NP and IP coordination and gapping, where the scope of the coordinator roughly corresponds to the set of the nodes dominated by the node on which the coordinator depends.

I will first define an m-plane. M-planes are associated with a splitting node, or, for instance in the case of gapping, with two splitting nodes. In order to provide a general enough definition, I will define an m-plane associated with two splitting nodes x and x', whereby x may be identical to x'. Furthermore, I will assume that m-planes have to have a root node dominating a coordinator. Later, however, we will see that this condition has to be revised for certain cases. M-planes should then include exactly one expansion of x, all nodes dominated by x and all nodes dominating x and dominated by y. In this sense, m-planes have to be maximal. Thus m-planes can be defined as in (70):

(93) <u>Definition of m-plane (preliminary version)</u>
Let x and x' be a splitting node in a three-diemsnional phrase marker (N, D, P). An **m-plane associated with** x and x' is a maximal subphrase marker (N', D', P') of (N, D, P) such that N' contains exactly one expansion of x and exactly one expansion of x' and the root node of (N', D', P') is the lowest node y such that y dominates x and a coordinator j.

We will see later that the definition in (93) is too narrow in three respects. First, it holds only for splitting nodes that are IPs or referential NPs. Second, it does not account for wide scope coordinators and in particular 'respectively'-sentences (see section 1.6.). Third, it only defines obligatory planes, which are the planes rooted in a node dominating a coordinator. We will see in chapter 2, that a sentence may also be assigned nonobligatory planes, which can be rooted in a splitting node not dominating a coordinator.

The goal now is to define an m-plane assignment. Again in order to account for gapping,

a complete set of m-planes may be associated with two different splitting nodes.
Let me say that a complete set of m-planes associated with splitting nodes x and x' is a set of m-planes which are all rooted in the same node. Formally, this notion is defined in (93):

(93) Let x be a splitting node in (N, D, P).

A **complete set of m-planes** C associated with splitting nodes x and x' is a maximal set of m-planes associated with x and x' such that there is a y such that for every (N', D', P') in C, y is the root of (N', D', P') and for any distinct (N', D', P') in C and (N", D", P") in C, N' and N" contain distinct expansions of x and distinct expansions of x'.

This definition guarantees that the m-planes in a complete set of m-planes all share the same root node. Also it requires that m-planes be distinguished from each other by containing different expansions of the same splitting node(s). Furthermore, it ensures that the m-planes be 'anchored in a coordinator' i.e. have a root node dominating a coordinator. This condition clearly does not allow for wide scope of coordinators and it will be modified in later sections.

In the definition just given, in the case of ordinary coordination, x, x' and y coincide. In the case of bare argument ellipsis, x and x' coincide but differ from y. In the case of gapping, x and x' are distinct. In this case, m-planes have to differ both with respect to choice of an expansion of x and the choice of an expansion x'. This captures the observation about gapping mentioned in relation to Muadz's theory, namely that gapping allows for only **two** meaningful planes, unlike multiple ordinary phrasal coordination. This condition together with a condition on the linearization of gapped sentences (which will be given in the next section) can dispense with Muadz's condition (22) in section 1.3.2.2., which had to make reference to an inherent ordering relation among conjuncts or planes.

To summarize, the definitions of an m-plane and a complete set of m-planes account for the following cases: first, NP coordinations such as *the man, the woman and the child* and IP coordination of the same kind, and second, gapping and bare argument ellipsis, which I will take to be represented in the same way as in Muadz (1991). In the first case, the x and the y in the two definitions coincide. In the second case, the x generally is an IP node, whereas the y is a category for a major constituent of the IP (dominating a remnant and its correlate). Thus, the definitions are formulated in a way general enough to cover both ordinary coordination, bare argument ellipsis and gapping.

In order to represent the coordinator associated with a complete set of m-planes explicitly, I will define another notion. I will call a **complete m-plane pair** a pair consisting of the (singleton) set containing relevant coordinator and the complete set of m-planes associated with that coordinator.

(94) <X, Y> is a **complete m-plane pair** iff X contains only coordinators and Y is a complete set of m-planes associated with the splitting nodes x and x' and j is dominated by the root of the m-planes.

The reason why the first argument of a complete m-plane pair is a set containing the coordinator, rather than a coordinator itself, is that complete m-plane pairs should be admitted that are not associated with a coordinator. In this case, the first element of the pair is the empty set. Complete m-plane pairs of this sort will play a role in the implicit coordination constructions discussed in chapter 2.

An m-plane assignment - for the present purposes - should consist of at least as many complete pairs of m-planes as there are coordinators in the sentence. Consider (95).

(95) John or Mary compared Sue and Bill.

(95) is associated with two complete m-plane pairs, one associated with the splitting node dominating *and* and one associated with the splitting node dominating *or*. The m-planes associated with *or* include each of the two m-planes associated with *and*. The set of the two sets of complete pairs of m-planes will be called an **m-plane assignment** for (95). The m-plane assignment for (95) can be represented by only mentioning the terminal nodes of the planes as in (96):

(96) {<{*or*}, {*John compared Sue and Bill, or Mary compared Sue and Bill*}>,
<{*and*}, {*Sue, and Bill*}>)}

An m-plane assignment can now be defined as a set of complete m-plane pairs which in a certain way 'exhaust' the splitting nodes in the three-dimensional phrase marker. The definition is given in (97):

(97) An **m-plane assignment** M for a three-dimensional phrase marker (N, D, P) is a set of complete m-plane pairs such that each splitting node in (N, D, P) is associated with exactly one element in M.

(97) only requires that each splitting node in a phrase marker be associated with exactly one complete set of m-planes; it does not require the converse, namely that each complete set of m-planes in the m-plane assignment be associated with exactly one splitting node. This is so in order to allow for gapping, where a complete set of m-planes is associated with two splitting nodes.

1.5.4. The interpretation of a sentence relative to an m-plane assignment

Given the role an m-plane assignment should play for semantic interpretation, the semantic interpretation of a sentence now is not only to be relativized to a phrase marker, but also to an m-plane assignment to that phrase marker. Thus, I will say that a sentence S has a meaning relative to the phrase marker (N, D, P) and relative to a plane assignment M to (N, D, P). The m-plane assignment will determine which sequences of terminal elements will be assigned a meaning as a unit.

How should the compositional interpretation of a coordinate sentence relative to an m-plane assignment be conceived formally? The following procedure is required. First, consider the set(s) of the smallest m-planes and evaluate the terminal nodes of the set with respect to those planes. Then evaluate the relevant coordinator relative to the semantic values of those planes. Then proceed to the set(s) of the next larger planes and so on.

I will assume a particular conception of compositional interpretation. In this conception, the interpretation of a sentence is based on systematic correlations between syntatic relations or functions and semantic operations. This conception is based on ideas in Lieb (1983). Let me introduce the basisc assumptions and notions of this view of compositionality.

In every language, specific syntactic relations or functions are correlated with semantic operations or semantic conditions on meanings. Syntactic relations hold between constituents, or more generally parts, of sentences relative to a phrase marker and an assignment of m-planes. Syntactic functions hold of individual constituents in a sentence relative to a phrase marker and m-plane assignment. Both syntactic relations and syntactic functions have to be syntactically identifiable for a sentence. They are associated with what I call **'identification conditions'**. Identification condition consist for instance in information about the syntactic position and about morphological properties of constituents.

Semantic operations are functions from n-tuples of meanings to meanings. **Semantic conditions** impose certain requirements on meanings that can be assigned to a sentence. For instance, the syntactic relation of coindexing between anaphors and their antecedents is correlated with the semantic condition that the referents of the anaphors and the antecedents be identical. Semantic conditions can be conceived simply as relations between meanings of constituent. Thus the syntactic relation of coindexing is associated with the relation = of identity between meanings.

The correlation between syntactic relations or functions and semantic operations or conditions can be considered a set of pairs consisting of a syntactic relation or syntactic function R and a semantic operation or condition O. Let me call this correlation for English **'corr'**.

Semantic composition in this conception consists essentially in the following. Let R be an n-place syntactic relation correlated with a semantic operation O. That is, we have <R, O> as an element of corr. Syntactic relations are functions always are relativized to a phrase marker T and, for three-dimensional phrase markers to an m-plane assignment M. If constituents x1, x2,..., xn stand in the relation R in a phrase marker T, i.e. if <x1, x2, ..., xn> R(T, M), then the application of O to the meanings of x1, x2, .., xn gives the meaning of the syntactic unit consisting of x1, .., xn. In the case of a two-dimensional phrase marker, this syntactic unit is the sequence of x1, ... , xn, i.e. x1^...^xn. That is, given [] is the semantic interpretation function and T is a two-dimensional phrase marker, we have $O([x1]_T, [x2]_T, ..., [xn]_T) = [x1\hat{}...\hat{}xn]_T$. I will later come to how this principle applies to three-dimensional phrase markers. If R is a syntactic function of a single constituent correlated with a semantic condition C, then we have C([x1]).

More precisely, the following two principles hold for semantic composition, where [] is the semantic interpretation function relative to a sentence S, a phrase marker T of S and an m-plane assignment of P.

(98) a. Let R be an n-place syntactic relation and O an n-place semantic operation such that $<R, O> \in$ corr.
If for a sentence S with a phrase marker P and an m-plane assignment M, $<x1, ..., xn> \in R(T)$, then $O([x1](T), .., [xn](T)) = [x1\text{^}...\text{^}xn](T)$

b. Let R be an n-place syntactic relation and O an n-place semantic condition such that $<R, O> \in$ corr.
If for a sentence S with a phrase marker P and an m-plane assignment M, $<x1, ..., xn> \in R(T)$, replace [xi] in such a way that $O([x1](T), ..., [xn](T))$.

The syntactic relations or functions R need not involve constituents; they may also be applicable to three-dimensional syntactic units, such as complete m-plane pairs. I will to how this conception of compositional interpretation applies to three-diemsnional phrase markers below. In the following, I will restrict myself to two-dimensional phrase markers and only later generalize the relevant notions and principles to three-dimensional phrase markers.

On the basis of the syntactic relations and functions holding of constituents of parts of a sentence, one give a precise formualtion of the principle of Full interpretation as applied to semantic interpretation (cf. Chomsky 1985). Every sentence with a phrase marker P will be associated with a set of n-tuples which are arguments of meaningful syntactic relations. I will call such a set a 'functional assignment' to a sentence relative to a phrase marker. This notion is defined in (99):

(99) The **functional assignment** to S relative to a phrase marker T is a set F of pairs consisting of a syntactic relation R or function and an n-tuple $<x1, ..., xn>$ such that $<x1, ..., xn>$ $R(S, T)$.

The principle of full interpretation then says that every terminal element must be a component of such an n-tuple:

(100) <u>The Principle of Full Interpretation (applied to semantic interpretation) (FI)</u>
For every sentence S there must be a functional assignment F to S relative to T such that every constitunet C of S relative to T is a component of an n-tuple in a pair in F.

An m-plane assignment can now be conceived as a part of a functional assignment to a sentence. An m-plane assignment contains all the pairs that stand in the relation of being argument of a coordinator to each other. In fact then an m-plane assignment is enforced by (100) because the coordinators have to stand in a meaningful syntactic relation to other elements. The condition on complete sets of m-planes then constitute the identification condition on such relations. Thus we redefine the relevant notions in the following way.

(101) <u>The identification condition for the coordinator relation</u>

<Y, X> $\in$ j-coord iff X is a completem-plane pair and ell elements in Y are coordinators of the type j.

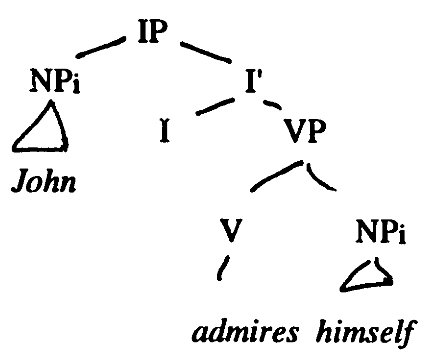
(102) <u>Definition of an m-plane assignment</u>

Let S is a sentence with a three-diemsnional phrase marker T and functional assignment F, satisfying FI.

The m-plane assignment to S relative to T is the greatest subset M of F such that the first component of every element is coord.

In syntactic theories, syntactic relations generally are conceived not as relations between constituents, but rather as relations between category nodes in a tree, where the category nodes are the lowest nodes dominating all the elements the constituent consists of. Thus for instance, the relation of anaphorhood in (103) holds between the second and the first NP node, not between strings of terminal elements,

(103)



However, there is always a one-to-one correspondence between the relevant category nodes and strings of terminal elements. One can therefore define the following notion.

(104) Let T be a (two-dimensional) phrase marker and X a string of terminal elements.

The category node of X in P (**cat(X, T)**) is the lowest node y in P such that for any element x of X, yDx.

Thus we have the following condition on the identification of syntactic relations among strings of terminal elements, where R is a meaningful syntactic relation defined in traditional syntactic way and R' the corresponding syntactic relation among strings of terminal elements.

(105) Let T be a (two-dimensional) phrase marker, X1, ..., Xn strings of terminal elements such that cat(Xi, T) = xi, and R an n-place meaningful syntactic relation. If R(x1, ..., xn), then R'(X1, ..., Xn).

In the following I will use terms for syntactic relations ambiguously for either category nodes or strings of terminal elements. The definitions (104) and (105) later have to be modified to account for three-dimensional phrase markers.

The distinction between syntactic relations holding among strings of terminal elements and category nodes is not only required conceptually. It will also play an emprirically significant role in the behavior of elements with respect to ATB reconstruction, as discussed in section .

A number of remarks are in order about the nature of meanings that I will assume. In this dissertation, I will assume an indirect semantics. That is, natural language expressions are translated into a semantic representation language, rather than assigned modell-theorietic meanings directly. Note that this assumption is independent of the particular conception of compositionality that I adopt. The semantic operations associated with syntactic relations or functions are then syntactic operations on expressions of the semantic representation language. The semantic representation language that is required for the present purposes is simply the language of first order logic with the property abstractor and the description operator For the explicit semantic translation, I will disregard quantifiers such as *most* and *few* and many other expressions that are not in the focus of investigation (at least in the first four chapters of this dissertation).

The semantic representation language contains the following special symbols. G (for group formation) is a functional parameter. P (is a part of) a two-place predicate parameter. In part I will use expressions from the object language English for individual and predicate parameters, for instance 'John', 'Mary, 'meet', love'. Following the tradition of Davidson (1967), I will assume that every verb that takes n arguments is translated as an (n+1)-place relation, where the first argument position is occupied by events. The symbols of the semantic representation language are partly listed in (106).

(106) individual parameters: John, Mary, Bill, Sue, ...
individual variables: x, x', x'', y, z, w, e, e', e'' ...
functional parameters: G (for group formation)
relational parameters:
one-place predicates: 'man', 'dog', ...
two-place relations: 'come', P (is a part of), < (is smaller than),
three-place relations: 'meet', admire', praise', criticize', ...
four-place relations: 'show', 'give', ...
logical constants: &, v, -->, -, =,
as a property formation operator
the description operator

Given this approach to the semantic analysis, [] is to be understood as a function from occurrences of natural language expressions in a sentence S to expressions of first order logic relative to a phrase marker T of S and an m-plane assignment M to T. Proper names are translated simply into individual constants. Thus, for instance, we have (107):

(107) If *or* occurs in a sentence S with the a phrase marker T and a plane assignment M, then $[or]_{S, T, M} = v$

The coordinators *or* is always translated as the logical constants 'v'. In contrast, *and* is translated as '&' or as 'G' or in yet another way (see chapter 2).

I will assume that every proper name is translated as the parameter represented by the same name. Thus we have (108).

(108) If x is a proper name in a sentence S with a phrase marker T and an m-plane assignment M, then $[x]_{T, M} = x$.

Furthermore, every verb and every noun is translated as the predicate parameter represented by the same verb or noun. Thus we have (109).

(109) If x is a noun or verb in S relative to T and M, then $[x]_{T,M} = x$.

Furthermore, I will assume that finite verbs are always interpreted in such a way that the event variable is bound by an event quantifier. However, I will completely disregard tense. Thus, for transitive verbs (and analogously for intransitive verbs), we have the following condition on []:

(110) If X_{fin} is a finite transitive verb in S with respect to T and M, then $[X_{fin}]_{T,M} = \lambda xy[\exists e([X]_{T,M}(e, x, y))]$.

Let me illustrate how semantic composition works in this view with the syntactic relation of argumenthood. I will first consider the case of noncoordinate structures and later generalize the definitions to three-dimensional syntactic units. (111a) and (111b) give the definition schemas for the syntactic relation of argumenthood and the associated semantic operation.

(111) a. <u>The relation of argumenthood</u>

Let T be a phrase marker.

For strings of terminal elements x1 and x2 in T, $\langle x1, x2\rangle \in ARG_{i,k}(T)$ iff c2 is k-place and x2 is the ith argument of c2

b. <u>The operation of argument satisfaction</u>

For a k-place relation symbol and an individual symbol x,

$arg_{i,k}(R, x) = \lambda y1y2...y_{i-1}, y_{i+1}, .. y_k[R(y1, y2, ..., y_{i-1}, x, y_{i+1}, .., y_k)]$

c. $\langle ARG_{i,k}, arg_{i,k}\rangle \in$ corr.

The syntactic relations of argumenthood are associated with certain identification conditions. For instance we have (112a) and (112b) for the relation 'is the internal argument of' and the relation of 'is the subjet of'.

(112) Let T be a phrase marker and x1, x2 strings of terminal elements of T.

a. $\langle x1, x2\rangle \in ARG_{2,2}(T)$ ('x1 is object of x2') iff the lowest maximal projection dominating x1 is immediately dominated by the smallest maximal projection dominating x2.

b. $\langle x1, x2\rangle \in ARG_{1,1}(T)$ ('x1 is subject of x2') iff the lowest maximal projection dominating x1 is sister of the lowest maximal projection dominating x2.

We can now apply the syntactic relations and semantic operations given so far to (113).

(113) John met Mary.

According to (108) and (110), we get the following translation for the primitive constituents in (113) (relative to a phrase marker T and an m-plane assignment M):

(114) $[John]_{S, P, M}$ = John
$[Mary]_{S, P, M}$ = Mary
$[met]_{S, P, M} = \lambda xy[\exists e\ \text{meet}(e, x, y)]$

Given the syntactic positions of the NPs relative to the verb in (113), we have the following syntactic relations in (115).

(115) a. $\langle Mary, met\rangle \in ARG_{2, 2}(T)$
b. $\langle John, met\ Mary\rangle \in ARG_{1, 1}(T)$

Given the correlation of these syntactic relations with semantic operations, we can apply semantic operations as in (116).

(116) a. $arg_{2, 2}([Mary], [met]) = \lambda x[\exists e(\text{meet}(e, x, \text{Mary}))]$
b. $arg_{1, 1}([John], [met\ Mary]) = \exists e(\text{meet}(e, \text{John}, \text{Mary}))$

Now let us turn to the more difficult task of translating quantificational sentences. I will assume a syntactic representation of quantifier scope in the way proposed by Williams (1986), rather than by Quantifier Raising in the tradition of May (1977). I will provide reasons for this decision later, in particular in chapter 4. In Williams' proposal, a quantifier is coindexed with the category dominating its scope. Thus for (117a), we have the representation of quantifier scope in (117b).

(117) a. Every man came.
b. $[_{IP}[\text{Every man}]_i \text{ came}]_i$

More presisely, I will assume that quantifiers such as *every* in (117) enter a syntactic relation to their restriction (i.e.*man*) and their scope, i.e. *every man came*. Thus, if for universal quantifiers we call this relation UNIVQUANT, for (117a) we have (118) relative to a phrase marker T.

(118) <*every, man, every man came*> $\in$ UNIVQUANT(T).

From this relation we want to get to the semantic representation in (119).

(119) $\forall$x(man(x) --> y(come(y, x))

This requires first an adequate translation for the scope of the quantifier, i.e. the third argument of UNIVQUANT. For that purpose, I will assume that quantifiers by themselves are always translated as variables:

(120) If X is a quantified NP in T and M, then $[X]_{T,M}$= x.

Given the translation of the finite verb form *came* according to (110), we get the property in (121) as the translation as the third component of the triple in (118).

(121) $[\text{every man came}]_{T,M} = \lambda x[\exists y\ \text{come}(y, x)]$

Only the quadruple consisting of the quantifier, its restriction and its scope is translated into a quantificational structure. Thus we have (122).

(122) a. <*every, man, every man came*> $\in$ UNIVQUANT(T)

b. univquant(<[*every*], [*man*], [*every man came*]>) = $\forall$x(man(x) -->$\exists$y(come(y, x))

More generally, we have the following syntactic relation and correlated semantic operation.

(123) a. <u>The scope relation for universal quantified NPs</u>

Let x1, x2 and x3 be constituents of S with a phrase marker T and an m-plane assignment M.

<x1, x2, x3> $\in$ UNIVQUANT(T, M) iff x1 is of the form *every* or *all*, x1^x2 is an NP in S relative to T, X3 is the smallest IP in T containing x1^x2.

b. <u>The semantic operation for universally quantified NPs</u>

univquant(<X1, X2, X3>) = ∀x([X2](x) --> [X3](x)).

c. <UNIVQUANT, univquant> ∈ corr.

Similarly for existentially quantified NP we have (124):

(124) a. <u>The scope relation for universal quantified NPs</u>

<X1, X2, X3> ∈ EXISTQUANT(T) in T iff X1 is of the form *some a* or *O*, X1^X2 is an NP in S relative to T, X3 is the smallest IP containing X1^X2.

b. <u>The semantic operation for existentially quantified NPs</u>

univquant(<X1, X2, X3>) = ∀x([X2](x) & [X3](x)).

c. <EXISTQUANT, existquant> ∈ corr.

Later, in chapter 4, we will see that the condition on the syntactic relations UNIVQUANT and EXISTQUANT have to be revised in certain ways.

Pronouns are translated either as parameters or as variables. How they are translated depends on whether they are coindexed or contraindexed with another NP. Assuming standard 'identification conditions' for coindexing and contraindexing, we have the following principles.

(125) a. <X1, X2> ∈ COIND(S, T, M), then [X1] = [X2].

a'. <ANAPH, => ∈ corr.

b. <X1, X2> ∈ CONTRAIND (S, T, M), then [X1] ≠ [X2].

b'. <CONTRAIND, => ∈ corr.

(126) If X is a pronoun in S with respect to T and M, then choose a variable or parameter c such that $[X]_{T, M}$ = c so that 125(a) and 125(b) is satisfied.

I will now turn to the task of generalizing this conception of compositional semantic interpretation to three-dimensional phrase markers. This requires both dealing with multidominance and with the role of f-planes and m-planes in establishing meaningful syntactic relations.

First, I will have to generalize the notions for meaningful syntactic relations to three-dimensional phrase markers. In the semantic interpretation of coordinate sentences, meaningful syntactic relation have to be established that involve not just constituents, but also the terminal nodes of complete sets of m-planes, that is, 'three-dimensional syntactic units'. Consider (127) with the m-plane assignment given in (128a) and the f-plane assignment given in (128b).

(127) John and Bill met.

(128) a. {*John, Bill*}

b. f-plane 1: John met

f-plane 2: Bill met

In order to evaluate (127) semantically, the following meaningful syntactic relation has to established among a set of terminal nodes and a terminal node of the phrase marker T of (127).

(129) {*John, and Bill*} is second argument of *met.* in T.

How is this relation established? There are two possibilities for establishing the relation in (129). The first possibility involves f-planes. The second one involves m-planes and is based on the correlation between syntactic relations among terminal elements and syntactic relations between category nodes.

The first alternative of estblishing the relation in (129) goes as follows. (129) holds because the relation of argumenthood holds in a corresponding way between terminal elements: Given that we have the notion of an f-plane available for independent reasons, we can say that (129) holds because (130) holds:

(130) *John* is second argument of *met* in the first f-plane;

Bill is second argument of *met* in the second f-plane.

Thus, I define the generalized relation of argumenthood ARG' as follows, based on a notion of 'correspondent' as defined in (131).

(131) Definition of 'correspondent'

Let X be a constituent or a set of constituents. A constituent x1 is a **correspondent** of X if x1 = X or x1 is an element of X.

(132) Definition of the relation of argumenthood for three-dimensional syntactic units

Let T a phrase marker and X1 and X2 constituents or sets of constituents.

$<X1, X2> \in$ **ARG'i, k(T)** iff for every f-plane $T' \in$ FPA(T), there is a correspondent x1 of X1 and a correspondent x2 of X2 such that $<x1, x2> \in$ ARGi, k(F)

More generally, we can posit the following principle for establishing meaningful syntactic relations among three-dimensional syntactic units.

(133) Definition of meaningful syntactic relations among three-dimensional syntactic units

Let T be a three-dimensional phrase marker, M an m-plane assignment of T, X1, ..., Xn sets strings of terminal elements of complete sets of m-planes in M or strings of terminal elements, and R an n-place meaningful syntactic relation.
$<X, Y> \in$ **R'(T)** iff for every T' in FPA(T) there is a correspondent x of X and a correspondent y of Y such that $<x, y> \in$ R(T).

Let us now turn to the second alternative of defining the relation in (129). For that purpose, the notion of a category node has to be generalized to three-dimensional syntactic units, that is, sets of strings of terminal elements that are not ordered with respect to each other with respect to precedence.

(134) Let X be set of elements, T a three-dimensional phrase marker and R a meaningful syntactic relation.

The **3D-category node** of X (**3D-cat(X, P)**) is the lowest node y in T such that for every X' in X, y = cat(X', T) and for every Y such that y = cat(Y, T), $Y \subseteq X$.

Clearly, X in (134) may also be a complete set of m-planes. In fact, meaningful syntactic relations among three-dimensional syntactic units generally involve complete sets of m-planes.

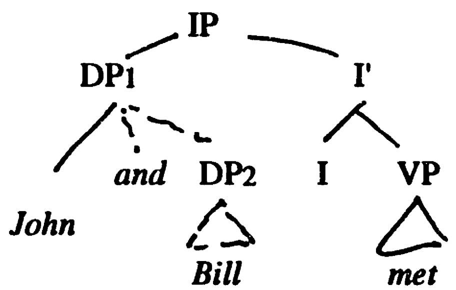
But what is the relation between sets of sets of strings of terminal elements and the category nodes among which syntactic relations are first established? The following definition generalizes over the two-dimensional and the three-dimensional case.

(135) Let T be a three-dimensional phrase marker, x1, ..., xn category nodes in T, M an m-plane assignment to T, R a meaningful n-place syntactic relation, and Xi either a complete set of m-planes in M or a string of terminal elements such that xi = cat(Xi, T), for 0<i<n.

If R(x1, ..., xn), then R'(X1, ..., Xn).

We can now apply the definition (135) to the case in (127). Consider the three-dimensional phrase marker of (127) in (136).

(136)



{*John, and Bill*} is a complete set of m-planes with NP1 as its category node. Given the identification condition in (112b), NP1 is first argument of the VP node. Therefore, given (135), {*John, and Bill*} will be the first argument of *met* in (136).

It is easy to see that the two alternatives of defining syntactic relations between three-diemsnional syntactic units are equivalent.

Both definitions do not exclude the possibilility that an element of a complete m-plane by itself stands in a relation to an element outside this set of m-planes. This is the case, for instance, in (137).

(137) John compared himself and Mary.

In (137), the complete set of m-planes associated with *and* is the set {*himself, and Mary*}. However, only *himself* stands in the relation of anaphorhood to *John*.

In either way of establishing the relation in (129), we also get the case in which the verbs or verb phrases are coordinated and the case in which both the argument and the verbs or verb phrases are coordinated as in (138).

(138) a. John came and left.

b. John and Mary met and sat down.

In the case of (138a), we have the relation in (139a), in the case of (138b) the relation

(139b) (for a relevant phrase marker T and an m-plane assignment M).

(139) a. <*John*, {*came, and left*}>∈ARG1, 1(T, M)

b. < {*John, and Mary*}, {*met, and sat down*}>∈ ARG1, 1(T, M).

When complete sets of m-planes stand in meaningful syntactic relations to other syntactic units, they of course must themselves receive a semantic evaluation.The strings of terminal nodes in complete m-plane pairs are assigned a semantic value, based on the meaning of the coordinators in the first argument and the meaning of the terminal nodes of the m-planes. For the moment, I define the semantic interpretation of three-dimensional syntactic units as follows, where [] on the right-hand side is the standard semantic interpretation function (implicitly relativized to a phrase marker and an m-plane assignment).

(140) <u>Definition of the semantic interpretation of complete m-plane pairs</u>

Let T a three-dimensional phrase marker and M an m-plane assignment M to T. If for a complete m-plane pair $<\{j\}, \{X_1, ..., X_n\}> \in M$, x_i is the string of terminal nodes of X_i ($i \in \{1, ..., n\}$).

$[j, <x_1, .., x_n>]_{T, M} = [j]_{T, M}(\{[x_1]_{T, M}, [x_2']_{T, M}, ..., [x_n']_{T, M}\})$,

where x_i' is obtained from x_i by leaving out an initial coordinator.

Let me illustrate how the semantic interpretation works in detail for the simple example *John and Bill met*

For the sake of illustration, I will assume the following translation of *and*, where G is the function that maps a set of individuals into the group composed of those individuals,

(141) $[and]_{T, M} = G$

I hereby follow the tradition of Link (1983), that definite plurals and coordinated NPs such as *John and Bill* are evaluated as group-denoting referential terms. Thus the evaluation of *John and Bill* will be the group consisting of John and Bill. That is, the semantic value of *John and Bill* is $G(\{[John]_{T, M}, [Bill]_{T, M}\})$, as in (142).

(142) $[<\{and\}, \{John,\ and\ Bill\}>]_{T, M} = [and]_{T, M}(\{[John]_{T, M}, [Bill]_{T, M}\}) =$
$G(\{[John]_{T, M}, [Bill]_{T, M}\})$.

This group then will become an argument of $[met]_{T,M}$ in *John and Bill met.* Thus, based on the fact that the syntactic relation in (129) holds, (127) is evaluated roughly as (143):

(143) $met(G(\{[John]_{T,M}, [Bill]_{T,M}\}))$.

In this section, I have illustrated the semantic interpretation of a coordinate sentence relative to an m-plane assignment only for extremely simple cases and only for the coordinator *and*. However, the schema of interpretation introduced in this section should be general enough to be carried over to the semantics of more complex coordinate sentences, also with other coordinators. In chapter 2, the semantic interpretation of coordinate sentence relative to an m-plane assignment will be elaborated in more detail for a number of other cases.

1.5.7. The linearization of coordinate sentences at PF

The remaining task of the theory of coordination is to provide rules of linearization of coordinate sentences at PF. I will presuppose that there is a linearization procedure for noncoordinate sentences. The linearization rules for coordinate sentences can be stated on the basis of precedence relation established on the basis of this procedure.

Two things play a role for the linearization of coordinate sentences: first, the position of the coordinator in the tree and second the assignment of m-planes. The latter shows that the linearization is in a special way related to semantic interpretation.

A general principle for the linearization of coordinate sentences is: preserve the linearization of the terminal elements of the f-planes as much as possible. The ordering relation to be established among the terminal nodes of a three-dimensional syntactic tree is based upon the ordering relation P. In particular, an ordering relation P_i, 'immediate precedence', is established among the terminal elements of each f-plane of a dominance tree. In a derivative way one can also say that this ordering relation holds among sequences of terminal nodes of the f-planes of a dominance tree, where a sequence of terminal nodes is defined as in (144).

(144) $\langle x_1, ..., x_n \rangle$ is a sequence of terminal elements iff $x_i \; P_i \; x_{i+1}$ for $0 < i < n$.

Let X, Y, Z,... be variables ranging over terminal nodes or sequences of terminal nodes. Then I will define the relation P' and P_i' as follows:

(145) a. X P' Y iff for every x in X' and y in Y' xPy.

b. X P_i' Y iff for the final element x in X' and the initial element y in Y, xP_i y.

The task now is to define an ordering relation among the terminal nodes of a dominance tree. I will call this relation of immediate precedence 'L'. Given that the terminal elements or strings of terminal elements of a three-dimensional tree are partially ordered by P_i, we can state the conditions on L. Again, L holds either among terminal nodes or sequences of terminal nodes.

The linearization of a coordinate sentence requires a recursive definition. I will first define the linearization of nonnested coordinate sentence and then consider the nested case.

(146) L is a linearization of the terminal nodes or strings of terminal nodes of the three-dimensional phrase marker (N, D, P) representing a nonnested coordinate structure with an m-plane assignment M iff the following conditions are satisfied:

(i) If X P_i Y P_i Z and for no Y', Y' $\neq$ Y, X P_i Y' P_i Z, then X L Y L Z.

(ii) If for a maximal set {Y_1, ..., Y_n} such that X P_i Y_k P_i Z (k {1, ..., n}) and Y_i = j Y' for some Y' and i {2, ..., n}, then X L Y_1 L ... L Y_n L Z, where X and Z may be empty.

(iii) If for Y and Y', X L Y L Z and X L Y' L Z, and Y $\neq$j Y'' and Y' $\neq$j Y'', and for V and V' , X L V L Z, X L V' L Z and Y and V belong to the same m-plane M' in M and Y' and V' belong to the same m-plane in M, and Y P V, then Z Ln j Y V, where j is the coordinator associated with M.

(iv) After (i) has applied: if for V and V', V $\neq$ V', V P_i Z and V' P_i Z and for no X consisting of elements in N, Y P_i X, then V L Z if for some W Z L W, V' L Z otherwise.

Condition (149)(i) ensures that if terminal elements involve no coordination and thus are completely ordered by P, they are ordered in the same way by L.

Condition (149)(ii) establishes the ordering relation L among the conjuncts of an ordinary phrasal coordination. Notice that (149)(ii) is intended only for coordinations such as *John and Bill and Mary*, not *John, Bill and Mary*. I will assume that a coordinator *and* between *John* and *Bill* in *John, Bill and Mary* has been deleted at PF, after linearization.

Condition (149)(iii) accounts for gapping and bare argument ellipsis. (149)(iii) states that all but one of the elements dominated by a splitting node without coordinator follow everything else in the sentence. This ensures that all but one of the phrasal conjuncts in gapping and bare argument ellipsis are at the end of the sentence. Furthermore, (149)(iii) states the following for a case in which there are more than one such splitting node (i.e. gapping). The relative order in one f-plane (P) among the elements that are expansions of different splitting nodes must be preserved when these elements are put at the end of the linearized structure. This guarantees that (150a) is linearized for instance as (150b), not as (150c).

(150) a.
```
                John        Mary
IP-and     NP    met   NP
                Bill        Sue
```
b. John met Mary and Bill Sue

c. John met Mary and Sue Bill.

(149)(iii) makes reference to m-planes. The intended effect is that the remnants in a gapped sentence belong to the same m-plane and so for the correlates. This accounts for why a sentence with the m-plane assignment in (151a) is linearized as in (151b), rather than as, for instance, (151c).

(151) a. {<{*and*}, {*John met Mary, Bill met Sue*}>

b. John met Mary and Bill met Sue.

c. John met Sue and Bill Mary

(151b) disallows an interpretation in which John met Mary and Bill met Sue. For this reason, (149)(iii) requires that *John* and *Sue* belong to the same m-plane and so for *Bill* and *Mary*. As a further condition that influences the relation between interpretation and linearization of gapping sentences, recall that a complete set of m-planes for gapping may contain only two m-planes.

Condition (149)(iv) accounts for the linearization of Right Node Raising structures. It says that after a precedence relation among the clausal conjuncts in a RNR sentence has been established, an element that immediately follows (in the sense of Pi) the material in the first conjunct in one plane and the material in the second conjunct in another plane should follow (in the sense of Pi) only the material of the rightmost conjunct (which has been so ordered by the prior application of (149)(ii) to the clausal coordination). This account for the fact that (152a) is linearized as in (152b), rather than as in (152c).

(152) a. John saw
IP-and this man
Sue met

b. John saw and Sue met this man.

c. * John saw this man and Sue met.

(153) linearization for nested coordination

(154) the PF coordinator deletion rule

1.6. Further evidence for the parallelism between gapping and phrasal conjunction: the scope of negation and modals

In this section, I will provide independent evidence that for the parallelism of phrasal coordination on the one hand and gapping and bare argument ellipsis on the other hand.

One such parallelism was observed by Sobin (1982), who proposes a treatment in the same spirit. First, Sobin notes that the treatment of gapping as a case of phrasal coordination makes adequate predictions about the behavior of modals and negation in gapped sentences.

It has been observed that modals and negation in the first conjunct of a gapped sentence can take wide scope over the conjunction. There are dialectal differences in English (cf. Oehrle 1987), but the facts are clear, for instance, in German. The modals and negation in (84) can have scope only over the entire clause:

(84) a. weil Hans nicht reich sein kann und Maria arm.
'because John cannot be rich and Mary poor'
b. weil Hans nicht in Afrika leben kann und Maria in Amerika
'because John cannot live in Africa and Mary in America'
c. weil Hans das Glas zerbrochen haben muss und Maria den Krug
'because John must have broken the glass and Mary the pot'

(84a) can only have the interpretation 'because it is impossible that John is rich and Mary is poor'. It cannot have the interpretation 'because it is impossible that John is rich and it is impossible that Mary is poor'.

The possibility of wide scope holds only for epistemic and deontic modals. It does not hold for modals of physical modality:

(85) weil Hans nicht ueber die Huerde springen kann und Maria ueber die Kiste
'because John cannot jump over the hurdle and Mary over the box'

Sobin (1982) notes that the scope possibilities of coordinators and negation in gapping correspond to those in phrasal coordinations: Thus, both (86a) and (87a) are equivalent to (86b) and (87b), but not to (86c) and (86c), and (88a) and (89a) are equivalent to (88b) and (89b), but not to (88c) and (89c).

(86) a. Mary didn't eat an apple or a peach.
b. Mary didn't eat an apple and Mary didn't eat a peach.
c. Mary didn't eat an apple or Mary didn't eat a peach.
(87) a. Mary didn't eat an apple or Bill a peach.
b. Mary didn't eat and apple and Bill didn't eat a peach.
c. Mary didn't each an apple or Bill didn't eat a peach.
(88) a. Mary didn't eat an apple and a peach.
b. Mary didn't eat an apple or Mary didn't eat a peach.
c. Mary didn't eat an apple and Mary didn't eat a peach.
(89) a. Mary didn't eat an apple and Bill a peach.
b. Mary didn't eat and apple or Bill didn't eat a peach.
c. Mary didn't each an apple and Bill didn't eat a peach.

Bare argument ellipsis exhibits exactly the same behavior with respect to modals and negation, as seen in (90) and (91).

(90) John can't have won and Bill too.
(91) a. John didn't win or Bill.
b. John didn't win and Bill didn't win.
c. John didn't win or Bill didn't win.

1.5. Three-dimensional phrase markers and the scope of coordinators

1.5.1. The treatment of scope in three-dimensional theories of coordination

We have seen that in Muadz's and Goodall's theories, coordinators like *and* and *or* may, and in fact must, have maximal scope, which is certainly not correct empirically. Furthermore we have seen that construals of m-planes provide a new way of representing scope. However, according to the rules for construing planes that were given earlier, the scope of the coordinator is always the category immediately dominating the coordinator. This is not quite correct; a coordinator may take wide scope. In this section, I will discuss the scope possibilities of coordinators in greater detail.

1.5.2. The scope of coordinators in simple coordinations.

There are general limitations on the scope of *and.* First of all, as we have seen, the assumption of maximal scope is inadequate for group-referring coordinate NPs. Second, *and*, even when it does not determine a group-referring term, is subject to limitations on its scope. For instance, the scope may not extend over a referential complex NP. (92a), for instance, is not equivalent to (92b):

(92) a. John heard the rumor that Bill and Sue won the race.
b. John heard the rumor that Bill won the race and John heard the rumor that Sue won
the race.

However, how is the scope of *and* delimited? An assumption which has been made implicitly in section is that the scope of a coordinator is always limited to the catgory immediately dominating it. However, this might not generally. A natural approach to restrictions on the scope of coordinators within the planar theory would be in terms of general conditions on the size of distinct planes of a phrase marker. However, I will not pursue the question of the scope in much greater detail.

The syntactic conditions on the scope of *or* are different from those on *and*. The difference between the scopal behavior of *or* and and may be traced to the presence of an implicit or explicit scope marker in the case of *or*, namely *either* or *whether*, as has been proposed by Larson and Higginbotham. Such a scope marker would then determine the size of a plane, rather than the independent conditions on plane construal.

The assumption that there are general constraints on the construal of planes raises an interesting question concerning the gapping and phrasal coordination in the three-dimensional account of coordination. Recall that in this account, gapped sentence and sentences with phrasal coordination, in particular 'respectively'-sentences, have almost the same syntactic representation. The main difference is that in gapping the remnants and the correlates depend on the same XP node without there being an overt coordinator, whereas in 'respectively'-sentences, the conjuncts of the phrasal coordination depend on the same XP node and are sisters of an overt coordinator. Thus, it may be that gapping and 'respectively'-sentences impose the same constraints as imposed by general conditions on plane construal.

In the next two sections, I will examine the constraints on gapping and the 'respectively'-construction and note a number of parallels. I will then provide a uniform account of those constraints within the planar theory of coordination.

1.5.3. Parallelisms between constraints on gapping, 'respectively'-sentences, and phrasal *and*

1.5.3.1. The semantic status of *respectively*

Before discussing parallelisms between gapping and 'respectively'-sentences, let me first justify a general evaluation of the function of *respectively* and sketch a semantic analysis of 'respectively'-sentences.

I will propose that *respectively* is an indicator of how to construe m-planes for a sentences. Thus, *respectively* in (93) 'means' (93) has an m-plane assignment in which *John met Mary* represents one plane and *Bill met Sue* a second plane.

(93) John and Bill met Mary and Sue respectively.

This can formally implemented within the framework of compositional semantics that was outlined earlier. I will assume that *respectively* in (93) enters a syntactic relation to four items. I will call this relation 'resp'. The identification condition for this relation, however, must make reference to the linearization of the sentence at PF. Therefore, the relation is in addition relativized to a linearization of the sentence L(T, M). For (93) we have thus (93'):

(93') <*John, Mary, Bill, Sue, respectively*>∈ RESP(T, M, L(T, M))

The identification conditions for RESP are given in (93a).

(93) a. <x1, x2, y1, y2, z>∈ RESP(T, M, L(T, M)) iff z is the category node of *respectively*, cat(x1,T) = cat(y1,T).. for every w such that w has the label IP w is the lowest node in T dominating cat(x1,) iff w is the lowest node in T dominating cat(x2,)

The 'content' of the respectively relation can now be given as follows:

(93) a. resp(x1, x2, y1, y2, z) iff there is a complete set of m-planes X in M such that wx1w'∈X and wx2w'∈X and a complete set of m-planes Y such that wy1w'∈ Y and wy2w'∈ Y.

We then have the correlation in (94a). In this case, the second argument is not a condition on meanings, but rather a condition on the syntactic structure of the sentence, namely the m-plane assignment of its phrase marker. Thus for (a) the principle in (94b) applies.

(94b) a. <RESP, resp>∈ corr.

b. If for a phrase marker T, an m-plane assignment M to T and strings of terminal nodes in T $<x1, x2, y1, y2, z> \in RESP(T, M)$, then resp(x1, x2, y1, y2, z)(T, M).

There is a general objection against this analysis of *respectively* that a semanticists might raise. In order to get the 'respectively'-interpretation of (93), it is not necessary to assume 'big' m-planes for the phrasal coordinations. Rather it is sufficient that *John and Bill* and *Mary and Sue* be interpreted as group-referring terms on the basis of 'small' m-planes. The interpretation of (93) would simply be as in (94'a). (94'a) would also be the proposition for (94'b) if *the two men* denotes John and Bill and *the two women* Mary and Sue.

(94') a. met(G({John, Bill}), G({Mary, Sue})).
b. The two men met the two women.

General rules of distibutivity then allow (94a) to represent the situation in which John (only) met Mary and Bill (only) met Sue. *Respectively* in (93) in this approach would only have the function of 'choosing' one of the readings that a simple proposition involving two groups would allow, whereby this choice would depend on the form of the utterance. It would not require something like m-planes.

However, there is evidence that 'respectively'-sentences are phenomenon distinct from ordinary distributivity phenomena. The 'scope' of distibutivity is generally clause-bound. But the relation of the phrasal coordinations in a 'respectively'-construction need not belong to the same clause under certain circumstances. This is seen by comparing the acceptable 'respectively'-sentence in (95a) with the simple plural sentence in (95b), which which does not allow for the relevant interpretation.

(95) a. John and Bill believe that they met Mary and Sue respectively.
b. The two men believe that they met the two women.

(95a) allows for the reading in which John believes that he met Mary and Bill believes that he met Sue. In contrast, (95b) does not allow for the interpretation in which one of the two men (only) believes that he met one of the two women and the other man (only) believes that he met the other women. (95b) implies that each of the two men believes that he met the two women.

Given that 'respectively'-sentences are indicators of certain 'big' m-planes, they involve a new way of construing planes. Here the expansions of the two splitting nodes are divided simultaneously into distinct planes. The relevant rule of m-plane construal is roughly of the following form:

(96) If in a phrase marker (N, D, P), x and x' are splitting nodes immediately dominating a coordinator j, then x and x' can be associated with a single set of m-planes C such that the following holds:
   (i) there is exactly one node y that is the root node of each (N, D, P) and dominates x and x'.
   (ii) any two planes in C differ in containing distinct expansions of x or distinct expansions of x'.

In my analysis, 'respectively' does not have a direct semantic function, but rather has only a syntactic function, namely in the following sense: *respectively* indicates that a sentence must have a certain kind of m-plane assignment, given the linearization of the sentence at PF. Unlike ordinary expressions, *respectively* does not enter a syntactic relation at any syntactic level, but enters a relation to other expressions only at PF. In (93) *respectively* relates to the sequence at PF *<John, and Bill>* and *<Mary, and Sue>*. What *respectively* in (93) then 'means' is the following: there is an m-plane assignment M of (93) such that for a complete set of planes C in M, C contains exactly one plane with the first elements of *<John, and Bill>* and of *<Mary, and Sue>* as terminal nodes and exactly one with the second elements of those sequences as terminal nodes, and C contains no other planes.

The *respectively* construction is subject to a number of syntactic conditions. I will show that these conditions are in part parallel to those on gapping. This parallelism motivates a uniform account in terms of general conditions on the construal of planes. However, in one respect 'respectively'-constructions behave differently from gapping, namly in that they are not subject to the Major Constituent Constraint. The Major Constituent Constraint should rather be derived from what distinguished gapped sentences from 'respectively'-sentences, namely the position of the coordinator.

'Respectively'-constructions behave like gapping in that the same types of constituents may be related to each other. First, *respectively* may relate any arguments of the same predicate to each other, as in (97).

(97) a. John and Bill love Sue and Mary respectively.
b. John gave Sue and Mary a book and a record respectively.
c. John and Bill gave Mary a book and a record respectively.

Furthermore, *respectively* may relate conjuncts of conjoint predicates to conjuncts of a conjoined subject:

(98) a. John and Bill are a teacher and a student respectively.
b. John and Bill are American and British respectively.

Finally, *respectively* may relate arguments of a predicate and conjuncts of a conjoined predicate:

(99) a. John and Bill left after lunch and before dinner respectively.
b. John and Bill played the sonata fast and slow respectively.

1.5.3.2. Parallel constraints on gapping and 'respectively'-constructions

There are a number of constraints on the relation between the remnants of gapped sentences. I will propose that these parallels should be captured by rules of plane construal, which apply in the two cases in the same way.

Neijt (1979) notes that the relation between the remnants of gapping generally observes the constraints on wh-movement. First, it obeys the CNPC:

(100) a. * John discussed the question of which animals they saw and Bill (of) which flowers.
b. John asked which animals they saw and Bill which flowers.

Second, it obeys the wh-Island Constraint:

(101) a. * John wondered what to cook today and Peter tomorrow.
b. John wants to cook today and Peter tomorrow.

However, Gapping observes a stronger constraint than wh movement in that the remnants may not generally be separated by a clause-boundary.

(102) a. *Max says that you should buy bread and Peter wine.

b. ?? Max believes Mary to be sick and Bill Sue.

The restrictions of the *respectively* construction across clause-boundaries are parallel to the restrictions on gapping. Dougherty (1979) has observed that *respectively* is less acceptable when it relates to arguments separated by clause-boundaries, as in the following examples:

(103) a. ? John and Mary believe that Sue and Bill respectively won the race.

b. ?? John and Mary believe that Bill married Sue and Ann respectively.

c. ?? John and Bill left before we had lunch and dinner respectively.

(104) ?? John and Mary believe Bill to have married Sue and Ann respectively.

With factive verbs, the relation of *respectively* to arguments outside the embedded clause is completely excluded:

(105) a. * John and Mary know that Bill proposed to Sue and Ann respectively.

b. * John and Mary know whether Bill proposed to Sue and Ann respectively.

c. * John and Mary know who proposed to Sue and Ann respectively.

The constraints on gapping and 'respectively'-constructions seem to neither coincide with the constraints on wh movement, nor with usual constraints on anaphoric relationships. Rather the generalization basically seems to be that both gapping and 'respectively'-sentences are subject to a clausemate constraint which requires that the two splitting nodes they involve be contained in the same minimal clause.

However, gapping and 'respectively'-sentences both allow a suspension of the clause-mate constraints in one context, namely when an intervening subject is coreferential with the first term in the two constructions. Both controlled clauses and clauses with a coreferential pronominal subject constitute such a context:

(106) a. Max intends to try to buy bread and Peter wine.

b. Max and Peter intend to buy wine and bread respectively.

(107) a. John and Bill believe that they have met Mary and Sue respectively.

b. John believes that he has met Sue and Bill Mary.

Thus gapping and 'respectively'-sentences behave parallel both in imposing something like a clausemate constraint and suspending in in the same context, namely with an intervening subject coreferential with the first term.

How can the constraint be captured within a three-diemsnional theory of coordination? Muadz (1991) notes the constraints on gapping and proposes that the constraint be conceived as a constraint on the relation between two splitting nodes. His account is given in a very simplified fashion in (108):

(108) A tree containing splitting nodes X and Y not dominating overt coordinators is well-formed iff at least one of the following conditions holds:
(i) X and Y are selected by the same verb
(ii) X and Y are not selected by the same verb and there is a Z such that Z is a controller of Y

But beside the fact that this constraint is stipulative, it does not even seem correct as an empirical generalization. For instance, it excludes sentences with multiple gapping, as in (109):

(109) John met Mary and Bill Sue before John was married to Sue and Bill to Mary.

In (109), the second and the third splitting NP nodes (the subject NPs) do not satisfy the condition in (108). They satisfy the condition (108) only relative to the object NPs.

A conceptual alternative of conceiving of a condition that is responsible for the constraint on gapping is in terms of the construal of planes. Thus, planes that are construed on the basis of selecting expansions of splitting nodes may not extend over a certain domain. Descriptively speaking, a multiplanar structure of a sentence with conjunction may not extend beyond the minimal finite clause:

(110) M-planes of a phrase marker based on the construal rule in (96) may not extend beyond the minimal IP node containing the two relevant splitting nodes, except when a subject coindexed with the first splitting node intervenes.

There is one major difference between 'respectively'-constructions and gapping. Gapping is subject to the so-called Major constituent constraint (cf. Hankamer 1973, Neijt 1976) which requires that the remants and the correlates be **major constituents**, that is, daughters of IP or VP.

(111) a. * John saw a picture of Sue and Bill Mary.
b. * John became upset about Sue and Bill Mary.
c. * John left before lunch and Bill dinner.
d. * Pictures of John were shown to Sue and Bill Mary.
e. * Paintings by John resemble photographs of Sue and Bill Mary.

Unlike with gapping, the constituents *respectively* relates to need not be major constituents. This is seen in (112):

(112) a. John and Bill saw pictures of Sue and Mary respectively.
b. John and Bill became upset about Sue and Mary respectively.
c. John and Bill left before lunch and dinner respectively.
d. Pictures of John and Bill were shown to Sue and Mary respectively.
e. Paintings by John and Bill represent Sue and Mary respectively.
f. Pictures by John and Bill resemble photographs of Sue and Mary respectively.

This difference between the 'respectively'-construction and gapping can be traced to locality conditions having to hold between the overt coordinator dominated by the IP node in gapping structures and the splitting node it is associated with which do not dominate an overt coordinator. In 'respectively'-constructions, the splitting nodes themselves dominate an overt coordinator and hence no relation between splitting nodes and coordinators has to be established.

Interestingly, violations of the Major Constituent Constraint as in (112) are subject to the restriction that the NPs containing the arguments *respectively* relates to have to be indefinite. Thus, *respectively* in the following sentences is considerably less acceptable. Notice that even a nonspecific definite NP as in (113e) is excluded.

(113) a. ?? John and Bill saw the / all / Ann's pictures of Sue and Mary respectively.
b. ?? The / Most / Ann's pictures of John and Bill were shown to Sue and Mary respectively.

c. ?? The / Most paintings by John and Bill represent Sue and Mary respectively.
d. ?? The parents of John and Bill met Sue and Mary respectively.

The restriction to indefinite NPs suggests that the syntactic relation involved in the *respectively* construction is, in some way, subject to the Name Constraint. The Name Constraint as conceived in May (1977) prohibits 'variables' to be free in definite (or specific) NPs, as in (114)

(114) A name X may not contain a variable free in X.

However, clearly, (114) cannot in this form be applied to 'respectively'-constructions, since there are not variables involved. However, the Name Constraint can appropriately be generalized from operator-variable relations to meaningful syntactic relations in general, as in the following way:

(115) A name X may not contain an element y that stands in a meaningful syntactic relation to an element y' not contained in X.

Applying the generalized Name Constraint in (115) to 'respectively'-constructions gives the right result. We only have to subsume the relation *respectively* enters to the two other expressions in the sentence under 'meaningful syntactic relations' in (115). This relation relates individual conjuncts from the two conjunctions to each other. Thus if a conjunction is contained in a name not containing the other conjunction, the individual conjuncts will enter a relation to elements not contained in the name and this relation is prohibited by (115).

1.5.3.3. Distributivity and the conjunction of predicates and modifiers

In this section, I will present another application of the planar theory of the scope of coordinators, namely the scope of *and* in conjoined predicates, modifiers or nouns. I will show that the planar theory provides an account for certain asymmetries in the semantic effect of *and* in those constructions in different contexts.

Let me first note a number of peculiarities of AP and PP conjunction of adjectives. Conjunction of AP and PPs seems to have different semantic effects in different contexts.

In particular, conjunction seems to have a different effect with APs and PPs as predicates than as noun modifiers. This is seen in the following contrast:

(116) a. ?? The chairs are heavy and light.

b. the heavy and light chairs

(116)a. sounds contradictory, whereas the NP in (116)b. may refer to a group of chairs some of which are heavy and some of which are light. I will call the reading of *and* with incompatible predicates like *heavy* and *light* as in (116a) the **'contradictory reading'**. The reading of and with those predicates as in (116b) I will call the **'distributive reading'**.

A few further data show that the availability of the distributive reading in fact depends on whether the conjoined predicate occurs as a (noun) modifier or as a predicate.

Coinjoined adjectives can always have a distributive reading as prenominal or postnominal attributes:

(117) a. The light and heavy chairs were put into another room

b. the extremely big and extremely small houses (but not the houses of normal size)

c. the fathers proud of their sons and without any sons (but not the fathers disappointed at their sons)

Conjoined attributive adjectives behave the same way with secondary predicates. Conjoined secondary predicates disallow a distributive reading in the same way as predicates with copula verbs:

(118) a. # John ate the fruits raw and cooked.

b. # John made his students happy and very angry.

c. # John and Mary ate the fruits raw and cooked.

(I.e. John ate the fruits raw and Mary ate the fruits cooked)

d. # John and Mary made their students happy and angry.

(I.e. John made his students happy and Mary made her students angry.)

There does not seem to be a natural way to account for the asymmetry between conjoined

APs and PPs as modifiers and as predicates within traditional theories of coordination. However, an account for the asymmetry can be provided within a three-dimensional approach to coordination based on rules of plane construal.

I will propose an analysis of the asymmetry within the three-dimensional theory of coordination that accounts simultaneously for another observation about AP and PP noun modifiers. This observation concerns the interpretation of the modified NP with respect to number. An NP such as *the heavy and light chairs* cannot refer to a group of two chairs, one of which is heavy and one of which is light; it must refer to a group of chairs composed of heavy chairs and light chairs. That is, the plural *chairs* is relevant both for the application of *heavy* and the application of *light*.

In the account I propose for the two phenomena, everything depends on the construal of planes. I assume that in the case of conjoined predicative APs and PPs, the planes that arise from selecting a conjunct of the conjoined predicate cannot be minimal (and thus give rise to the semantic formation of a 'mixed-group' property), but rather have to always include the subject. Thus the only two possible planes are those given in (119):

(119) plane 1: The chairs are heavy.
plane 2: The chairs are light.

The interpretation of these two planes, of course, will yield a contradiction.

In the case of attributive APs and PPs, I will assume that planes cannot be minimal either, but have to be rooted in the N'. This gives for (116b) the following planes:

(120) plane 1: heavy chairs
plane 2: light chairs

In (116b), the two planes form two predicates which can hold only of groups since the head noun is plural. For instance, the predicate *heavy chairs* generally holds only of a group of at least two chairs. From this, we derive the second peculiarity of conjunction of APs and PPs. *And* in (116b) semantically conjoins the predicates *heavy chairs* and *light chairs* and thus forms a complex group predicate. The resulting predicate holds of any group x just in case x consist of a subgroup falling under *heavy chairs* and a subgroup falling under *light chairs*. Such an x then is the referent of (116b).

Since this account crucially rests on the two assumptions about the extent of planes, the question has to be answered, what is the proper generalization and what are the principles governing the construal of planes in this respect? The conditions at stake are general conditions on the construal of planes involving conjoined nonreferential constituents. It is clear that conjoined referential NPs always allow for minimal planes, since they may always act as group-referring terms.

The relevant condition on the construal of planes then is the following:

(121) Condition on the construal of planes for conjoined nonreferential constituents
Planes that include expansions of a nonreferential constituents X have to be maximal within the minimal clause or referential NP containing X.

(121) guarantees that planes for predicates include the subject.

There are certain cases that might present counterexamples to the proposed account of predicate conjunction, for instance the examples in (122):

(122) a. The flag is red, white and green.
b. The chairs are red and green

In (122a), *red, white and green* expresses a property of an entity part of which is red, part of which is white and part of which is green. (122b) has a natural interpretation in which part of the chairs are red and part of the chairs are green. What seems crucial for the acceptability of (122b) is that being red and being green are not contradictory, but only contrary properties.

The reason why the examples such as (122b) are OK seems to be that propositions of the form 'the chairs are red' and 'the chairs are green' are compatible with each other, unlike the propositions 'the chairs are heavy' and 'the chairs are light', whatever the reason for that may be If this is so, the same 'wide scope' analysis for predicate coordinators can be applied to (122).

So far we have only looked at conjunction and not at disjunction. Clearly, the account predicts that disjunction should pattern the same way. In particular, the disjunction in disjoined predicates should always take clausal scope. Of course, this holds for (123), since any interpretation of the disjoined predicate would be equivalent to the wide scope reading of *or*.

(123) John is German or French.

However, the situation is different with quantifiers as in (124):

(124) Everybody was German or French.

Clearly, (124) has a reading where or does not take maximal scope, but rather narrow scope with respect to *everybody*. But still the account of coordinator scope can be maintained if one assumes quantifier raising or scope indexing.

The principle in (121) makes further predictions. It should apply to all nonreferential constituents. However, I will not pursue these consequences further.

1.5.3.4. Distributivity and conjunction in complex NPs

In this section, I will give another application of the planar theory of coordinator scope, namely an application to a peculiar broad distributive reading of *and* in complex NPs.

I have mentioned in relation to the 'respectively'-construction that the distributive interpretation of plurals is (more or less) restricted to the minimal clause containing the plural. Disregarding the exception with 'respectively'-constructions mentioned in the preceding section, this basically also holds for conjoined NPs. Thus (125a) cannot receive an interpretation in which John believed that Bill was elected president and Mary believed that Sue was elected president. Such an interpretation is possible only when the embedded clause is nonfinite, as in (125b).

(125) a. John and Mary believe that Bill and Sue were elected president.
b. John and Mary believe Bill and Sue to have been elected president.

But there is a very interesting type of exceptions to this generalization about the clause-boundedness of distributivity. A typical example for this type of exception are conjoined NPs in appositive *that* clauses modifying a plural NP, as in (126).

(126) John and Mary invented rumors / # a rumor that Bill and Sue were elected president.

(126) may have the reading in which John invented a rumor that Bill was elected president and Mary a rumor that Sue was elected president. I will henceforth call this reading the **'broad distributive reading'** of conjunction.

A first important fact to note is that the broad distributive reading is not available for nonconjoined plural NPs, as in (127):

(127) a. John and Mary invented rumors that these two women were elected president.
b. John and Mary invented rumors that two women were elected president.

(127a) and (127b) lack a reading in which John invented a rumor that one of two women was elected president and Mary believed this about the other one of the two women.

A second important fact about this broad distributive reading is that it is an independent phenomenon from the *respectively* construction. There are at least three differences between the broad distributive reading of conjunction and the 'respectively'-construction. First, *respectively* is hardly acceptable when relating a term in that appositive clause to a term outside the complex NP, as in (128):

(128) a. ?? John and Mary invented rumors that Bill and Sue respectively were elected president.
b. ?? John and Mary invented rumors that the committee had elected Sue and Bill respectively.

Second, the first sentence of (126) allows not only for the reading mentioned above, but equally well for the reading in which John invented a rumor that Sue was elected president and Mary invented a rumor that Bill was elected president (rather than conversely). In other words, the 'broad reading' of *and* in (126), unlike the *respectively* construction, does not care about the sequence of the conjuncts.

Third, a broad reading of *and* is available even without a conjoined subject that it would relate to. For instance in (129a), John may have heard a number of distinct rumors each of which was either about Bill being elected president or Mary being elected president. (129b) allows the relevant broad reading even without there being any other NP argument in the sentence.

(129) a. John heard rumors that Bill and Sue were elected president.

b. Rumors that Sue and Bill were elected president have never been spread.

This shows that the 'broad reading' of *and* depends simply on the complex NP and not on a preceding conjoined NP with whose conjuncts the conjuncts of *and* would have to associate. Thus, unlike the 'respectively'-construction, the broad reading of *and* does not involve a syntactic relation to another conjoined NP in the sentence.

A fourth important observation about the construction in question is that it exhibits Name Constraint effects. That is, it requires that the complex NP be indefinite, not definite or quantified. This is so regardless of whether there is a conjoined subject with which the broad distributive reading of a conjoined NP in the *that* clause could interact.

(130) a. John and Mary invented a lot of / # these / # all rumors that Sue and Bill won the race.

b. # Mary heard the rumors / all those rumors that John and Bill won the race.

All except the first example in (130a) exclude the relevant reading. In (130b), what Mary heard can only be rumors each of which had the (contradictory) content that John and Bill won the race. Thus, the Name Constraint appears to be operative for the broad distributive reading of conjoined NPs regardless of the material outside the complex NP.

How general is the phenomenon of the broad reading of *and* ? In particular, the question arises, do relative clauses behave the same way? This question cannot easily be decided. Consider (131).

(131) John and Mary read books that were writtern by Goethe and Schiller.

(131) allows for the relevant distributive interpretation in which John read books that were written by Goethe and Mary books that were written by Schiller.. However, this distributive interpretation might have an alternative source. It might also be due simply to the usual rules for (local) distributive interpretation of *and* and plurals. Let us assume

that the meaning of the relative clause in (131) is as in (132). Then general rules for distributive interpretation might allow this property to be satisfied by any entity which is composed of parts which are either written by Goethe or written by Schiller.

(132) λx[written by (x, Goethe and Schiller)]

However, there is evidence that the broad distributive reading of (131) is not due to the usual rules for the distributive interpretation of conjoined NPs and plurals. The evidence is that the broad distributive reading of a plural in a relative clause much better available when the NP is indefinite, not definite or quantifying:

(133) a. John and Mary read the books that were written by Goethe and Schiller.
b. John and Mary read many / # most / # all books that were written by Goethe and Schiller.

This indicates that the relevant distributive reading of coordinate NPs is relative clauses is subject to the Name Constraint. Since there is no reason why the Name Constraint should hold for a local distributive reading, the relevant distributive reading should classify as a broad distributive reading, not a local distributive reading.

The broad distributive reading of conjunction does not only show up with conjoined NPs. The same distributive reading can be observed with conjoined predicates. Recall from the preceding section that conjunction of predicates is ordinarily impossible when the predicate denote contradictory properties. However, in relative clauses a conjunction of contradictory predicates becomes possible:

(134) a. John bought chairs that were heavy and light.
b. This school accepts children that are intelligent and stupid.

How should the conjunction of the contradictory predicates in (134) be acceptable at all? There are two possibilities. First, the conjunction in the context of a relative clause as in (134a) could take narrower scope than usual. This scope would only comprise the predicates. But this would be extremely implausible. How should the scope of an expression within a clause be influenced by whether the clause is a relative clause or not? The second and only plausible possibility is that the conjunction in (134a) takes wider scope than usual. This scope would extend beyond the relative clause so that no contradiction would result. Such a wide scope would render (134a) equivalent to (135), which is noncontradictory.

(135) John bought chairs that were heavy and chairs that were light.

Again, the condition on the broad distributive reading of the conjunction of predicates is that the NP modified by the relative clause be indefinite:

(136) John bought a lot of / # most / # all / # the / # Mary's chairs that were heavy and light.

The examples given above show that as with conjoined NPs, the broad distributive reading of conjoined predicates does not require a conjoined NP outside the complex NP that it would have to relate to.

Note that the requirement that the NP be definite or quantified does not hold for conjoined phrases with a 'distributive interpretation' modifying the NP directly as in (137).

(137) a. Sue saw the passport photographs of John and Mary.
b. Sue saw passport photographs that represented John and Mary.
c. ?(?) Sue saw the passport photographs that represented John and Mary.

Why should conjoined predicates and NPs in relative clauses differ from conjoined adjectival and NP attributes, since since relative clauses and other NP modifiers seem to have the same semantic function? It appears that this difference does not have anything to do with the internal syntactic structure of relative clauses, but rather with the syntactic or semantic status of the relative clause itself. This is shown by the fact that conjoined relative clauses prohibit a distributive reading as well. (138a) sounds as contradictory as (138b).

(138) a. The chairs that were heavy and that were light were put into the room.
b. The chairs that were heavy and light were put into the room.

I propose the following account of the broad distributive reading of *and* in complex NPs. The basic idea is that in complex NPs larger planes than usual may be construed: the plane may be a **minimal argument** containing the conjoined NP. This principle is given in (139).

(139) Principle for the construal of extended m-planes

If x is a splitting node dominating a coordinator, then x may be associated with a complete set of m-planes C such that the root node y of each element in C is the smallest argument dominating x.

In the case of relative clauses, the application of this principle is straightforward. The relative clause is not an argument; hence the m-plane may correspond to the NP modified by the relative clause. The application to appositive that clauses requires further consideration. If these *that* clauses are true appositives, as Stowell (1982) assumed, then they can be considered arguments and hence the principle would not give the desired result. However, there is evidence that these *that* clauses do not function as true appositives, but more like relative clauses in that they do not identify, but only specify the content of the attitude in question. The NP modified by an 'appositive' *that* clause may refer to different specifications of the proposition expressed by the *that* clause. This is seen from the acceptability of *different* modifying such an NP:

(140) John invented a different / another rumor that Mary was elected president.

What John invented in (140) was the content of a rumor. Hence the possibility of different in (140) shows that rumors may differ in content even when being about Mary's having been elected president, i.e. when being rumors that Mary was elected president. Thus, 'appositive' *that* clauses can be said to be specifiers, rather than identifiers of the proposition denoted by the NP. Then certainly they do not have the status of arguments.

Since relative clauses and NP modifying *that* clause containing a conjoined phrase are not arguments, the minimal argument containing the conjoined phrase is the complex NP itself.

Now from the requirements that m-planes corresponding to the complex NP have to be interpreted we can derive the appearance of what looks like Name Constraint effects.

If the complex NP provides the m-planes, this yields the following m-planes for (141):

(141) a. plane 1: rumors that Bill won the race

plane 2: rumors that Sue won the race

b. plane 1: a rumor that Bill won the race

plane 2: a rumor that Sue won the race

c. plane 1: most / all rumors that Bill won the race

plane 2: most / all rumors that Sue won the race

And operates semantically on the semantic evaluations of these planes. This yields a group of rumors for (141a), single rumors for (141b). But why is (141b) out? This can be traced to a general condition that plays a role in the evaluation of such planes. This condition says that the outcome of the operation applying to the semantic values of the two NPs must again be a semantic value of the determiner and the noun. This clearly is not the case in (b), since here the NP is singular, not plural. Furthermore it is not the case in (141c), since here the quantifier cannot apply twice. <to be elaborated>

1.6. ATB movement, ATB reconstruction and three-dimensional phrase markers

1.6.1. Introduction

In this section, I will discuss the traditional problem of ATB extraction and propose a new account of this phenomenon within the three-dimensional phrase marker approach. Furthermore, I will present a new set of data, namely data involving ATB reconstruction and show that the basic properties of ATB reconstruction follows from the proposed account of ATB movement. However, I will first discuss the accounts of ATB movement that have been proposed in the literature, namely on the one hand Goodall's and Muadz's proposal within the three-dimensional phrase marker approach, and on the other hand Williams' proposal in terms of simultaneous factorization.

1.6.2. ATB movement in Goodall's and Muadz's theories

One of the strongest arguments for three-dimensional theories of coordination is it provides a way to straightforwardly derive the Coordinate Structure Constraint and the ATB principle.

Both Goodall (1985) and Muadz (1991) derive the Coordinate Structure Constraint

(CSC) from the prohibition against vacuous quantification, which either applies to individual phrase markers before phrase marker union or to individual planes. The ATB principle which suspends the CSC in case extraction has taken place from each conjunct is satisfied just in case there is a variable the wh phrase can bind in each independent phrase marker or in each plane. Thus in Muadz's theory, (142a) is represented as in (142b), where the quantifier can bind a variable in each plane.

(142) a. Who did Mary praise t and Sue criticize t?

b.
Mary praise t_i
Who$_i$ IP did
Sue criticize t_i

In Goodall's theory, movement applies before phrase marker union. Hence, ATB extraction is unproblematic. However, it is less clear how ATB extraction should work in a theory in which three-dimensional phrase markers are base-generated. Muadz himself is not explicit of how ATB movement should look like in his theory. Later, I will show how ATB extraction in base-generated three-dimensional phrase markers can be conceived as an instance of movement in the ordinary sense.

1.6.3. Williams' theory of simultaneous factorization

Williams (1977, 1978) proposes a theory that accounts for the behavior of parallel elements in conjuncts as units in syntactic operations such as ATB extraction and ATB deletion. Williams' idea is that factorization for the purpose of the application of syntactic operations applies to all conjuncts in a coordinate structure simultaneously. The simultaneous factorization of (143a) before the application of wh movement looks as in (143b), and after the application of ATB movement as in (143c).

(143) a. Whom did John hate and Mary love

b.
John hate whom
IP-and did
Mary love whom

c.
John hate t
whom IP-and did
Mary love whom

ATB movement applies to (143b) by first deleting all but one occurrences of *what* and moving the remaining occurrence to SPEC(CP).

Williams posits certain conditions on simultaneous factorization. The conditions that Williams assumes are informally given in (144):

(144) a. If one conjunct is split by a factor line, then all are split.
b. If the conjuncts are split, then the left conjunct brackets must all belong to the same factor.

The first condition in (144) simply accounts for the ATB principle. The second condition , accounts for certain parallelism phenomena that the conjuncts from which ATB extraction has taken place seem to exhibit. For instance, (144b) rules out the examples in (145), though it allows for (146).

(145) a. * Who did John see and like Mary
b. * Who and whose friends did John see?
(146) I know the man who Mary likes t and we hope will win.

Williams assumes that simultaneous factorization is represented at Deep Structure. More precisely, coordinate sentences are base-generated with simultaneous factorization. This means that one should find ATB A'-movement as well as ATB A-movement. Cases of ATB A-movement would be (147a), given that *arrive* is an unaccusative verb, and (147b).

(147) a. John arrived t and seemed t to be happy.
b. John was praised t by Mary and criticized t by Sue.

As Williams (1977) himself acknowledges, generating coordinated structures with simultaneous factorization raises problems for sentences such as those in (148).4

(148) a. Who laughed and was criticized t by Mary.
b. Who laughed and seemed t to be happy.

Apparently, in the sentences in (148), NP-movement has applied to the second conjunct alone before ATB wh movement of the subject to SPEC(CP). (148a) might not be a problem for Williams' theory if one assume the VP-internal subject hypothesis. Then (148a) might involve ATB movement from two VP-internal positions, the VP-internal subject position in the first conjunct and the object position in the second conjunct. But (148b) is still problematic. Williams' theory as it stands is unable to account for cases such as those in (148), which I will call **'mixed-movement constructions'**.

But there might be a way to adjust Williams' theory to account for mixed movement constructions. In the derivation of (148a), *who* in the second conjunct might first have moved non-across-the-board to the subject position of the second conjuncts. Only then would ATB movement apply to the subjects of both conjuncts.

This account requires that the simultaneous factorization of a conjoined clause may apply after movement. For (148a), this is at least required for NP-movement. In order to account for (148a), one would have to allow simultaneous factorization not only to take place at the D-structure of a sentence, but to apply everywhere in the derivation at NP structure (in the sense of van Riemsdijk/Williams 1981), i.e. before A'-movement.

(149) Simultaneous factorization of a coordinated sentence may apply everywhere in the derivation at NP-structure (the level of A-movement).

(149) in fact follows from the fact that factorization is part of a movement transformation and one movement transformation may follow another one. One only has to allow that not all movement transformations in a sentence need to involve simultaneous transformations.

We will see in the next section that there is a way of conceiving ATB movement for coordinate sentences that can dispense with simultaneous factorization altogether.

1.6.4. ATB movement and three-dimensional phrase markers

1.6.4.1. ATB movement and implicit coordination

In the this section, I will show that the parallelism requirement can also be captured within a three-dimensional phrase marker approach on the basis of a new construction type, namely what I will call 'implicit coordination'.

As it turns out, the proposal that I will make is in fact the only way in which ATB extraction could possibly apply in three-dimensional phrase markers. Let us look at a reasonable configuration that would result from ATB extraction in a three-dimensional phrase marker:

(150) a. *What* did John give t to Bill and Sue show t to Mary?

b.
```
                       John give    to Bill
NP-what  C IP-and  did
                       Sue show    to Mary
```

In (150b), a single NP node in SPEC(CP) dominates *what*. This is in fact the only possible structure for ATB movement. There is no way that two NP nodes with single dominance would move to SPEC(CP) by substitution (given the standard assumption that there is a single SPEC(CP) node). What is therefore required is that *what* in the two conjuncts be also dominated by the same NP node in base-position. That is, the D-structure of (150a) has to be as in (151):

(151)
```
                    John gave               to Bill
SPEC(CP) C IP-and              NP-what
                    Sue show                to Mary
```

In this treatment of ATB extraction, for (150a) never more than one occurrence of *what* has to be represented at any syntactic level. The reason is that the NP node and hence everything it dominates are shared nodes, that is they belong to both planes. Note that in this account, one can dispense with a deletion rule which deletes all but one occurrence of *what*, as in Williams' account of ATB movement.

The construction involved in ATB extraction is in fact of the same type as RNR structures. In a sense, one can say for (150a) that the two 'appearances' of *what* in the two distinct planes are implicitly coordinated. I will call the construction involved in ATB extraction, **'implicit coordination'**. Implicit coordination simply consists in an expansion (or several expansions, see chapter 2) being dominated by a joining node.

I will assume that implicitly coordinated phrases are base-generated. In fact, the construction is allowed by the same definition of precedence/dominance trees that allow for joining nodes for Right Node Raising. Clearly, for ATB movement no condition that the joining node be rightmost should hold. However, we saw earlier that the requirement that the condition that joining nodes in RNR structures be rightmost has been made to follow from linearization rules and need not be stipulated among the conditions on three-dimensional phrase markers. Thus, we can say that joining nodes are generally admitted by conditions on phrase markers, but that potentially unacceptable cases are ruled out by the impossibility of a linearization. Thus (150a) would be impossible to linearize if ATB movement did not take place, given the rules of linearization given earlier. According to those rules, only a rightmost wh phrase could be linearized in the same way as RNR. Such a linearization is possible only (153), a RNR structure:

(153) Who saw and said that Mary saw which picture?

Implicit coordination for ATB movement is not only conceptually required in the three-dimensional phrase marker approach. It also allows for an account of a number of constraints on ATB wh movement, which I will discuss in the following sections.

1.6.4.2. The parallelism constraint on ATB extraction

As has often been noted, ATB extraction exhibits certain parallelism phenomena (cf. Williams 1977). In many cases, ATB extraction can extract only elements that are in parallel positions in the conjuncts. For instance, ATB extraction from both subject and object position seems impossible in (154c).

(154) a. Who did John see t and Mary meet t?
b. Who t saw John and t met Mary?
c. * I know who John saw t and t met Mary.

As was mentioned above, Williams tries to capture the parallelism phenomena by conditions on simultaneous factorization. However, it is not quite clear what really the nature of the parallelism phenomena is. There is evidence that the data are by far not as secure as they first seem. Anderson (1982) notes a number of cases in which no parallelism has to hold for ATB extraction. Examples are given in (155):

(155) a. Mary wore a dress that Ungaro designed t and t cost a fortune.
b. Mary read a book which I haven't read t, but t was recommended by every

professor.

Anderson traces the requirement of parallelism or the lack of it, whatever the relevant context exhibits, to parsing requirements of the sentence. Without further going into the issue, I will assume that parallelism phenomena are in fact not to be accounted by the syntax of coordination. From a conceptual point of view, implicit coordination as the basis of ATB movement does not necessarily require parallelism. Note that also RNR, which involves the same construction, does not require parallelism. Thus the joining NP node dominating *this man* in (156) is a daughter of a VP node in the second conjunct that is deeper embedded than the VP node in the second conjunct.

(156) John saw and Mary said she saw this man.

1.6.4.3. Mixed movement constructions

Mixed movement constructions, which were a problem for Williams' account, are entirely unproblematic in the present approach. In the derivation of (157a), the SPEC(IP) node that in the subject position of *laughed* and *seemed* is a joining node. Before any movement applies, we have the structure in (157b):

(157) a. Who t laughed and tseemed t to be happy.

b.
```
                                      / laughed
SCPEC(CP)  C  IP - SPEC(IP) <
                                      \ seemed        SPEC(IP) - who to be happy
```

The NP node dominating *John* then will substitute for the joining SPEC(IP) node and subsequently for the SPEC(CP) node.

Note that the account also allows for mixed movement constructions of the converse type, where first ATB movement takes place and then movement of the usual sort, as in (158):

(158) *John* was believed t to have been killed t and to have been buried t.

If the CSC is derived from the prohibition against vacuous quantification, a certain prediction is made regarding the distinction between wh movement and NP movement. Unlike a wh-phrase ungergoing wh movement, an NP undergoing NP movement lands in an argument position, not an operator position. Hence it is not subject to the prohibition against vacuous quantification in each f-plane. Therefore, we would expect it to be possible for an NP to move to a shared position from one conjunct only. This is in fact the case, for instance in (158'a) with the S-structure in (158'b) or in (158"a) with the S-structure in (158"b).

(158') a. John laughed and seemed t happy.

b.
laughed
SPEC(IP)-$John_i$ VP-and
seemed t_i happy

(158") a. John wrote a book and was praised.

b.
wrote a book
SPEC(IP)-$John_i$ VP-and
was praised t_i

1.6.5. ATB reconstruction and three-dimensional phrase markers

1.6.5.1. The empirical generalization

The issue of whether reconstruction of ATB moved phrases is possible and in which way it is possible has rarely been discussed in the literature (an exception is Hoehle 1991). In this section, I will first establish the empirical generalization that ATB reconstruction in a certain sense is in general not possible. I then show how the account of ATB extraction that I have proposed in the last section can account in a natural way for the lack of ATB reconstruction, namely the assumption that ATB extraction involves implicit coordination.

Generally, reconstruction of elements taking an antecedent is not possible with ATB extraction in the sense that the element could take an antecedent in each conjunct. In the following, I will talk about '**ATB reconstruction**' in precisely this sense.

ATB reconstruction is impossible with reflexives, with extraposed relative clauses and PPs and with wh movement. Let me present the relevant data in the following.

First, reflexives generally do not undergo reconstruction with respect to all conjuncts, as was noted by Haik (1985):

(159) Himself, John likes t and Bill hates t.

With ATB reconstruction, (159) could mean 'John likes himself and Bill hates himself'. But most speakers can interpret (159) only as 'John likes himself and Bill hates John'.

Second, extraposed relative clauses and PPs generally never undergo ATB reconstruction. The relative clause in (160) can express a property only of the man, not of the man as well as the woman.

(160) a. *A woman* t came and *a man* t left *who is from Paris.*
b. *A woman* t came and *a man* t left *from Paris.*

Third, ATB-reconstruction of wh phrases in coordinate interrogatives is impossible. Consider (161).

(161) a. *Which woman* did John marry t and Bill propose to t.
b. *Which masterwork* did John write t and Bill compose t?
(162) Which woman did John marry and which woman did Bill propose to?

(161a) presupposes that John married and Bill proposed to a single woman; thus (161a) can never have the interpretation in (162), which would be the interpretation of (161a) with ATB reconstruction. Similarly, (161b) implies that John wrote and Bill composed the same masterwork.

1.6.5.2. An account based on implicit coordination

If we assume that ATB extraction involves implicit coordination and that a structure with implicit coordination can only be interpreted in a certain way, the apparent lack of reconstruction with ATB follows straightforwardly. Consider the structure of (159):

(163) John likes
NP -himself IP-and t

Bill hates

In the present account, the only available antecedent for the shared NP node dominating *himself* is an implicit coordination of *John* and *Bill.*, that is, a joining NP node dominating both *John* and *Bill,* as in (164).

(164)

John likes

NP -himself$_i$ IP-and NP$_i$ t

Bill hates

The reason is that *himself* necessarily belong to both planes of the phrase marker of (159) and thus requires an antecedent that also belongs to both planes. The implicit coordination of *John* and *Bill* is equivalent to *John and Bill* and hence a plural NP. But since *himself* is not plural, it cannot corefer with this antecedent and thus renders (159) unacceptable.[5]

This account is based on a very general condition, namely the Condition on Establishing Required Syntactic Relations in Three-Dimensional Syntactic Trees (CRS) introduced earlier. This condition says that a node x that belongs to a plane P can enter a syntactic relation to a node x' only if x' also belongs to P. Thus since in (159) *himself* is a shared node, belonging to both planes, it can enter the relation to an antecedent x only if x also belongs to both planes, which is impossible. The condition, which will play a major role in the following sections and in chapter 2 is given again in (165):

(165) Condition on required syntactic relations in three-dimensional syntactic trees

If in a phrase marker (N, D, P), a node x requires a meaningful syntactic relation to an element x', then x requires the relation to an element x' in all f-planes of (N, D, P) to which x belongs.

The case of extraposed relative clauses and PPs can be accounted for in exactly the same way. Also the case of lack of reconstruction of ATB wh movement follows. Consider the structure of (161a) in (166):

(166) John marry

NP - which woman IP-and did t
Bill propose to

(166) is an uninterpretable structure because *which woman* cannot enter any meaningful syntactic relation to any other element in (166). *Which woman* is a shared node, but all the other elements in (166) are not shared nodes. The only way (161a) could have an interpretable structure is by implicit coordination of *marry* and *propose*, and of *John* and *Bill*. The structure of (161a) then will be as in (167):

(167)

John marry
NP - which woman IP-and did NP V t
Bill propose to

In (167) *which woman* can be an argument of the implicit coordination of *marry* and *propose*. *John* and *Bill* also have to be implicitly coordinated because otherwise there would be no element belonging to the same planes that the implicit coordination of *marry* and *propose* could enter the relation 'is predicate of' to.

The evaluation of the implicit coordination in (167), renders (161a) equivalent to *which woman did John and Bill marry and propose to.* From this paraphrase it is clear that *which woman* can only be satisfied by a single woman.

1.6.5.3. ATB reconstruction with respect to quantifier scope

Let us first consider ATB reconstruction of wh-phrases with respect to the scope of other quantifiers. As has often been noted (cf. May 1985), a sentence such as (168) is ambiguous between a 'family of questions' reading in which *how many pictures* takes scope over *every student* and a reading in which *every student* takes narrow scope.

(168) I would like to know how many pictures every student praised.

Now consider a sentence with ATB-movement of the wh phrase:

(169) I would like to know *how many books* every student liked t and every professor disliked t.

Three readings of (169) can be distinguished. In the first reading, *how many books* has narrow scope with respect to *every student* and with respect to *every professor*. This reading is a double family-of-questions reading and can appropriately be answered by listing for each student how many pictures he likes and for every professor how many pictures he dislikes. In the second reading, *how many books* takes wide scope both over *every student* and *every professor*, but narrow scope with respect to the conjunction. An appropriate answer to (169) with this reading would be 'all students likes x-many books and all professors liked y-many books'. In the third reading, *how many books* takes wide scope over *everything* and an appropriate answer has to specify the quantity of books x such that every student liked x and every professor disliked x. Thus ATB-movement of a wh-phrase, like ATB-movement of a quantifier, yields an additional reading in which the wh-phrase takes scope over the conjunction.

In principle, there should be a fourth reading of (169), namely a reading in which *how many pictures* takes narrow scope with respect to *every man* and *every woman* as a single quantifier. In (169), this reading cannot be distinguished from the first reading. But this reading can be enforced if the two NPs are associated with a multiply headed extraposed relative clause, as in (170).6

(170) How many books did *every student* t like and *every professor* t dislike *who have published a paper together*?

Crucially, (169) lacks a fifth (and a sixth) potential reading, namely one in which *how many books* takes narrow scope with respect to *every student* and wide scope with respect to *every professor* (or vice versa). Thus, there is a general condition of parallelism of scope order with quantifiers that have undergone ATB movement. This parallelism condition is in fact much more general and will be discussed in a later section in more detail.

(171) every professor like

NP-how many books IP-and did NP t who ....

every student dislike

Whatever way one might choose to represent scope, *how many books* must have the same scope with respect to both conjuncts, since it is a shared node and thus the scope must be a 'shared domain', a set of nodes dominated by a shared node.

The same parallelism effect for scope shows up with quantifiers such as *most*.. Consider (172).

(172) Most books were read and most problems were solved by every student.

Two readings can be distinguished for (172): one in which *every student* takes narrow scope with respect to both occurrences of *most* and one in which it takes wide scope over both occurrences of *most*. A reading in which *every student* would take narrow scope in the first conjunct and wide scope in the second conjunct is not available.

1.6.5.5. Exceptions to the generalizations

Unfortunately, there are a number of exceptions to the generalization that ATB reconstruction in the sense of the preceding two sections is impossible for anaphoric expressions.

The first exception to the impossibility of ATB reconstruction are relational adjectives. ATB-reconstruction seems to be generally possible with relational adjectives. Consider (173).

(173) *The men* said and *the women* are about to say the *same* thing.

In (173), two internal readings of *same* are available: one in which the implicit coordination of *the men* and *the women* is the 'antecedent' of *the same thing* and another one in which *the same thing* relates to *the men* and *the women* individually. In the second reading, the thing the men said may be different from the thing the women are about to say

Note that there are no mixed readings possible:

(174) a. John and Mary read and Bill wrote the same thing.

b. John and Mary are about to say and Bill has already said different things.

c. A and B about to say and C and D have already said different things.

(174a) does not allow for a reading in which the thing Mary read is different from the thing John read, but the same as the thing Bill wrote, similarly for (174b) and (174c). This shows that the antecedent-anaphor relationship with *same* has to observe the hierachy of planes. For instance in (174a), the 'antecedent' of *same* may not consist of a constituent of the second conjunct of the clausal *and* and a conjunct of a phrasal conjunction contained in the first conjunct of *and.*

As would be expected, the same two readings are possible also with quantified 'antecedents' for *same*, as in (175).

(175) *Every man* said and *every woman* is about to say the *same* thing.

(175) has a reading in which the men said the same thing and the women said the same thing, but the men said different things from the things said by the women. It also allows for second reading in which there is one and the same thing the men said and women were about to say.

Also with possessive pronouns ATB-reconstruction is not excluded. Thus *his key* in (176a) and (176b) can relate both to John and to Bill.

(176) a. *His* key, *John* lost t and *Bill* found t.

b. *John* claims and *Bill* denies that Sue found *his* key.

These exceptions apparently show that individual lexical items may take an antecedent in individual planes even when they are shared nodes.

The difference between the class of expressions that allows for ATB reconstruction and the class that does not can also be captured in the following way. Elements of the first class must enter the antecedent-anaphor relationship before the construal of m-planes. Then establishing this relationship requires that the antecedent-anaphor relation hold in the standard way in each f-plane. Elements of the second class, in contrast, may enter the antecedent-anaphor relationship both before and after the construal of m-planes. When for an element of this class the relationship is established after the construal of m-planes, the effect is that the element takes an antecedent in the individual conjuncts. That is, the relationship will be established in each m-plane separately.

1.6.5.6. ATB reconstruction with different quantifiers

The is another sense of ATB reconstruction, which I will discuss in this section. ATB reconstruction in this sense shows up with quantifiers that can interact in scope with coordinators, i.e. with conjunction and disjunction.

The possibility that quantifiers can be reconstructed across-the-board and take narrow scope with respect to the coordinator varies. It depends both on the type of quantifier and its syntactic position. The discussion of these issues in this section will be modest. All I will do is present a number of empirical generalizations, which still require an explanation.

ATB extraction of quantified and indefinite NPs generally allows for more readings than the nonextracted structure. ATB topicalization or Right Node Raising in a conjoined clauses generally leads to a preferred reading in which the existential quantifier representing the NP takes wide scope over the conjunction. In the following examples, many (though not all) speakers also get the reading in which *a picture* takes narrow scope with respect to *and* and thus seems to be able to undergo reconstruction with respect to scope.

(177) a. John painted and Mary drew a picture.
b. A picture in this library, John damaged t and Mary destroyed t.

However, interestingly, ATB movement of an indefinite subject does not allow for the 'ATB-reconstructed' reading:

(178) A man walked down the street and was killed.

(178) can be only about one man who walked down the street and was killed.

Another contrast can be observed in languages such as German which allow for scrambling. When the subject indefinite NP is in a position in which it could have undergone ATB scrambling, narrow scope with respect to the coordinator is impossible, as in (179a). But narrow scope is possible with topicalization, as in (179b). This was noted by Hoehle (1991).

(179) a. Es ist wahr, dass *ein Mann* den Hund gefuettert hat und den Kater gestreichelt hat.
'It is true that a man has fed the dog and pet the cat.'
b. *Ein Mann* hat den Hund gefuettert und hat den Kater gestreichelt.
'A man has fed the dog and has pet the cat.'

(179b) has two readings. In one reading, the same man fed the dog and pet the cat. In the other reading, the man who fed the dog may be different from the man who pet the cat. By contrast, (179a) can be only about one man.

This difference also holds for objects:

(180) a. Es ist wahr, dass *einen Hund* Hans t gefuettert hat und Maria t gestreichelt hat.
it is true that a dog (acc) John fed has and Mary pet has
'It is true that John fed a dog and Mary pet a dog.'
b. Es ist wahr, dass Hans *ein Bild* jemandem t gestohlen hat und jemandem t verkauft hat.
it is true that John a picture (acc) somebody stolen has and somebody sold has
'It is true that John stole a picture from somebody and sold a picture to somebody.'
c. *Ein Bild* hat Hans jemandem gestohlen und jemandem verkauft.
a picture (acc) has John somebody stolen and somebody sold
'John stole a picture from picture from somebody and sold a picture to somebody.'
d. *Ein Bild* hat Hans t gemalt und Maria t gezeichnet.
a picture has John painted and Mary drawn
'John painted a picture and Mary drew a picture.'

(180)a. and b. are about one dog and one picture respectively, (180)c. and d. may be about two dogs and two pictures respectively.

A somewhat different pattern can be observed for the scope order of disjunction and universally quantified NPs. The following facts hold.

First, a quantified subject that has undergone ATB movement may never take narrow scope over the disjunction. Thus (181a) cannot have the reading (181b):

(181) a. Every picture was damaged by John or destroyed by Mary.
b. Every picture was damaged by John or every picture was destroyed by Mary.

This also holds for German ATB-scrambling as well topicalization (unlike in the case of indefinite NPs and conjunction):

(182) a. *Jedes Bild* wurde t beschaedigt oder t zerstoert.
Every picture was damaged or destroyed.
b. Es ist wahr, dass *jedes Bild* t beschaedigt wurde oder t zestoert wurde.
It is true that every picture was damaged or was destroyed.

Second, a quantified NP that has undergone RNR in a disjoined clause may have both narrow scope with respect to the disjunction and wide scope. Thus (183a) can mean both (183b) and (183c):

(183) a. John damaged or Mary destroyed every picture.
b. John damaged every picture or Mary destroyed every picture.
c. Every picture is such that John damaged it or Mary destroyed it.

In the case of topicalization, however, the narrow scope reading is much harder to get:

(184) *Every picture in this library*, John damaged t or Mary destroyed t.

Hoehle (1991) notes that in the corresponding sentence in German, wide scope of the quantified object NP over the disjunction is strictly impossible:

(185) *Fast jeden Hund* hat Karl gestreichelt t oder Maria gefuettert t.
almost every dog has Charles pet or Mary fed
'Almost every dog, Charles fed or Mary pet.'

The difference in the availability of scope reconstruction with RNR and topicalization may be traced to the fact that unlike topicalization, RNR does not involve movement at all

Hoehle captures the difference between ATB-movement of quantified universal NPs and ATB movement of indefinite NPs with respect to ATB scope reconstruction by stipulating that quantified NPs may never undergo reconstruction, whereas indefinite NPs optionally may undergo reconstruction. But why there should be this differences between reconstruction of quantified NPs and indefinite NPs still remains to be investigated.

Again a possibility to capture the difference between indefinite NPs and universal NPs would be the following. Universally quantified NPs enter scope relations only prior to the construal of m-planes; hence they must necessarily take wide scope over the coordinator. In contrast, indefinite NPs may enter scope relations both before and after the construal of m-planes; clearly, if they are contained in distinct m-planes, they can take only narrow scope with respect to the coordinator.

1.6.5.7. Other parallelism effects with ATB extraction

So far we have seen parallelism effects with the scope order of wh-phrases and quantifiers. The account that was given for these effects suggest a stronger claim. Parallelism effects show up with all meaningful syntactic relations that an ATB extracted phrase may enter. Let me briefly provide some further evidence for this claim.

The parallelism condition does not only hold for quantifier scope, but also for the referential status of pronouns in a phrase that has undergone ATB movement. If such a pronoun has the status of a bound variable with respect to a quantifier in the first conjunct, it must also be bound by a quantifier in the second conjunct and cannot, for instance, be referential the second conjunct. This was noted for German by Hoehle (1989). The relevant example is given in (186).

(186) Seinen Hund fuetterte jeder t, aber streichelte niemand t.
'His dog everybody fed, but nobody pet.'

(186) cannot have the reading of (187a), a reading available for (187b) without ATB-

topicalization of *seinen Hund.* (Note, though, that the evidence is weakened by the fact that this reading of (187b) requires additional focusing of at least one occurrence of *seinen*, which would not be representable in the ATB case).

(187) a. Everybody fed John's dog and nobody pet his (own) dog.
b. Jeder fuetterte seinen Hund, aber niemend streichelte seinen Hund.
'Everybody fed his dog, but nobody pet his dog.'

Further evidence for the parallelism condition on bound pronouns in ATB-extracted phrases comes from the following example:

(188) * *Everybody* lost and the brother of *Bill* found *his* key.

If *his* is interpreted as a pronoun bound by *everybody* with respect to the first conjunct, then it cannot be coreferential with *Bill* with respect to the second conjunct. The reason is that in the second conjunct, *Bill* does not c-command *his* and thus the condition on bound pronouns is not satisfied (cf. Reinhart 1976).

The parallelism condition shows up in other constructions as well, for instance in the choice of the 'evaluative antecedent' of *each other* , that is the antecedent that enters the relation of reciprocity (cf. Higginbotham 198). Consider (189).

(189) A and B believe, but C and D do not believe that they like each other.

(189) has only two of four potential readings: one in which the embedded *they* is the evaluative antecedent, the other one in which A and B and C and D respectively are the evaluative antecedent of *each other.* Mixed readings are excluded.

Parallelism effects with syntactic relations in coordinate structures follow straightforwardly from two things: first, the requirement that phrases that have undergone ATB extraction be implicit coordinations and the Condition on Required Syntactic Relations in Three-Dimensional Syntactic Trees (CRS), which requires that a node in a three-dimensional tree can enter a syntactic relation that it requires only to a node that belongs to the same planes. Thus,*each other* in (189) belongs to both planes of the coordination and hence requires an evaluative antecedent that also belongs to both planes. This antecedent can be only either the implicit coordination of A and C or the implicit coordination of B and D. Similarly, quantifier scope relations with an implicitly coordinated quantifier have to be established 'across' planes: the scope of an implicitly coordinated quantifier must be dominated by a node that belongs to the same planes as the quantifier. Whatever account of quantifier scope one might choose, the account would predict the parallelism effect.

Notes

2 Note that this is also a problem for Muadz's analysis.

Interestingly not all quantifiers allow for variable binding from one conjunct to another. For instance *no* does not:

(1) a. * *No man* and *his* dog entered the room.
    b. * John saw *no movie* and praised *it.*

Perhaps, *no* obligatory takes narrow scope, a scope which cannot extend over a single conjunct. Then the phenomenon on (1) would be a matter of scope and possibly independent of variable binding.

Alternatively, (1) might ruled out because *his dog* and *no man* do not have the monotonicity properties, a general condition on coordinate NPs (cf. Barwise/Cooper 1982). (1a) then would be ruled out for the same reason as (2a), which also contrast with (2b) with*every*:

(2) a. * No man and Mary / Mary and no man entered the room.
    b. Every man and Mary / Mary and every man entered the room.

3How does disjunction of predicates and modifiers pattern? There are a few interesting observations to be made. With disjoint relative clauses, a 'distributive reading' seems to be possible:

(1) a. the apples that are red or that are green
    b. the children that failed the exam or that made it

(1a) can refer to the group of apples each of which is either red or green. Similarly, (1b) can refer to the group of children each of which either failed the exam or made it.
However, with disjoined adjectival or PP modifiers, a distributive reading is possible only under certain conditions. In the following cases, a distributive reading is impossible. (Notice that definite plural NPs with disjoint modifiers contrast with quantified NPs.)

(2) a. John invited Sue's or Mary's children / the children of Mary or Sue.
    b. John invited all children of Sue or Mary.
    c. The children of Sue or Mary made a mess.

This follows if plurals are group-referring expressons and modification of plurals by disjoined modifiers means the following: [P *or* (-P)]Q(x) iff Q(x) and either P(x) or (-P)(x).
Note that the distributive reading of disjunction with modifiers, however, becomes

available in modal contexts, as in (3):

(3) a. John would always invite Sue's or Mary's children.
b. The children of Sue or Mary always start making a mess.   end note>

[4]Jackendoff (1977) and subsequently Sag et al. (1982) put into doubt a rule of ATB-movement or Conjunction Deletion for those cases because of the nonequivalence of the Deep Structure and the Surface Structure of, for instance, a sentence with a subject modified by *same/different* as in (1).

(1) The same man laughed and was criticized by Mary.

However, the premise of this objection, namely that Deep Structure should be semantically equivalent to Surface Structure is generally not maintained anyway. The rules of semantic interpretation for sentences such as (1) would apply after ATB NP-movement.

[5]When they are contained in V-projections that have undergone ATB movement, reflexives may freely reconstruct in German. Relevant examples such as (1) have been noted by Hoehle (1990):

(1) a. *Sich* aendern will *Hans* und will auch *Maria.*
Himself/herself change wants John and also Mary
b. *Hans* kann und *Maria* will *sich* selbst helfen.
John can and Mary will help himself/herself.'
c. *Sich* im Spegel betrachtet hat *Hans* oft und hat *Maria* selten.
Himself/herself in the mirror watched has John often and has Mary rarely.

(1a) is fine in the reading 'John wants to change himself and Mary wants to change herself', and similarly for (1c) and (1d).

This construction suggests a treatment of anaphor binding for this case along the lines of Reinhart/Reuland (1991), where anaphors enter the relevant relationship to a predicate, rather than an NP-antecedent.

[6] The ambiguity still remains when reconstruction is required for the purpose of anaphor-binding:

(1) I would like to know how many pictures of herself every student showed Mary.

This show that reconstruction for the purpose of anaphor binding is a different process from reconstruction for the purpose of scope.

Chapter 2:

Implicit Coordination and Group Formation

2.1. Introduction

Beside ATB extraction, implicit coordination has another important application, namely constructions in which an element takes a plural antecedent which is composed of parallel parts of conjuncts, as in (1):

(1) A man came and a woman left who know each other well.

In(1), the plural antecedent of the collective relative clause is composed of *a man* in the first conjunct and *a woman* in the second conjunct.

In the analysis of the construction in (1) that I will present in this chapter, *a man* and *a woman* are implicitly coordinated. Given that implicit coordination is interpreted in the same way as explicit phrasal coordination and plural NPs, this allows the extraposed collective relative clause in (1) to take an antecedent and to be interpreted in the usual way without requiring special rules of semantic interpretation.

Due to the the presence of both overt and implicit coordination in (1), in the proposed analysis, the sentence meaning of (1) is of an unusual kind. Sentences with implicitly coordinated antecedents such as (1) receive two partial interpretations. The 'combination' of these two partial interpretations then yields the full sentence meaning. One partial interpretation evaluates (1) with respect to the clausal coordination and disregards the relative clause. The other partial interpretation evaluates (1) with respect to the implicit phrasal coordination and evaluates the collective relative clause. The two partial interpretations of (1) are based on two distinct construals of m-planes: first a construal of 'small' planes and second a construal of 'big' planes.

This chapter is structured as follows. I will first present the relevant constructions and the syntactic and semantic account of it in terms of implicit coordination. Then I show how this account explains a number of syntactic properties of the construction. I will then discuss further phenomena that are explained by the analysis, namely the behavior of simple plurals and relational adjectives in implicit coordination constructions, a distinct behavior of arguments and adjuncts, a prohibition against collective predicates, and finally the treatment of NP conjunction and an identity condition on determiners imposed by multiply headed relative clauses. Then, I will persue the question of how general the construction is, that is, which elements are able to take plural antecedents composed of conjuncts. I will then turn to constructions that are different from, but in certain ways also parallel to, constructions with implicit coordination. First, I will investigate the properties of 'respectively'-sentences, showing that 'respectively'-sentences exhibit exactly the same behavior as sentences with implicit coordination and thus call for the same syntactic and semantic treatment. Second, I will discuss similar properties displayed by gapping and bare argument ellipsis.

2.2. The problem and the analysis

There are various different kinds of elements that may take parallel parts of conjuncts as antecedents. Among those are extraposed relative clauses as in (2) and relational adjectives such as *same* and *different.* The latter ones have to be contained in phrases in topic or Right Node Raising position, as in (3)1. Furthermore, reflexives in picture NPs belong to the relevant class of elements, as seen in (4).

(2) a. A *man* came and a *woman* left *who know each other well.*
b. a *man* and a *woman who know each other well*
c. Every *professor* was praised and every *student* was criticized *who had published an article together.*
d. every *boy* and every *girl who danced together*

(3) a. *John* praised and *Mary* criticized *different* people.
b. On the *same* day, *John* died and *Mary* was born.

(4) Which pictures of *themselves* did *John* praise and *Mary* criticize?

(2)-(4) illustrates that the construction occurs with IP conjunction in the same way as with NP conjunction.

The construction in (2-4) in which an element takes a plural antecedent composed of parts of conjuncts has often puzzled syntacticians working on coordination (see Perlmutter/Ross 1971, Jackendoff 1977, Sag et al. 1982) and semanticists working on plurals (see Link 1984, Hoeksema 1986). However, none of these authors has attempted a general syntactic or semantic analysis of the construction. The semantic analysis of Link (1984) is restricted to collective relative clauses modifying conjoined NPs as in (2b) and (2d). The analysis of Hoeksema tries to account for sentences like (1) and could be generalized to the other constructions; but, as we will see, it is in many ways inadequate. The problem that the construction in question raises is that the syntactic structure, as traditionally assumed, does not provide an appropriate basis for the semantic interpretation.

To illustrate this, consider (3a). Given standard assumptions and assuming, for the sake of the argument, that Right Node Raising is movement, there are two syntactic representations on which the semantic interpretation of (3a) might be based, one as presented in (5a) and another one as presented in (5b).

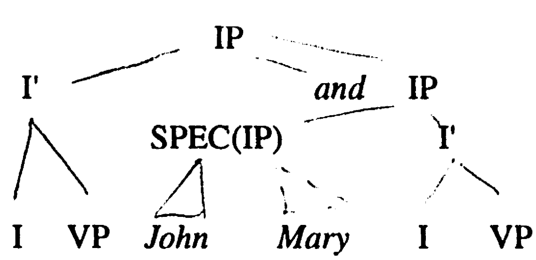
(5) a. John praised different people and Mary criticized different people.
    b. [John praised t and Mary criticized t] different people.

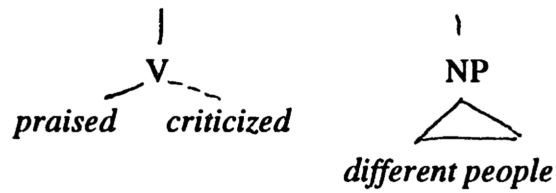
It is clear that both of these representations are inappropriate for the semantic evaluation of (3a). (3a) clearly means something different from (5a). For instance, unlike (5a), (3a) cannot describe a situation in which John praised a single person x and Mary criticized single person y different from x.

Similarly, (5b) cannot be the syntactic basis for the intended interpretation of (3a). Any interpretation of (5b) implies that John praised the same person or the same people that Mary criticized.

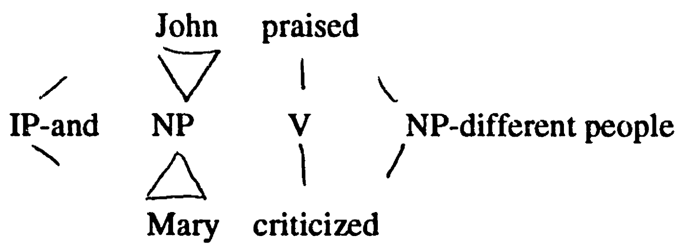
In the syntactic structure that I will propose for (3a) *John* and *Mary* as well as *praised* and *criticized* are implicitly coordinated. The syntactic structure of (3a) accordingly is as given in (6).
Recall that a structure such as (6a) can be notated in a simplified way as in (6b).

(6) a.





b.



Crucially, this structure has one 'reading' in which (3a) is equivalent to (7):

(7) John and Mary praised and criticized different people.

This 'reading' of the syntactic structure of (3a) will be semantically evaluated in exactly the same way as (7). The semantic evaluation of (7) is unproblematic, given an adequate general semantics of *different* and the generally held assumption that phrasal coordination may be interpreted by group formation.

Given the semantics of *different* in Moltmann (1992), (7) can be paraphrased roughly as (8):

(8) There is an event e and a group of people x such that: e is an event of praising and criticizing of x by John and Mary for which the following holds:
For all distinct subevents e' and e" of e, if there are parts z' and z" of the group consisting of John and Mary, and parts x' and x" of x such that z' is the agent of e' with respect to x' and z" is the agent of c" with respect to x", then x' and x" are distinct.

Thus the syntactic effect of implicit coordination in (3a) can be described as follows. Expressions that take plural antecedents such as*different* in (3a) may take an implicitly coordinated antecedent that consists of constituents denoting individual entities. Thus *different* in (3a) takes as its antecedent the implicit coordination of *John* and *Mary.*

The semantic consequences of the possibility of implicit coordination is the following.

Implicitly coordinated phrases can be interpreted by the same semantic operation as plurals (see chapter 1). Thus the implicit coordination of *John* and *Mary* in (3a) can interpreted as a referential term referring to the group whose members are John and Mary. The implicit coordination of *praised* and *criticized* can interpreted as a three-place relation among events e, agents x and objects y such that e is a group event consisting of a subevent of praising y (or a part of y) by x (or a part of x) and a subevent of criticising y (or a part of y) by x (or a part of x). That is, semantic rules yield the same interpretation for the implicit coordination of *John* and *Mary* in (3a) as for the explicit coordination *John and Mary,* and they yield the same interpretation for the implicit coordination of *John* and *Mary* in (3a) as for the explicit coordination *praised and criticized.* As a result, the interpretation of sentences such as those in (3a) with respect to the implicit coordination can be achieved by the same semantic operations as for ordinary plural sentences.

The evaluation of (3a) as (7), that is, the evaluation of the implicit coordinations of (3a), actually does not provide all the information that (3a) in fact provides. (7), for instance, leaves it open whether John did the praising and Mary the criticizing or conversely. However, this information is provided by another 'reading' of the same syntactic structure of (3a), namely the evaluation of the clausal coordination of (3a). In the evaluation of the clausal coordination of (3a), however, certain elements are disregarded, in particular the elements taking an implicitly coordinated phrase as a plural antecedent. Instead those elements are evaluated simply as free variables that will later be bound by a lambda operator. Thus the evaluation of the clausal coordination of (3a) is equivalent to (9), where *them* refers to the people praised and criticized by John and Mary.

(9) John praised some of them and Mary criticized some of them.

The evaluation of the implicit coordinations in (3a) and the evaluation of the clausal coordination in (3a) each constitute a partial interpretation of (3a). The union of these partial interpretation will give the full interpretation of (3a).

The two partial interpretations of (3a) are based on two different m-plane assignment that are assigned to the phrase marker in (6a). These two m-plane assignments are both enforced as a consequence of the principle of Full Interpretation.

Let me now develop the syntactic and semantic analysis of constructions as in (2)-(5) in detail.

2.3. The account in terms of implicit coordination

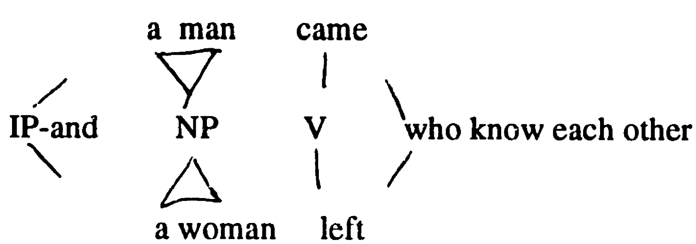
2.3.1. Implicit coordination and group formation

In the construction in (1-4) the parts that act as the antecedent act as a unit syntactically and semantically. However, a means of representaing parallel parts of conjuncts as units is not available in earlier theories of coordination. Recall from the previous chapter that in the two previous three-dimensional theories of coordination, namely the ones of Goodall's and Muadz, the independence of conjuncts in coordinated clauses is emphasized. Both Goodall and Muadz do not provide any formal means to represent parallel elements in coordinated phrases as units. In particular, they do not provide any means for representing parallel parts of conjuncts as group-referring terms. However, within the present three-diemsnional theory of coordination, the construction of implicit coordination can provide the basis for the status of parallel NPs as plural antecedents.

The basic idea in the application of implicit coordination to (1a) repeated here as (10a) is the following. A sentence such as (10a) has a syntactic representation in which *a man* and *a woman* are coordinated by phrasal coordination. That is, they are dominated by the same splitting NP node. However, this coordination lacks an explicit coordinator. (10a) accordingly has the syntactic representation given in (10b) in the abbreviated notation introduced earlier. Similarly, (3a) repeated here as (11a) has the representation in (11b).

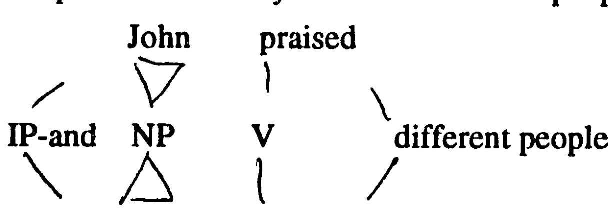
(10) a. A man came and a woman left who know each other.

b.



(11) a. John praised and Mary criticized different people.

b.



Mary criticized

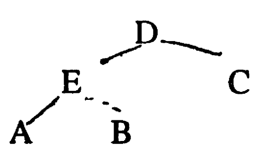
Implicit coordination for the purpose of plural antecedents is generated by the same rules as implicit coordination for the purpose of ATB extraction.

As for the application to ATB extraction, the use of implicit coordination in the constructions in (2) - (4) raises general questions. In particular, when is implicit coordination allowed or required? Implicit coordination can be enforced as a requirement of interpretation. Sentences without the relevant implicit coordinations are ruled out because otherwise the element taking an implicitly coordinated antecedent would not receive an appropriate semantic interpretation. Note that in (10b) and (11b) both the NPs and the verbs are implicitly coordinated. Both implicit coordinations are required to provide a syntactic basis for an interpretation of the element taking a split antecedent, as we will see. Furthermore, I will assume that implicit coordination is allowed even when it is not required for the purpose of interpretation, and hence is not necessarily interpreted. Implicit coordination may then still be enforced syntactically. This is the case, for instance with ATB extraction, as discussed in chapter 1.

2.2.2. The construal of planes for sentences with implicit coordination

The three-dimensional syntactic representations for (10a) and (11a) in (10b) and (10b) provide an appropriate antecedent for the extraposed relative clause and for*different*. Recall from chapter 1, however, that it is not clear how a three-dimensional tree such as (10b) or (11b) should receive a compositional interpretation. Unlike two-dimensional syntactic structures, where (according to the most commonly assumed view) a compositional semantic interpretation proceeds from smaller constituents to larger constituents, three-dimensional syntactic structures allow for more than one 'direction' for the composition of meanings. This was shown with a simple three-dimensional tree such as (12).

(12)



There are two ways to proceed after A, B and C have been evaluated. After the evaluation of A, B and C, either the syntactic unit consisting of A and B could be evaluated or else the constituents AC and BC could be evaluated. The first interpretation evaluates 'cross-planar', three-dimensional syntactic units, the second one first evaluates bigger planes.

In chapter 1, the ambiguity in the direction of the compositional semantic interpretation of a three-dimensional tree was conceived as a matter of different construals of m-planes from the tree. The first direction of compositional interpretation will apply when A and B are conceived as constituting **'small' m-planes.** (More precisely, these two small m-planes are the two two-dimensional subtrees rooted in E). The second direction of interpretation will apply when AC and BC are conceived as constituting , what I will call **'big' m-planes.** (More precisely, these two planes are the two two-dimensional subtrees rooted in D).

One of the plane assignments of (12) is represented by the set of pairs in (13a), which provides the basis of the first interpretation mentioned above. Another plane assignment of (12) is represented by the set of pairs given in (13b). As the first element of the complete m-plane pairs in (13a) and (13b) we get the empty set, since (12), as a structure of implicit coordination, does not contain an overt coordinator.

(13) a. P1 = {<{ }, {A, B}>}
b. P2 = {<{ }, {AC, BC}>}

In (13a) and (13b), a plane is 'represented' by the sequence of terminal nodes of the plane, a two-dimensional subtree. This should not distract from the fact that a plane is really a tree. As in chapter 1, I will always make use of this representation of planes.

Thus, the 'direction' of the compositional interpretation of a three-dimensional tree depends crucially on the construal of m-planes. A three-dimensional tree can be semantically evaluated only in relation to a particular complete m-plane assignment. For a given tree, there may be several possible complete assignments of m-planes which will provide the basis of the semantic interpretation of the sentence.

Two general questions then arise concerning the assignment of m-planes to a three-diemsnional phrase marker. [1] Does the semantic interpretation of a coordinate sentence have to be based on a single complete m-plane assignment or may it be composed of the evaluations of several complete m-plane assignments? [2] What determines that a phrase marker is assigned a particular m-plane assignment, and what determines how many different m-plane assignment the phrase marker is assigned?

Regarding the first question, I will argue that the evaluation of a three-dimensional tree on the basis of several complete m-plane assignments is crucial in the case of sentences with implicitly coordinated antecedents as in (2)-(4). For instance, one of the complete m-plane assignments of (3a) contains small planes for the splitting NP node and for the splitting VP node. These planes are not associated with a coordinator. This small m-plane assignment allows for the evaluation of *different*. The other complete m-plane assignment of (3a) contains two big m-planes which are rooted in the IP node. These m-planes are associated woth coordinator *and*. In the evaluation of (3a) with respect to this m-plane assignment *different* will be disregarded. Thus for (3a) we have the two complete m-plane assignments represented by M_1 and M_2 in (14):

(14) M_1 = {<{ }, {*John, and Mary*}>, <{*and*}, {*praised, and criticized*}>}
M_2 = {<{*and*}, {*John praised different people, and Mary criticized different people*}>}

The semantic interpretation of (3a) with respect to M_1 will evaluate the pair <{ }, {*John, Mary*}> as a group-referring term, which provides the antecedent of *different*. Furthermore, it will evaluate the pair <{*and*}, {*praised, and criticized* }> as a predicate holding of triples consisting of a group event of praising and criticizing, a (group or single) agent, and another (group or single) participant.

The semantic interpretation of (3a) with respect to M_2 will evaluate the pair <{*and*}, {*John praised different people, and Mary praised different people*}> roughly as a conjunction of the proposition of John criticizing x and Mary praising x. In the next section, I will show how the interpretation of (3a) with respect to these two m-plane assignments proceeds in detail.

In fact, I will assume that the evaluation of a three-dimensional tree may in principle be based on an unlimited number of complete m-plane assignments. The evaluation of a tree relative to a plane assignment then may yield only a partial interpretation of the sentence. Thus we have the following notion of a partial interpretation of a tree:

(15) Let F be a functional assignment of a sentence S with respect to a phrase marker T.
I is a **partial interpretation** of S relative to T iff there is a complete m-plane assignment M in F such that I is the semantic interpretation of S relative to M and T.

Now let us turn to the second question, namely what determines how many m-plane assignment are assigned to a sentence relative to a phrase marker. In chapter 1, certain general conditions were imposed on m-plane assignments. In particular, a condition on m-plane assignments was imposed that it consist of planes rooted in the node dominating a coordinator. This condition was modified in order to account for 'respectively' sentences, where the coordinators may be lower in the tree. In order to account for implicit coordination, in fact the condition has to be given up completely as a general condition on m-planes. The crucial point of assuming implicit coordination for the sentences in (1-4) is that the implicitly coordinated phrases may be constitute small m-planes and hence allow for an interpretation as group terms.

But still, one should impose a condition to the effect that a sentence with an overt coordinator j should be assigned at least one m-plane assignment which contains a complete m-plane pair with the coordinator as the element of the first argument (a set of coordinators). We have seen the necessity of this with gapping which requires 'big' m-planes for an adequate interpretation. Again it is necessary for implicit coordination construction. In this case, big m-planes have to be enforced to yield a partial interpretation which given the right association of the predicate conjuncts (of the implicit predicate coordination) with the argument conjuncts (of the implcit NP coordination). Thus, the following condition shoudl hold for m-plane assignments to a phrase marker:

(16) For a sentence S with a phrase marker T containing a coordinator j, S has to be assigned an m-plane assignment containing a complete m-plane pair in which j is an element of the first argument.

As a consequence of (16), a sentence such as (11a) has to have a complete m-plane assignment with planes rooted in the IP node since this node dominates the overt coordinator. That is, the second plane assignment given earlier, the big m-plane assignment is obligatory for (11a). The semantic effect of the (syntactic) obligatoriness of this second plane assignment for (11a) is that the right association of the predicate conjuncts with the argument conjuncts is enforced.

But clearly, (16) does not have to be stipulated. It simply follows from the requirement that the coordinator j be interpreted. Only m-plane assignments provide the relevant relation that can be the basis for the interpretation of the coordinator. In other words, (16) is simply an instance of the Principle of Full Interpretation. Which coordinator can be associated with planes in a complete set of m-planes will be a matter of the identification condition for the coordinator relation. I will assume that an overt coordinator will not be available for small m-planes associated with an implicit coordination structure.

The question then is, why are small m-planes required for implicit coordination structures such as those for (1-4)? Small m-planes are required for the same reason, that is, the Principle of Full Intepretation. The element taking the split antecedent must be interpreted and hence must stand in the relevant anaphoric relation to its antecedent. But this requires that there be a plural antecedent, and only small m-planes can represent the relevant parts of the conjuncts as conjoined plural terms.

As is reasonable for meaningful syntactic relations in general, I will assume m-plane assignments are governed by the following principle. A sentence is assigned only so many m-plane assignments as to allow for an interpretation of all the elements in the sentence, that is, to allow for the satisfaction of the Principle of Full Interpretation. Thus, we have the following condition on m-plane assignments, which are an instance of the more general condition in (18).

(17) Minimality Condition on M-Plane Assignments
Assign an m-plane assignment M to a sentence S relative to a phrase marker T iff S contains an element x such that x can be interpreted only on the basis of a relation in M or a relation to a complete m-plane set in M.

(18) Minimality Condition on Functional Assignments
A functional assignment to a sentence S relative to a phrase marker T should contain only those relations that are required to provide a semantic evaluation of all constituents in S.

2.2.3. The simultaneous partial interpretation of constructions with implicit coordination

Let me now present a formal semantic analysis of a sentence with a three-dimensional phrase marker based multiple m-plane assignments. The interpretation of a sentence on the basis of a complete m-plane assignment has to be conceived as a partial sentence meaning in such a way that it can be appropriately combined with the interpretations of the sentence on the basis of another m-plane assignments. There are various ways one can conceive of such partial simultaneous interpretations. I will choose a particular way of construing partial interpretations of a sentence. This conception of partial sentence meanings is mainly motivated by simplicity, rather than any deeper theoretical considerations. In this conception, partial interpretations of a sentence are simply relations between participants and events. There are a number of other formal proposals in the literature for partial interpretations of sentences for other purposes. I will briefly discuss these proposals and their applicability to the present concern in the next section.

Recall from chapter 1 that in the present conception the syntactic basis of the interpretation of a three-dimensional phrase marker are meaningful syntactic relations such as argumenthood which may be established among three-dimensional syntactic units. The way meaningful syntactic relations among three-dimensional syntactic units are established is via the ordinary syntactic relations among constituents in the individual f-planes. Thus, for instance *<John, and Mary>* is an argument of *<praised, and criticized>* because *John* is an argument of *praised* in one f-plane and *Mary* of *criticized* in another f-plane. Similarly, the shared constituent *different people* is an argument of *<praised, and criticized>* because *different people* is an argument of *praised* in one f-plane and of *and criticized* in another f-plane. Thus we have the following condition on syntactic relations among three-dimensional syntactic units:

(19) <u>Condition on syntactic relations among three-dimensional syntactic units</u>
For a (two-place) syntactic relation R, a three-dimensional phrase marker T, three-dimensional syntactic units X and Y in T, R(X, Y) iff for each X' which is a member of X or X itself (if X is a shared node) there is an Y' such that Y' is a member of Y or Y itself (if Y is a shared node) such that R(X', Y') in some f-plane of T and conversely for each Y' which is is a member of Y or Y itself, there is an X' with the same specification.

I will assume the following two general rules for the evaluation of three-dimensional syntactic units. (20a) accounts for conjunction of referential NPs and (20b) for any expressions denoting relations, for instance verbs. G, as usual, maps a set of entities into a group composed of those entities:

(20) a. For referential NPs X_1 and X_2, $[<\{and\}, \{X_1, X_2\}>] = G(\{[X_1], [X_2]\})$

b. For two-place place predicates N_1 and N_2, $[<\{and\}, \{N_1, N_2\}>] = \{<x, y>|Ex'x''y'y''(N_1(x', y') \& N_2(x'', y'') \& x = G(\{x', x''\}) \& y = G(\{y', y''\})\}$

How should three-dimensional syntactic units with implicit coordination be interpreted? In the constructions discussed, the implicit coordination is always evaluated as if it were *and.* coordination. There are two possible reasons why this should be so.

The first one is that *and* is the implicit coordinator for the phrasal coordinators because *and* is the explicit coordinator for the clausal coordination. More generally, the interpretation of implicit phrasal coordination would always correspond to the coordination of the clauses containing the phrases.

The second possibility is that implicit coordination is, as the default case, always interpreted as conjunction, i.e. by the operation of group formation. The proper choice between the two possibilities can be decided when coordinate constructions other than *and* coordination are considered. If other types of clausal coordination allow for implicit coordination and this implicit coordination is always interpreted by the same semantic operation as the coordinator of clausal coordination, this would be evidence for the first possibility. However, when we examine other types of coordinate structures in chapter 3, we will see that this is not the case. In fact there are a number of clausal coordinate structures with coordinators other than *and* that allow for implicit coordination; but the implicit coordination in these structures is never interpreted by the same semantic operator as the clausal coordination. The implicit coordination is always interpreted by group formation, i.e. as *and.* Moreover, the discussion in chapter 3 will show that an even stronger claim is justified: Every clausal coordinate structure allows for implicit coordination syntactically. However many such structures are unacceptable semantically because the evaluation of implicit phrasal coordination by group formation is incompatible with the overall interpretation of the sentence. This motivates the following rule:

(21) Rule for the interpretation of implicit coordination

Let $<\{\ \}, X_1, ..., X_n\}>$ be a complete pair of m-planes of an m-plane assignment

to a phrase marker T of a sentence S.
Then [<{ }, {X_1, ..., X_n}>] = [<*and*, X_1,..., X_n>]

We can now apply the rules given above to evaluate (22a) with respect to the small plane assignment in (22b).

(22) a. John and Mary praised and criticized Bill.
b. {<{*and*}, {*John, and Mary*}>, <{*and*}, {*praised, and criticized*}>}

The syntactic relations on the basis of which (22a) is evaluated are given in (23a). Based on the evaluation of these relations, the semantic interpretation then is the proposition in (23b).

(23) a. *<and, praised, and criticized>* is a finite verb form in (T,M)
<Bill, <and, praised, and criticized> $\in$ ARG2, 2(T, M).
<and, John, Mary>, <<and, praised, criticized>, Bill>> $\in$ ARG1, 1(T, M).
b.$\exists$e[[*<and, praised, and criticized>*](e, G({John, Mary}), Bill)]

However, for the purpose of partial interpretation, I will assume that, generally, the evaluation of a sentence with respect to a complete m-plane assignment is a relation between events and participants, rather than a proposition. That is, the relations of argumenthood and the function of finite verb forms must be evaluated only after the various partial interpretations on the basis fo the different m-plane assignments have been conjoined. This will become clearer in the following.

For the internal reading *same/different* I will assume the analysis in Moltmann (1992). According to this analysis, a sentence such as (24a), has an interpretation which consists of two parts: one, namely (24b), specifying the meaning of (24a) while disregarding the contribution of *different* and a second one, namely (24c), specifying the specific contribution of *different*. Applying exististential closure to the event variable and the variable standing for the *different* NP and lambda conversion to the variable standing for the *different* NP yields (24d) as the sentence meaning (24a) before existential closure with respect to the event and object variables applies.

(24) a. John and Mary praised and criticized different people.
b. λexy[([*<and, {praised, and criticized}*]](e, x, y) & people(y)]

c. λex[Ex'x"y'y"(x'Px & x"Px & -x' = x" & yPy' & yPy" & Ee'e"(e'Pe & e"Pe & agent(e', x', y') & agent(e", x", y")))

d. λey[([<*and*, {*praised, and criticized*}](e, [<*and, John ,and Mary*>], y) & people(y)] & Ae'e"x'x"y'y"(e'Pe & e"Pe & agent(e', x', y') & agent(e", x", y") & x'P[*John and Mary*] & x"P[<*and, John, and Mary*] & -x' = x" & yPy' & yPy" & --> -y' = y"))

Clearly, (24c) is identical to the evaluation of (11a) with respect to the first plane assignment given in (16a) and repeated in (25):

(25) M_1 = {<{ }, {*John, Mary*}>, <{ }, {*praised, criticized*}>}

Now let us turn to the interpretation of (11a) with respect to the second plane assignment, namely M_2 as in (26):

(26) M_2 = {<{*and*}, {*John praised different people, and Mary criticized different people*}>}

Clearly, the planes in (26) cannot be interpreted literally. Rather, as was suggested earlier, *different people* in (26) will simply be evaluated as a variable. Such a reevaluation of a constituent in a plane is possible in exactly those cases in which the constituent takes a 'crossplanar' antecedent, that is, an antecedent consisting of constituents in different planes. This is captured by the following condition:

(27) For any constituent x in a three-dimensional tree T, if x enters an anaphoric relation to an antecedent that is a complete set of m-planes in a plane assignment M of T, then for any plane assignment M' distinct from M, $[x]_{T, M'}$ = y for an appropriate variable y.

Furthermore, the planes in (26) have to be evaluated in such a way that the event of the John's praising is a subevent of the complex event of praising and criticizing by John and Mary. This can formally be done by having the existential quantifier over the events of praising be restricted to the parts of the event represented by a variable bound by a lambda operator. This event variable will later be bound by the existential quantifier over complex events of praising and criticizing by John and Mary in the interpretation of (11a) with respect to the small plane assignment.

We now have syntactic relations for the first m-plane of (11a) with respect to the m-plane assignment M2 as in (28) and a semantic interpretation of this plane in (29).

(28) a. <*John* , *praised*>∈ ARG2, 3(T', M2)

b. <*different people, praised*>∈ARG3, 3(T', M2)

(29) λe'y'[praise(e', John, y'))]

Thus an IP is evaluated as a relation with respect to the m-plane assignment M2. Therefore, we can apply the rule in (20b) to the complete m-plane pair in M2. Thus the evaluation of the clausal coordination in (11a) then gives (30):

(30) [<*and, John praised different people, and Mary criticized different people*>]T, M2 =
λ ey[Ey'e'e"y"(praise(e', John, y')) & criticize(e", Mary, y") & e = G({e', e"}) & y = G({y', y"}))]

Thus (30) is the partial interpretation of (11a) with respect to the second plane assignment.

The combination of the two partial interpretations of (11a) is now easy to do: it is simply the union of the two relations in (24d) and (30). Only after the union of the partial interpretation do certain other operations apply which will eliminate the variables bound by the lambda operator. Thus we get (31) as the complete interpretation of (11a):

(31) Eey[([*praised and criticized*](e, [*John and Mary*], y) & people(y)] & Ae'e"x'x"y'y"(x'P[*John and Mary*] & x"P[*John and Mary*] & x'≠ x" & y'Py & y"Py & e'Pe & e"Pe & e' ≠ e" & agent(e', x', y') & agent(e", x", y") --> y'≠ y") & Ey'e'(e'Pe & y'Py & praise(e', John, y')) & Ey'e'(e'Pe & y'Py & criticized(e', Mary, y'))]

I will show how this account explains a number of syntactic peculiarities of the construction, given certain general assumptions about syntactic relations in three-dimensional trees. I will also point out a number of semantic consequences the account has.2 However, first, I will make a few remarks about partial interpretations of sentences in other contexts.

2.2.4. Partial interpretation in other contexts

There other phenomena in natural languages that require a treatment based on several partial interpretations that have to be combined to yield the complete meaning of a sentence or other linguistic expression. A prominent case are assertive and presuppositional parts of sentence meanings. Typically, multiple partial interpretations of a sentence raise the problem of how they should be combined. In particular, they raise the problem that a quantifier in one partial interpretation often has to bind a variable in another partial interpretation. The logical problem that usually arises is the following. If the 'combination' of the two partial interpretations is conjunction, the quantifier would take wider scope than it ordinarily does. An example of the relevant sort with presuppositions is given in (32') from Karttunen/Peters (1979).

(31') Some woman managed to get the job.

Roughly, the presupposition of (31) is that it was hard for some woman to get the job, and the assertion of (31') is that some woman did get the job. However, the woman the presupposition is about has to be the same as the one the assertion is about. Thus the existential quantifier representing *some woman* has to somehow take scope over both the assertion and the presupposition.

There are various formal proposals in the literatue to solve those scope problems as they arise in other contexts ('donkey' sentences), in particular with indefinite NPs. Most prominent among those proposals are Discourse Representation Theory (cf. Kamp 1981, Heim 1982) and Dynamic Predicate Logic (Gronendijk/Stokhof 1991).

The combination of the partial interpretations of a sentence involving implicit coordination such as (2a) repeated here as (31") on the basis of implicit coordination and on the basis of the clausal conjunction is, similarly, not a trivial matter.

(31") A man came and a woman left who know each other well.

The problem is that *he* and *she* in (31") are bound by the existential quantifier introducing the man and the woman in the evaluation of the implicitly coordinated structure. However, if the interpretation of big plane assignment should yield a second conjunct in the overall meaning of the sentence, the existential quantifier would have to have scope over the conjunction. Similarly, *came* and *left* in (31") are dependent on the event quantifier in the evaluation of the structure of implicit coordination, which however has scope only over elements in the first conjuncts. Note that this scope problem is a different one as for 'donkey'-pronouns. Unlike in the case of 'donkey'- pronouns, the quantifier that binds the pronouns and takes wide scope over the conjunction, need not be an existential quantifier. The same requirement of wide scope holds for universal quantifiers as in (31").

(32) Every man came and every woman left who had met before.

Thus the proposals for partial interpretations given in the literature in order to account for 'donkey'-sentences cannot generally be adopted for the partial interpretations arising with implicit coordination, since the phenomena are quite different in nature. (But see Groenendijk/Stokhof 1991 for considerations of extending Dynamic Predicate Logic to universal quantifiers.)

2.3. Syntactic peculiarities of constructions involving implicit coordination and group formation

In this section I will show that the syntactic account proposed above can explain a number of peculiarities of the construction under discussion. These peculiarities basically follow from general conditions on how meaningful syntactic relations are established in three-dimensional trees.

2.3.1. The restriction to coordination

The construction in (1) - (4) is generally restricted to coordination; that is, the constituents that together form a plural antecedent have to be belong to different conjuncts. This is seen for extraposed relative clauses in (32):

(32) a. * Mary met *a man* with *a dog who were quite similar.*

b. * *A man* met *a woman who came from the same country.*

c. * John showed *a man a woman who know each other.*

Also relational adjectives in the relevant construction require that the antecedents be constitituents in different conjuncts of a coordinated structure. This is seen in (33).

(33) a. * During the same period of time *John* claimed that *Mary* played piano.
b. * At the same time *John* laughed because *Mary* tried to play piano.

(33a) cannot have a reading in which *same* compares the time of John's claim and Mary's playing piano. (33b) cannot have a reading in which *same* compares John's laughing and Mary's attempt of playing piano.

The restriction to coordination follows immediately from the fact that implicit coordination - the only way such plural antecedents can arise - is possible only among nodes that belong to different planes.3

2.3.2. Constraints on implicit coordination and constraints on ATB movement

In this section, I will show that plural antecedents composed of parts of conjuncts are subject to the same constraints as ATB movement and thus justify a parallel treatment of the two constructions.

The conditions on parallelism imposed by the ATB format on elements undergoing syntactic movement seem to match those on elements acting as plural antecedents for expressions taking implicitly coordinated antecedents. This holds for all cases of parallelism that have been observed in the literature (cf. Williams 1977). As was discussed in chapter 1, the parallelism phenomena are not uncontroversal. But whatever the source for parallelism constraints or the lack of them may be, they seem to holds for ATB extraction in the same way as for implicitly coordinated antecedents.

First, let us consider the case of objects and subjects in embedded clauses. As with ATB wh-movement, the two NPs may not act together as a plural antecedent for an element taking an implicitly coordinated antecedent:

(34) a. **A woman* came and John met *a man who knew each other well..*
b. * John gave *Bill* and *Sue* received two presents *each..*

Williams' case (35a), where ATB is possible from the object position of a main clause and the subject position of the embedded clause, can also be parallelled with constructions involving implicitly coordinated antecedents. This is shown in (35b) and (35c):

(35) a. Who did John see t and Mary say t will come tomorrow?
b. John sent *the article* and Mary said that *the book* will be sent to two professors *each*.
c. John sent *Max* and Mary said *Sue* will be sent two picures of *themselves* / the *same* picture.

There are certain apparent exceptions, for instance the examples in (36).

(36) a. * At the *same* time John saw *Mary* and Bill believes *Sue* arrived.
b. * Mary met *a man* and John said *a woman* arrived *who know each other quite well.*
c. * Pictures of *themselves* impressed Mary and showed that Sue has been beautiful.

However, the unacceptability of these examples can be attributed to the fact that the locality conditions on the syntactic relation between the antecedent and *same/different*, extraposed relative clauses or reflexives are not satisfied in all conjuncts. For instance, *same* cannot take an antecedent in an embedded clause:

(37) * At the *same* time, John said that *Bill* and *Sue* arrived.

(36a) is bad since the condition is violated in the second conjunct.

(36b) is bad for the following reason. The extraposed relative clause would have to be adjoined higher in the tree than the embedded clause in the second conjunct in order to take part of its antecedent in the first conjunct. This is seen in (38).

(38) $[_{IP}[_{IP}$ John met a man t and Mary said $[_{cp}$that a woman t arrived]] who know each other well].

But this is impossible for relative clause extraposition. This can be seen from (39), where the relative clause takes an antecedent inside the subject clause.

(39) * That *a child* solved the problem was very impressive *who had never studied mathematics.*

(36c) is bad because reflexives cannot take an antecedent in a deeper embedded clause:

(40) * A pictures of *herself* showed that *Sue* was beautiful.

Thus ATB extraction and implicit coordination for the purpose of providing a plural antecedent seem to be governed by the same conditions. These conditions appear to be syntactic, not semantic in nature in the following sense. Even if the semantic or pragmatic context creates semantic or pragmatic parallelism, implicitly coordinated antecedents are excluded if conditions on syntactic parallelism are not satisfied. This is seen in examples such as those in (41).

(41) a. ?* *A woman* left and John kicked out *a man who knew each other quite well.*
   b. ?* Mary brought along *a man* and *a woman* appeared *who know each other quite well.*
   c. ?* *A man* left and John asked *a woman* to leave *who know each other quite well.*
   d. * John just wrote *a novel* and *a book* has recently been published *that are quite similar.*

This shows that possibility of implicit coordination is syntactically governed and is a construction that uniformly underlies ATB extraction and split antecedents in the relevant construction.

2.3.3. The Coordinate Structure Constraint for implicitly coordinated antecedents

A further condition on implicitly coordinated antecedents corresponds to the ATB principle of extraction and deletion. If one conjunct in a coordination contains a part of an implicitly coordinated antecedent, then every conjunct of this coordination must provide a part of the antecedent. Thus (42a) and (42b) are excluded because the third and first conjuncts respectively do not provide a part of the antecedent of the collective extraposed relative clause.

(42) a. * John met *a woman*, Mary met *a man* and Sue remained alone *who have known each other for a long time.*

b. * John, *a man* and *a woman who are married.*

(43) John said, *Mary* wrote and *Sue* shouted *different* things.

Within the planar theory of coordination, Goodall (1987) and Muadz (1991) derive the ATB principle for extraction from the Principle of Full Interpretation (cf. Chomsky 1986), more precisely the prohibition against vacuous quantification. The idea is that the Principle of Full Interpretation has to be satisfied in each plane. Thus, for instance, in (44), the principle is not satisfied because the wh operator does not bind a variable in the second plane.

(44) a. * Whom did John see and Mary became ill?

b. plane 1: Whom did John see t

plane 2: Whom did Mary become ill

The same account can be carried over to implicitly coordinated antecedents. This only requires the assumption that the element taking the implicitly coordinated antecedent has to stand in the relevant syntactic relation to an (ordinary) antecedent in each f-plane of the phrase marker of the sentence. In (42a) and (42b), this condition would not hold for one of the two f-planes.

Note that the syntactic relation that, for instance the relative clause in (42a) has to enter to an ordinary antecedent in each given f-plane is not directly related to the semantic evaluation of the relative clause. The semantic evaluation is based only on the syntactic relation of the relative clause to the implicitly coordinated NP. However, the relation to the implicitly coordinate antecedent has to somehow be syntactically established. Apparently, the general principle of how to establish such a relation is the following. Syntactic relations involving an implicitly coordinated phrase have to hold in each f-plane among a part of the implicit coordination and the antecedent. We have seen this principle at work already in the context of ATB extraction. It is given with some reformulations as (45). The notion of 'correspondent' in (45) is defined in (46).

(45) Condition on syntactic relations among three-dimensional syntactic units

For syntactic units X and Y belonging to several planes of a tree T and a meaningful syntactic relation R such as 'is anaphor to', R(X, Y) iff for each f-plane p of T there is a correspondent X' of X in p and a correspondent Y' of Y in p such that R(X', Y').

(46) Definition of 'correspondent'

X' is a correspondent of X in a plane p iff X is a shared node and X' = X or X' is a member of the first member of X.

Of course, the syntactic relations holding in the individual f-planes between an antecedent part and the collective relative clause cannot be exactly the same as the syntactic relation between an ordinary antecedent and a collective relative clause, as in *a man and a woman came who knew each other well.* In the latter case, the antecedent has to be in the plural. But in the case of an implicitly coordinated antecedent, the antecedents in the individual planes may be in the singular. What this shows is that conditions on number should not play a role in establishing the syntactic relations in the individual f-planes. The reason appears to be that conditions on number are not part of the syntactic conditions on the syntactic relation, but rather are a semantic requirement.4

2.3.4. The position of the element taking an implicitly coordinated antecedent

The element that takes an implicitly coordinated antecedent can occur only in certain positions. The following positions are possible: SPEC(CP) with ATB movement, adjunction to IP, the position of phrases that have undergone Right Node Raising, and extraposition. These four possibilties are illustrated in (47):

(47) a. How many pictures *each* did *John* buy and *Mary* sell?
b. On the *same* day, *John* died and *Mary* was born.
c. John *saw* and Mary *wants to see* the *same* man.
d. *A man* came and *a woman* left *who know each other well.*

Other positions are not possible, for instance those in (48):

(48) a. * *John* died on the same day and *Mary* was born
b. * *A man* came *who know each other well* and *a woman* left.

The difference between the positions of the elements taking implicitly coordinated antecedents in (47) and in (48) clearly is that in (47) the element belongs to each plane defined by a conjunct, that is, in (47) it is a shared node; in contrast, in (48) it can belong to only one plane. The requirement that the element taking the implicitly coordinated antecedent be a shared node can be made to follow from another general principle about syntactic relations in three-dimensional trees. This principle says that a node can stand in a meaningfull syntactic relation to another node only if it belongs to the same planes. This principle is given in (49):

(49) Condition on syntactic relations and shared planes
Two syntactic units X and Y in a three-dimensional syntactic tree can stand in a meaningful syntactic relation only if X and Y belong to the same f-planes.

(50) X and Y belong to the same f-planes if every f-plane that X or a member of X is part of is an f-plane that Y or a member of Y is part of.

2.3.5. Establishing the antecedent-anaphor relationship with implicit coordination

Syntactic relations with implicit coordination, that is, syntactic relations among three-dimensional syntactic units, raise another question. How are syntactic conditions on a syntactic relation satisfied if that relation holds among three-dimensional syntactic units? As is expected, such conditions are satified via the satisfaction of the syntactic conditions in individual f-planes.

For instance, Condition A of Binding Theory is satisfied with the relation between an anphor and an implicitly coordinated antecedent in the following way. Each conjunct must satisfy Condition A; it is not sufficient if only one conjunct does. This is seen in the following example.

(51) ?? *John* sold and *Bill* wants Mary to sell pictures of *themselves* / *self*-portraits.

In the first sentence of (51), Condition A is satisfied only with respect to the relation between *John* and *themselves* in one f-plane; it is not satified with respect to the relation between *Mary* and *themselves* in the other f-plane.

Parallel evidence for the general condition can be given for any other expression taking an implicitly coordinated antecedent. An example is given in (52) showing the condition for binominal *each,* which imposes a condition clause-boundedness in each f-plane:

(52) John bought and Mary discovered that Bill will sell two books *each.*

The requirement that conditions on syntactic relations must be satisfied in individual planes is another consequence of a principle that was introduced earlier, namely in relation to the constraint corresponding to the Coordinate Structure Constraint for implicitly coordinated antecedents. This principle says that a (meaningful) syntactic relation holds among three-dimensional syntactic units only if the syntactic relation holds in the ordinary way among correspondents of the three-dimensional units in individual f-planes.

2.4. Further consequences and applications of the account

2.4.1. Apparent differences between simple plurals and NPs modified by relational adjectives

There is a fundamental difference between NPs modified by relational adjectives such as *the same book* or *related problems* and what I will call 'simple plurals' such as *the children.* This difference manifests itself in differences in the interpretation of sentences with implicit coordination.

The difference between NPs with relational adjectives lies in the availability of a certain type of distibutive reading in certain contexts. This distributive reading of a plural NP is illustrated with the NP *the two books* in (53):

(53) John and Mary read the two books.

In the relevant distributive reading of *the two books* in (53), (53) means that John read one of the two books and Mary the other one of the two books, where neither John or Mary need to have read the book the other one has read.

Generally, the distributive reading of simple plurals is restricted to the minimal clause containing the plural. This is shown in (54).

(55) John and Mary believe that Bill read these two books.

(55) cannot have the meaning in which John (only) believes that Bill read one of the books and Mary (only) believes that Bill read the other one of the two books. (56) implies that both John and Mary have a believe about the two books.

A plausible analysis of the distributive reading of simple plurals is to reduce it to a general property of verb meanings. Accordingly, a verb holds of a group entity just in case it holds of the members of the groups (see Link 1984). Thus, in (53), given that the verb *read* holds of the pairs <[*John*], book 1>, <[*Mary*], book 2>, *read* also holds of the pair consisting of the group of John and Mary and the group of the two books, i.e. of <[*John and Mary*], [*these two books*]>. Thus, the distributive reading then is due to the following general meaning postulate, formulated for simplicity for two-place verb meanings and groups of two members.

(56) For any two-place meaning V of a verb, if $V(x, y)$ and $V(x', y')$, then
$V(G(\{x, y\}), G(\{x', y'\}))$.

The clause-boundedness of the distributive reading now follows immediately, since (56) allows only for distributivity among coarguments.

In contrast to simple plural NPs, NPs with relational adjectives may receive a nonclause-bound distributive interpretation. This interpretation is associated with a special syntactic relation (which is again subject to certain locality conditions). More precisely, relational adjectives such as *same, different, equal, related* and *neighboring* may enter a special syntactic relation that is associated with a specific semantic interpretation which consists in the relevant distributive reading. Consider the following examples:

(57) a. John and Bill want to live in different / neighboring villages.
b. John and Mary want Sue to learn the same language / related languages
c. John and Bill expect that they will work in adjacent buildings.

In (57a-c) the relational adjectives may have a broad distributive reading. In this reading (57a), for instance, can describe a situation in which John wants to live in village A and

Bill wants to live in village B such that A and B are different or neighboring.

In the same construction, an analogous reading is not available with simple plural NPs such as *two villages*. Consider (58).

(58) John and Mary expect that they will live in two remote villages

(58) implies that John wants to live in two remote villages and that Mary wants to live in two remote villages. *Two remote villages* cannot receive a broad distributive reading in which one village relates to John and the other one to Mary.

Crucially, the same restriction as for simple plurals on the availability of the distributive reading holds for NPs with relational head nouns.This is shown in the following contrast:

(59) a. John and Mary want Sue to visit neighboring countries.
b. John and Bill want Sue to visit neighbors.

(59a) allows for a broad distributive reading of *neighboring*. In contrast, (59b) cannot mean John wants Sue to visit x and Bill wants Sue to visit y, whereby x and y are neighbors. This means that the broad distributive readings of the examples in (57) cannot not just be due to the relational nature of the adjectives.

Now when we return to simple plural NPs, we see an important difference to NPs with relational adjectives. In general, simple plural NPs may not receive an interpretation in which the group is divided into subgroups or group members each of which relates to a different conjunct of an implicitly coordinated phrase in the same clause. I will call this the **'split interpretation'** of plurals. To illustrate this reading, consider the following contrasts:

(60) a. John married and Bill proposed to these (two) women.
b. John married and Bill proposed to different women / the same women / similar women.

(61) a. John painted and Bill composed these two masterworks.
b. These two masterworks, John painted and Bill composed.
c. John painted and Bill composed different / similar masterworks.

(60a) does not allow for the split interpretation in which John married one of the two woman and Bill proposed to the other woman. (60a) implies that John married the two women and Bill proposed to the two women. In contrast, (60b) allows for interpretations with monogamous relationships, even with the plural *women.* Similarly, (61a) and (61b) would only make sense if each of the two masterworks could have been both composed by John and painted by Bill.

Wh plural phrases pattern with other simple plurals:

(62) a. Which two women did John marry and is Bill engaged to?
    b. Which two masterworks did John paint and Bill compose?

(62a) has the same implication as (60a), and (62b) has the same one as (61a) and (61b).

For many speakers, plurals with relational head nouns pattern with simple plurals, rather than with NPs modified by relational adjectives:

(63) a. John married and Bill proposed to these two sisters / two sisters.
    b. These two sisters John married and Bill proposed to.
    c. Which two sisters did John marry and is Bill engaged to?

(63)a. - c. cannot have a reading in which John married (only) x and Bill proposed (only) to y, whereby x and y are sisters. The sentences imply that John married two women one of whom is the sister of the other and Bill proposed to the same two women.

The same pattern can be observed with NP-conjunction. Speakers generally have difficulties getting the split reading of simple plurals in arguments of conjoined NPs, as for *these two books* and *these two women* in (64).

(64) a. the editor and the author of these two books
    b. the husband and the fiancée of these two women
    c. the portrait and the sketch of these two women

(64a) cannot refer to the editor of one of the two books and the author of the other book. It implies that the two books each have an author and an editor. (64b) is not compatible with monogamous relationships. Finally, (64c) seems impossible if the portrait represent one woman and the sketch the other woman.

Again, the split interpretation of plurals in conjoined NPs becomes available with relational adjectives. The following examples from Jackendoff (1977) illustrate this:

(65) a. three students and two teachers of different languages / the same language
b. three members and two vice-chairmen of interlocking committees

The difference between simple plurals and NPs with relational adjectives follows from two things: on the one hand from the general ability of relational adjectives to take an implicitly coordinated NP as the plural antecedent and on the other hand from the semantics of sentences involving implicit coordination given in the previous section. The crucial point is the following. A sentence such as *John married and Bill proposed to different women* is interpreted on the basis of implicit coordination (or with respect to a 'small plane assignment'), where, crucially, the semantic evaluation of *different* takes place. The sentence then is again evaluated with respect to the clausal conjunction (or with respect to a 'big plane assignment'). Here *different* is disregarded and the sentence is roughly interpreted as *John married some of them and Bill proposed to some of them* (where the plural *some* is to be understood as referring to single women also).

In contrast, a sentence with a simple plural such as *John married and Bill proposed to these two women* will be interpreted as follows. With respect to the minimal plane assignment, the sentence comes out as roughly equivalent to *John and Bill married and proposed to these two women.* The interpretation with respect to this plane assignment would still allow for the split interpretation of *these two women* in relation to John and Bill. However, such an interpretation will be ruled out by the interpretation of the global plane assignment. With respect to this plane assignment, the sentence comes out as equivalent to *John married these two women and Bill married these two women.* The same, of course, holds for plurals with relational head nouns.

Thus the difference between simple plurals and NPs with relational adjectives can be traced simply to two factors: first, the fact that relational adjectives may enter a special syntactic relation for their semantic evaluation, a relation that involves a plural antecedent which may be an implicitly coordinated NP, and second the general semantics of sentences involving implicit coordination.[5]

2.4.2. Adjuncts and arguments and the split interpretation

There are more empirical facts involving the split reading than presented above. In particular, there is a distinction between arguments and adjuncts with respect to the availability of the split reading. Arguments seem to behave differently from adjuncts with respect to the split reading of plural NPs. Consider the examples in (66) and (67), where a simple plural NP is contained in an adjunct, rather than an argument.

(66) a. the man and the woman with the two black dogs
b. the blue carpet and the red carpet in the bedroom and the livingroom
c. the article and the book about John and Mary
d. a man and a woman from two remote islands

(67) a. In these two rooms, John died and Mary was born.
b. I can't remember in which two rooms John died and Mary was born.

(66a) can refer to a man who has one of the two black dogs and a woman who has the other dog. (66b) is fine in a situation in which the blue carpet is in the bedroom and the red carpet in the livingroom. (66c) is fine if the article is about John and the book about Mary. Finally, (66d) is fine if the man comes from a different island than the woman. Also most speakers get the reading of (67a) and (67b) in which John died in one of the two rooms and Mary was born in the other one.

Thus it appears that plural NPs in adjuncts generally allow for the split reading in implicit coordination structures.[6, 7] Why should arguments behave differently from adjuncts? The answer, it seems, can be made to follow straightforwardly from a planar theory of coordination, namely from plausible general conditions on m-plane construals.

There are two possible approaches to the argument-adjunct distinction one can take within the planar theory of coordination. On the basis of a further empirical fact, I will argue that the second approach is superior to the first one that I will present.

In the first approach, the notion of an m-plane is modified in such a way that an m-plane need not be a maximal sub-phrase marker (in the sense of chapter 1), but may be a sub-phrase marker from which certain nonobligatory elements have been taken away. In particular, a plane need not contain adjuncts which are not required by anything else in the subtree. Thus, in (67a) the big planes may simply correspond to *John died* and

Marywas born. They need not contain *in these two rooms. In these two rooms* may enter the relation of adjuncthood only to the implicitly coordinated verbs *died* and *was born,* and thus be evaluated only with respect to assignment of minimal planes.

Of course, as an option, also the big planes for (67a) may each contain the adjunct. That is, (67a) allows for the construal of the two planes *John died in these two rooms* and *Mary was born in these two rooms*. In this case, we get the second, absurd, reading of (67a), namely the reading in which John died in two rooms and Mary was born in two rooms.

We can now state the modification of the notion of an m-plane with respect to obligatory and optional elements as follows:

(68) <u>Modification of the notion of 'm-plane'</u>
An m-plane is a subtree as defined in chapter 1 possibly
without elements that are not required by other elements in the subtree.

However, there is the following problem with this account of the distinct behavior of arguments and adjuncts. The problem is that the split reading is unavailable when the adjunct 'has undergone' ATB-Right Node Raising, as in (69):

(69) John died and Mary was born in these two rooms.

(69) can only mean that John died in these two rooms and Mary was born in these two rooms.

As a first possibility of an explanation, this may have to do with the fact that, unlike in the case of IP adjunction, the position of *in these two rooms* in (69) may be considered an A-position (as for instance in the account of Larson 1990). One would then say that adjuncts in an A-position cannot be disregarded in the construal of m-planes. Thus one would have to modify the 'modification of the notion of 'm-plane'' in (68) in the following way:

(70) <u>Modification of the 'modification of the notion of 'm-plane''</u>
An m-plane of a phrase marker P is a sub-phrase marker of P as defined in chapter 1 possibly without adjuncts in adjoined (A') positions.

However, it is not clear how this condition on adjuncts in A-positions should be motivated.

An alternative and more plausible approach to the argument-adjunct distinction which immediately accounts for the special case of RNR is the following. In the construal of an m-plane, adjuncts that are in SPEC(CP) or adjoined to IP can be disregarded since the sub-phrase marker rooted in the lower IP node would already be an admissable plane in a sense to be made precise. In contrast, adjuncts that have undergone RNR cannot be disregarded simply because they are part of any sub-phrase marker including, let us say, the minimal IP. In this approach, nothing has to be subtracted from a sub-phrase marker in order to account for the distinctive behavior of arguments and adjuncts. The difference would simply be due to the fact that arguments in SPEC(CP) have to be included in the construal of an m-plane if this plane should include the lower IP.

This inclusion of arguments in an m-plane can be made to follow from a general condition that all required meaningful syntactic relations have to hold in a plane - this simply is a correlate of the Principle of Full Interpretation applied to m-planes. Adjuncts in SPEC(CP) or adjoined to IP would not have to be included in an m-plane that includes the lower IP, because they do not enter required meaningful syntactic relations to anything else in the plane.

This second approach to the argument-adjunct distinction can be implemented as the following condition on the construal of m-planes:

(71) Modification of the notion of 'm-plane' (second alternative)
An m-plane of a phrase marker T is a subphrase marker of T as defined in chapter 1 except that it is maximal only in the sense that all required meaningful syntactic relations can be established.

Further evidence for this account comes from the fact that extraposed adjunct PPs with simple plural complements disallow a partitioned interpretation:

(72) John met *a man* and Mary talked to *a woman from two European countries.*

(72) is impossible in a reading in which the man came from a different European country

than the women. The explanation is the same as for adjuncts with RNR, based on (71).

2.4.3. The prohibition against collective predicates

Another general property of sentences with implicit coordination is the following. Collective predicates are strictly impossible when the implicit coordination is to provide the group argument for the collective predicate. This is seen in (73):

(73) a. John eagerly became and Mary reluctantly became excellent in mathemantics / * similar.
b. *How similar / How tall does John want to be and Mary want to become?

The prohibition against collective predicates follows from the same principles as the prohibition against the split reading of simple plurals in a context of implicit coordination. Sentences with implicit coordination require an assignment of big m-planes. In the interpretation of big m-planes only elements such as relational adjectives, *a total of* etc. which enter a special relation to an antecedent can be disregarded. Other elements such as collective predicates and simple plural arguments cannot. Therefore, the evaluation of the second sentence of (73) with respect to the big plane assignment would render it equivalent to (74), which is unacceptable.

(74) # John eagerly became similar and Mary reluctantly became similar.

2.4.4. The treatment of NP coordination

Elements may take an implicitly coordinated antecedent not only in coordinate clauses, but also in coordinate NPs, as in (75):

(75) a. every man and every woman who had danced together.
b. an author and editor of different books
c. an author and an editor of a total of ten books

Such constructions were often discussed in the literature, for instance in Vergnaud (1974), Jackendoff (1977), and Link (1984). Constructions with NP coordination as in (75) can be treated semantically and syntactically in essentially the same way as clausal coordinations.

On the basis of implicit coordination, the construction in (75b) can be analysed as involving implicit N' coordination. Thus the structure of (75b) would be (76a) with two plane assignments as given in (76b).

(76) a.

an author

NP-and D N' of different books

an editor

b. M1 = {<{ }, {*an, an*}>, <(), {*author, editor*}>}

M2 = {<{*and*}, {*an author of different books, and an editor of different books*}>}

In order to evaluate the implicit coordination of the N', the rule ( ) can be applied. The part of the interpretation of the (75b) where *different* is disregarded then evaluates (75b) as (77a) and gives (77b) as the meaning of (75b):

(77) a. author and editor of different books

b. λx[Ey(books(y) & author and editor(x, y) & Ay'y"(y'Py & y"Py & y' $\neq$ y" --> Ex'x"(x'Px & x"Px & R(x', y) & R(x", y') & -y' = y")]

Since the head nouns in (75b) do not have any other arguments beside *different books*, the evaluation of (75b) with respect to big planes does not provide more information. In this interpretation, (75b) would be evaluated as equivalent to (78):

(78) an author of some of the books and an editor of some of the books

The analysis still leaves open how the implicit coordination of the determiner should be evaluated. I will simply assume that the implicit coordination of two determiners receives the same semantic interpretation as a single determiner. Thus, in (75b) the implicit coordination of the two occurrences of *a* would be evaluated exactly the same way as a simple *a*. The interpretation of two implicitly coordinated determiners as a single determiner is generally made possible syntactically because of a general syntactic condition on formal identity of the determiners, a condition I will come to shortly.

How are the two interpretations of (75b) with respect to the two plane construals combined? Apparently, the operation for combining the two interpretations cannot be the operation ordinarily associated with *and*-coordination of quantifier phrases, since there, unlike for (75b), coreference between the conjunct NPs is not required, as seen in (79).

(79) a. A man and a woman came
b. Every man and every woman came.

Thus, implicit coordination in NPs requires a special semantic operation for the combination of the partial evaluations of the two plane assignments.

2.4.5. The condition on the determiners

It has often been noted that multiply headed relative clauses are subject to certain conditions on the determiners of the head NPs: the determiners of the head NPs must be identical (or at least similar in certain ways). This phenomenon was discussed for conjunction of NPs first by Vergnaud (1974) and later also by Link (1984). It can easily be shown that this condition does not only hold for the construction with NPs, but also for the construction with clauses. A general question about the condition on the determiners is whether it is syntactic or semantic in nature. I will argue that the condition can only be a syntactic one, an insight on which also Vergnaud's proposal is based.

The condition on the determiners of the head NPs of a multiply headed relative clause includes the following generalization. The head NPs must either be both definite or indefinite:

(80) a. * a man and the woman who met last year
b. * the father of John and a woman who know each other quite well
c. * A man entered and the woman left who met last year
d. * John saw the man and Mary saw a woman who met last year

The crucial point about the condition on the determiners of the head NPs, noted by Vergnaud (1974), is that it does not hold for simple conjoined NPs, as seen in the following examples:

(81) a. John met a man and the woman he saw yesterday.

b. John met that man and a woman

Note that (80) cannot be straightforwardly excluded on semantic grounds (pace a conjecture by Link 1984). (80a) could be perfectly interpretable and could be (almost) equivalent to (82a) and similarly for (80c) and (82b).

(82) a. a man and the woman that he met last year

b. A man entered and the woman left who met him last year

An observation that bears on how the condition on the determiner can be satisfied is that numerals do not have to be identical (as was noted in Link 1984):

(83) two men and three women who know each other.

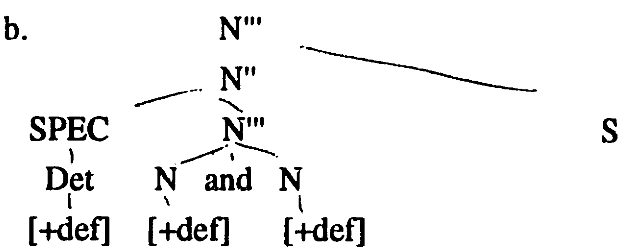
This can be traced to the common assumption that numerals are not always determiners, but may have the status of adjectives (cf. Milsark 1977). Thus the identity condition would be satisfied because both NPs contain empty determiners.

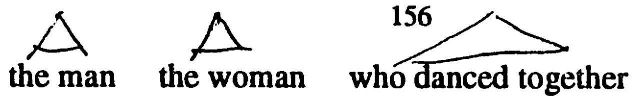
Vergnaud (1974) presents a syntactic proposal to account for the definiteness condition, though his proposal is restricted to conjoined NPs with multiply headed relative clauses and does not capture the case of conjoined clauses. I will briefly present his proposal, since it captures correctly the syntactic nature of the condition. I will then discuss two problems that this proposal faces as a general account of the determiner condition.

Vergnaud (1974) interprets the facts given in (80) as a condition that the determiners in question must agree in the syntactic features [+/-definite]. This he traces to the syntactic structure of the entire NP in which both determiners of the sub NPs are linked to a single determiner of the complex NP. The structure he assumes for (84a) is given in (84b).

(84)a. the men and the woman who danced together

b.





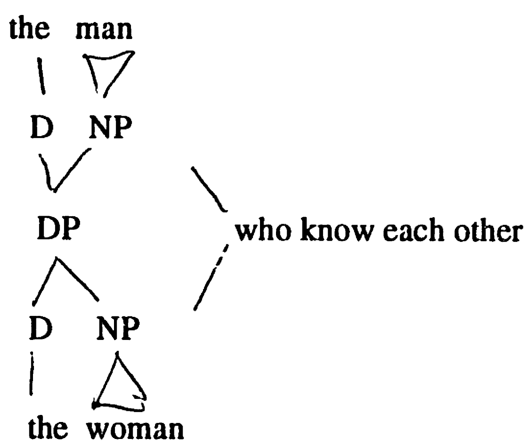
In Vergnaud's treatment, conjunction of NPs (with multiply headed relative clause) is given the same syntactic analysis as N'-conjunction such as (85).

(85) the men and women who danced together

This account faces two problems. The first one is that the proposal does not seem to carry over to multiply headed relative clauses with conjoined clauses. The second problem involves certain phenomena that indicate that NP-conjunction and N'-conjunction are not always equivalent in all cases to which Vergnaud's proposal should apply. I will show that both problems are solvable and that a Vergnaud-type account of the determiner condition can be maintained once the planar theory of coordination is appropriately exploited and certain conditions on the interpretation of determiners are taken onto account.

In order to address the first problem, let us reconsider the planar theory of coordination. Within this theory (84a) could be represented as in (86), given the DP hypothesis (Abney 1987):

(86)

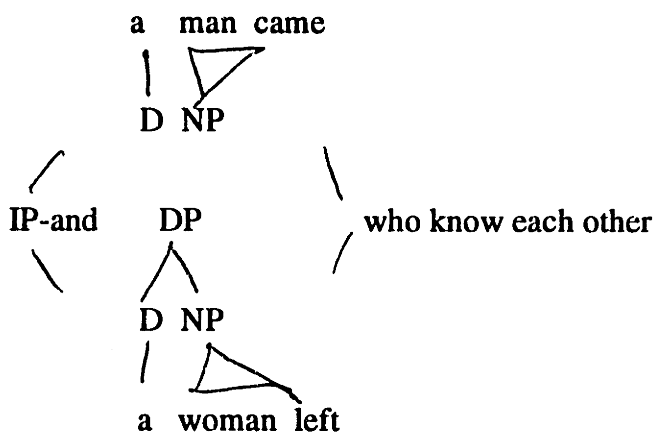


From this representation, the determiner condition can already straightforwardly be derived. The only additional assumption that has to be made is that (certain) syntactic features percolate from the head up to the maximal projection. That is, in the case of (84a), the feature [± definite] percolates up from the determiner to the DP node. Since this DP node dominates both the determiner of *the man* and the determiner of *the woman* and since contradictory feature specifications are disallowed, the two determiners have to agree in the relevant feature. Thus, we see that, unlike in Vergaud's proposal, we need not assume a third determiner node that relates to both NPs, but can derive the agreement condition simply by the DP hypothesis together with the planar theory of coordination.

The agreement condition in the case of clausal conjunction can be explained in a equally straightforward way if in addition the possibility of implicit coordination is taken into account. Given implicit coordination and the DP-hypothesis, (1a), repeated here as (87a) has the syntactic representation in (87b).

(87) a. A man came and a woman left who know each other well.

b.



The agreement condition can now be derived exactly the same way as in the NP conjunction case. In (87), the feature [±definite] percolates up from the D nodes to the DP node, which again does not allow for contradictory feature specifications.

This account so far raises an important and rather obvious problem, namely why does explicit coordination not impose the determiner condition. It is plausible that in the presence of an explicit coordination, the percolation of the determiner features is blocked. Why should this be so? The following line of thinking suggests itself. Generally, syntactic features of heads are percolated up to the maximal projection. But what happens with a maximal projection dominating an overt coordinator as well as ordinary expansions? Let us assume that in this case the syntactic features of the coordinator are percolated up first. Assuming these features are incompatible with the syntactic features of the ordinary expansions of the projection, this will block the percolation of the features of the expansions. This account clearly has mere speculative status and requires independent motivation.

We applied the determiner condition so far only to definite and indefinite determiners. What happens with quantified antecedents of multiply headed relative clauses? We will see that quantifiers exhibit just another instance of the agreement condition on the determiners of antecedents of multiply headed relative clauses.

The first general observation about quantifiers that can be made is the following. A quantifier and an indefinite or definite determiner may not cooccur:

(88) a. * every man men and the / a woman who met yesterday in this room
b. * Every man came and the / a woman left who danced together.

Again, as in the case of definite and indefinite determiners, this cannot simply be a matter of semantic interpretation. The reason is that examples such as (88a) and (88b) are perfectly acceptable and would be (almost) equivalent to (89a) and (89b) respectively.

(89) a. every man and the / a woman that he met yesterday
b. Every man came and the / a woman left who danced with him.

Furthermore, there are identity conditions on the quantifiers of the antecedent NPs. One of them is that quantifiers with different quantificational force are excluded. This is seen in the following examples:

(90) a. * all men and most women who danced together
b. * every man and almost every woman who danced together
(91) a. * John saw all men and Mary saw most women who danced together.
b. * John greeted every man and Mary greeted almost every man who danced together.

Again, it is logically not impossible to construe interpretations for NPs as in (90a). (90a) could refer to the subset of the set of men and women who danced together such that it contains all the men in that set and most of the women in that set. (90a) would then be equivalent to the perfectly interpretable (92a), and similarly for (90b) and (92b).

(92) a. all men and most women who danced with them
b. every man and almost every woman who danced with him

Are (90b) and (90b) therefore to be excluded because of a condition that the quantifiers have to have the same quantificational force? It seems that there is an independent principle that rules out the examples in (90)-(91). The unacceptability of (90b) can be traced to a general condition which excludes proportional quantifiers for NPs with multiply headed relative clauses, i.e. quantifiers which specify a quantity of entities relative to the set denoted by the N'. Thus *many* is allowed as a determiner of NPs with multiply headed relative clauses as in (93) only when it has a nonproportional reading:

(93) three men and many women who danced together

The prohibition against proportional quantifiers holds independently of whether the quantifiers of the antecedent NPs are identical or not. Thus (94a) is as bad as (90a) with the proportional reading of the quantifier *many* (both with a proportional reading in the first conjunct and and with a proportional reading in the second conjunct). Similarly, the inherently proportional quantifier *most* is excluded even when it occurs in both conjunct NPs, as in (94b).

(94) a. many men and many women who danced together
b. # most men and most women who danced together.

It is a consequence of the prohibition against proportional quantifiers that the conjunction of NPs with the same determiners is not always semantically equivalent to the conjunction of the corresponding N's with a single determiner. This now leads us back to Vergnaud's proposal, since the unacceptability of (94a) (in the relevant reading) and (94b) is unexpected in Vergnaud's account. In this account, (94b) has the same syntactic structure as (95), which is perfect.

(95) most men and women who danced together

The question now is, how can a proportional reading be excluded in which the quantifiers of the antecedent NPs receive a combined interpretation which specifies the quantity of a subset of a set of pairs? In such a reading, (94)b., for instance, would mean 'most pairs of men and women who danced together'. Such a reading is (for most speakers) available only for the construction with N'-conjunction as in (95).

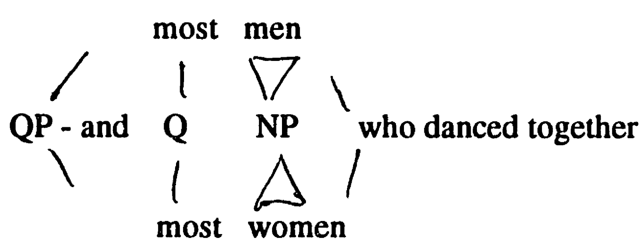
The reason for this difference might be the syntactic identification of the constituent that refers to the set *most* relates to. It is reasonable to assume that this constituent has to be c-commanded by *most* (see also Higginbotham's (1985) government condition on theta-identification). Thus in (94a), this constituent is *men and women who danced together*, whereas in (94b) it is *men* and *women* for each occurrence of *most.*

This condition on the the relation between *most* and the constituent denoting the set *most* relates to itself is independent of whether the coordination is NP or N'-coordination. Therefore, it is not surprising that a similar contrast is found with the construction *almost every* where no N'-coordination is involved. Thus (96a) is perfect, but (96b) is impossible:

(96) a. almost every man and every woman who danced together
b. * almost every man and almost every woman who danced together

However, the condition is not quite unproblematic when the possibilities of a three-diemsnional theory of coordination are taken into account. Within a three-diemsnional theory, (96b) could have the following representation:

(96)



Here the two occurrences of *most* and *men* and *women* are implicitly coordinated, i. e. they are dominated by one and the same Q or NP-node. As a consequence the Q-node c-commands both *men* and *women (and possibly* who danced with each other). Furthermore, it is not unnatural to assume that the structure of implicit coordination allows for a singe application of the semantic operation for the implicitly coordinated occurrences of *most.* Then, the structure of implicit coordination would yield a reasonable interpretation on the basis of syntactic relations identified in the usual way But still (95b) might be excluded on the basis of the interpretation of the assignment of big planes. *Most* may simply not be an element that may be disregarded in the construal of these planes. The reason, of course has to be that it enters a required syntactic relation in these planes.

But now setting the prohibition against proportional quantifiers aside, it appears that quantifiers do in fact provide evidence that the determiners of the antecedent NPs of multiply headed relative clause must meet a condition of formal identity. It appears that even quantifiers that have the same quantificational force are excluded if they differ in a relevant syntactic feature, for instance number. The determiner combinations *every-every* and *all-all* are allowed, but not the combinations *every-all* or *all-every*.

(97) a. ?? every man and all women who dated each other
 b. every man and every woman who dated each other
 c. all men and all women who dated each other

(98) a. ?? John met every professor and Mary greeted all students who worked with each other.
 b. John met every professor / all professors and Mary greeted every student / all students who worked together.

The agreement condition on number seems to also holds for definite or indefinite NPs. Antecedent NPs that disagree in number generally seem to be worse with implicit coordination than with explicit coordination:

(99) a. ?? The men came and the woman left who had met before.
 b. The men and the woman left who had met before.

(100) a. ?? Several men came and a woman left who had met before.
 b. Several men and a woman left who had met before.

This confirms the thesis that the cooccurrence of the determiners is indeed governed by a syntactic, rather than a semantic condition. This condition is that the determiners must agree in syntactic features such as those of definiteness and number. This is captured by the three-dimensional account of coordination together with the notion of implicit coordination and the DP hypothesis. The only additional assumption that is required is that number features, like definiteness features, percolate up from the determiner to the maximal projection.

This account now raises an important question that I will answer in anticipation of the discussion that is to follow. The question is, does this condition hold for any of the other constructions involving implicit coordination (which will in detail be discussed in the following sections)? The prediction of the present account, of course, is yes. However, in several cases, this does not seem to be so, at least not at first sight. Let us first consider *same/different* and its antecedent. The following examples seem completely acceptable, where the NPs do not match with respect to definiteness or number.

(101) a. John praised and a student / every student criticized the same picture.
b. Every professor praised and all students criticized the same picture.

However, there is reason to assume that these cases do not count. As Carlson (1987) has argued, the antecedents of *same* in (101) may be events, rather than NP referents. I. e. within the present account, one would say that the syntactic antecedents are the implicitly conjoined verbs *praised* and *criticized*. These conjuncts then arguably meet the relevant conditions on agreement. In fact it can be shown that in ases in which the antecedent of *same/different* can only be conjoined NPs, the agreement condition on determiners must be satisfied. This is the case in the following examples:

(102) a. A man and a / * the woman from the same country
b. every man and every / * the woman with the same accent
c. every professor and every student / * all students of the same language
d. the boy and the girl / ?? the girls with similar backgrounds

As with relative clauses, the bad examples in (102) cannot be ruled out simply on semantic grounds.

The second case that is problematic are plural reflexives in picture NPs. (103) shows that the agreement condition does not seem to be imposed on the determiners:

(103) a. An athlete praised and the coach criticized pictures of themselves.
b. Every professor praised and all students criticized pictures of themselves.

However, plural reflexives in picture NPs as in (103) do not necessarily involve implicit coordination. Plural reflexives in picture NPs may also take split antecedents, as in (104).

(104) John showed Mary pictures of themselves.

Thus, the examples in (103) might involve split antecedents, rather than implicitly coordinated antecedents.

Another construction that is relevant is binominal *each*. Binominal *each* requires implicitly coordinated NPs as antecedents in the relevant construction. But here the agreement in definiteness among the determiners must hold for independent reasons, namely simply because binominal *each* allows only definite antecedents:

(105) a. The / * A man sold and the woman bought two cars each.
b. The man and the woman / * A man and a woman bought two cars each.

However, binominal *each* apparently imposes the agreement condition on number. Antecedent NPs which disagree in number are much better with explicit coordination, than with implicit coordination:

(106) a. ?? The man sold and the women bought two cars each.
b. ?? The children destroyed and John repaired three toys each.
(107) a. The man and the women bought two cars each.
b. The children and John destroyed two toys each.

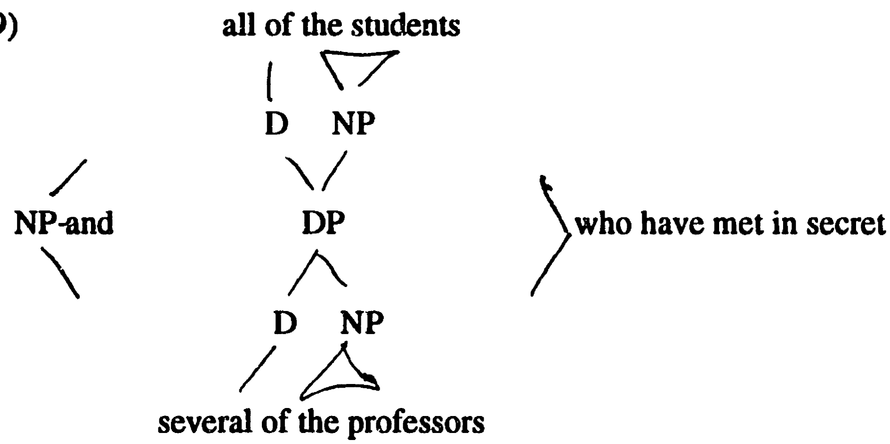
The other constructions that will be discussed in the later sections, for instance *a total of, together*, and *simultaneously* all involve propositions or events as antecedents and thus do not require implicitly coordinated NPs.

Let me conclude this section with an interesting observation made by Link (1984). Partitive NPs allow for relative clauses with multiple heads regardless of the determiners. The same holds for clauses.

(108) a. all of the students and several of the professors who have met in secret
b. * all students and several professors who have met in secret
c. John saw all of the students and Mary met most of the professors who have met in secret.

But, of course, the syntactic identity condition is met in this case, since the NPs *the students* and *the professors* share definite determiners. It is therefore reasonable to assume that the relative clause relates to these NPs, rather than to the entire partitive NPs. The structure of (108a) then would be as in (109) with implicit coordination of the inner NPs requiring agreement of the determiners.

(109)



2.5. The range of constructions involving implicit coordination with conjunction

In this section, I will discuss the individual constructions involving implicitly coordinated antecedents. I will proceed in the following way. First, I examine the range of elements that take implicitly coordinated antecedents. I then address the question of how general the ability of elements taking implicitly coordinated antecedents is cross-linguistically. Finally, I discuss another syntactic relation that exhibits an interesting behavior in the relevant respects, namely the relation between plural pronouns and their antecedents. This entire chapter, however, is restricted to phenomena involving implicit coordination only for sentences coordinated by *and*. I will examine other types of coordination with respect to the possibility of implcit coordination in chapter 3.

2.5.1. Collective adverbials

Jackendoff (1977) has noted with the following example that the adverb *together* may take an antecedents composed of parallel elements in a coordinated structure:

(110) John *whistled* and Mary *hummed together.*

The antecedent of *together* arguably is a complex action. Given Davidson's (1967) event semantics, in (110) this action is described by the implicitly coordinated verb consisting of *whistled* and *hummed.*

How do other adverbials of this sort, i.e. adverbs that take complex events or actions as antecedents, behave in English? Examples of such adverbs are *simultaneously, separately, consecutively* and *independently.* (111) shows that they all allow for implicitly coordinated antecedents in English.

(111) John *sang* and Mary *played simultaneously / separately / consecutively / independently.*

A related adverbial is *one after the other.* Interestingly, this adverbial allows for an implicitly coordinated antecedent, but not *each other* - even in semantically similar constructions:

(112) *John* sang and *Mary* played *one after the other* / * after *each other's* graduation.

This indicates that the ability of taking an implicitly coordinated antecedent is syntactically, rather than semantically conditioned. Reciprocals generally do not take implicitly coordinated antecedents (see next section).

To conclude, it seems the generalization is valid that all collective adverbials allow for implicitly coordinated antecedents in English.

2.5.2. English reflexives

English plural reflexives seem to take an implicitly coordinated antecedent. This is seen in (113).

(113) a. *Bill* bought and *John* sold pictures of *themselves.*
b. *John* saw and *Bill* wants to see *themselves* sleep.

However, the evidence for implicit coordination with plural reflexives is not particularly strong. First, the construction is restricted to plural reflexives in picture NPs. Simple reflexives do not seem to allow for an implicitly coordinated antecedent:

(114) * *Bill* admired and *Mary* despised *themselves.*

Furthermore, plural reflexives in picture NPs may also take split antecedent without coordination being involved:

(115) *John* showed *Mary* pictures of *themselves.*

Note also that implicitly coordinated NPs cannot serve as the antecedent of a reciprocal:

(115) a. *Bill* bought and *John* sold pictures of *each other*.
b. *John* saw and *Bill* wants to see *each other* sleep.

(115a) could mean, but does not mean, that Bill bought pictures of John and John sold pictures of Bill. (115a) is only acceptable if *each other* has the interpretation of a simple plural reflexive. In such a reading, (115a) means Bill bought pictures of John and Bill and John sold pictures of John and Bill.

Plural possessive pronouns do allow for implicitly coordinate antecedents:

(116) *John* lost and *Bill* found *their* key.

In (116), *their* can take the implicit coordination of *John* and *Bill* as antecedent.

2.5.3. *A total of*

In English, the construction *a total of* N' (or, equivalently, NP *in all*) may take an interpretation based on implicit coordination. This is seen in the contrast with the corresponding sentence with a simple plural with clausal and NP-conjunction in (117) and (118).

(117) a. John painted and Mary drew ten pictures.
(impossible if John painted five pictures and Mary drew the other five pictures)
b. John painted and Mary drew a total of ten pictures.
c. John painted and Mary drew ten pictures in all.
(118) a. a composer and a painter of ten masterworks
b. a composer and a painter of a total of ten masterworks

(117a) implies that John painted ten pictures and Mary drew ten pictures, whereas (117b) can be true if John painted five pictures and Mary drew five pictures. Similarly, (118a) can only refer to the painter of ten masterworks and a composer of ten masterworks. It cannot refer to a composer of five masterworks and a painter of five masterworks. But this reading is available for (118b).

Like relational adjectives, *a total of* differs from simple plurals in that it enters a special syntactic relation for its interpretation. In particular, unlike relational nouns and simple plurals, it does not have a local semantic contribution. For instance, the semantic contribution of *a total of* in *John and Mary drew a total of ten pictures* consists in specifying the quantity of a maximal group of pictures that John and Mary drew. The meaning of this sentence can be represented as follows, where *ten* holds of the maximal group (i.e. the supremum with respect to the part relation P) that consists of groups x of pictures such that John and Mary drew x.

(119) ten(supP({x|Ee (John and Mary drew(e, x)}))

Thus, in order to evaluate *a total of* the meaning of the entire clause has to be evaluated in some way. However. the scope of *a total of* is subject to certain locality conditions. It is not generally the entire clause, but generally has to be the minimal clause. In (120), for most speakers a reading is unavailable in which *a total of ten* counts the maximal group of pictures x that John wants Sue to see and that Mary wants Sue to see.

(120) John and Mary want Sue to see a total of ten pictures.

The semantics of *a total of* can now be sketched for (117a) as follows. With respect to the assignment of small m-planes, the sentence is evaluated as (121),

(121) ten(supP({x|Ee drew and painted(e, John and Mary, x) & pictures(x)}))

As in the case of extraposed relative clauses and reational adjectives, the occurrence of *a total of ten* is disregarded in the interpretation with respect to the assignment of big m-planes, and the sentence is interpreted roughly as (122), where the occurrences of *them* are pronouns with appropriate antecedents.

(122) John drew *some ofthem*1 and Mary painted *some of them*2.

As with reflexives, the locality condition on *a total of* must be obeyed by all conjuncts. Thus, the following sentence is ruled out in the relevant reading because *a total of* is not clause-bound in the second conjunct:

(123) * John painted and Mary wants Sue to paint a total of ten pictures.

Like plural reflexives and NPs with relational adjectives, the construction *a total of* differs from simple plurals in that it involves a special syntactic relation involving plural antecedents. Such a plural antecedent may be an implicit coordination of several singular NPs. This relation is responsible for the fact that the plural NP following *a total of* may receive an interpretation in which the group denoted by the NP is partitioned into subgroups each of which relates to a conjunct.

2.5.4. Binominal *each*

There is one other construction in English that may involve an implicitly coordinated antecedent, namely binominal *each*, a construction illustrated in (124) (for a detailed syntactic discussion of this construction see Safir/Stowell 1987 and also Moltmann 1989).

(124) *John and Mary* painted two pictures *each*.

Each is a binary quantifier that is associated with two NPs: a 'D-NP' (cf. Safir/Stowell 1987), the NP immediately preceding *each*, i.e. in (128) *two pictures,* and an 'R-NP' (cf. Safir/Stowell 1987), which is *John and Mary* in (128). The R-NP has to be a plural NP. But the R-NP may also be an implicit coordination of several singular NPs. This is shown in (129a) and (129b) and (130a) and (130b), in which *each* has the same function relating to John and Mary, and in (131a), which contrasts with the corresponding sentences (131b) with a simple plural:

(129) a. John and Mary painted four pictures.
b. *John* drew and *Mary* painted two pictures *each*.

(130) a. Four pictures were painted by John and by Mary.
b. Two pictures *each* were painted by *John* and drawn by *Mary*.

(131) a. How many pictures did John draw and Mary paint?
b. How many pictures *each* did *John* draw and *Mary* paint?

(131a) can only be a question asking for the entire number of pictures that John drew or Mary painted. In contrast, in (131b) *each* is a distributor relating to John and Mary as a group.

We have seen with five constructions in English that elements that take a plural antecedent may take an implicitly coordinated antecedent consisting of several singular elements. The question then raises: Does this hold for all constructions that involve a plural antecedent in English? Are there constructions in English that involve a plural antecedent, but disllow an implicitly coordinated antecedent? A construction for which this does not seem to hold are floated quantifiers:

(132) * *John* is and *Mary* was *each* / *both* reading a book.

However, (132) can presumably be ruled out independently, under the assumption that floated quantifiers involve movement of a plural NP from VP-internal position (cf. Sportiche 1987).

2.5.6. Exception phrases

There is another construction that is interesting for the present discussion, even though it does not involve NPs as antecedents, but rather the restriction of a quantifier. This construction are exception phrases as in (133).

(133) Every boy except John entered.

Exception phrases with *except* may be extraposed:

(134) a. Every boy entered except John.
b. John met every professor today except Professor Miller.

Interestingly, exception phrases may relate to multiple antecedents. This holds both for conjoined NPs and conjoined clauses. (For conjoined NP, this has been noted by Hoeksema 1989).8

(135) a. every man and every woman except John and Mary / the parents of Bill

b. *Every man* entered and *every woman* left *except John and Mary / except the parents of Bill.*

c. *No student* may write his dissertation in Latin and *no professor* may lecture in Latin*except the ones in Germany.* (meaning students as well as professors in Germany)

Exception phrases with split antecedents can be analysed as cases of implicit coordination. They exhibits the same syntactic constraints. (137) show that coordination is crucial; (138) shows that the antecedent NPs have to occupy parallel positions in the conjuncts (though (138) may be ruled out independently by the constraint on multiple antecedents of exception phrases in object position mentioned above):

(137) a. ?? *Every man* left, whereas *every woman* stayed, *except John and Mary.*

b. * *Every man* said that *every woman* was beautiful *except John and Mary.*

(138) * Bill greeted *every woman* and *every man* greeted Sue *except Mary and John.*

The semantic interpretation of sentences with exception phrases with multiple antecedents requires that N's are implicitly coordinated and then interpreted by the rule of group formation given in section 1.1. Unlike the cases discussed earlier, here we get a set of several groups. Thus the implicit coordination of *man* and *woman* in (135) will denote several pairs consisting of a man and a woman.

Exception phrases with multiple antecedents can be compared to *same/different* with quantified antecedents. In this case, also the restriction of the quantifier forms the antecedent, not referential NPs. Consider the following example:

(139) *Every man* said and *every woman* is about to say the *same* thing.

This sentence has two readings (disregarding a discourse-related reading of *same*). In one reading, the men said the same thing and the women said the same thing, but men and women possibly differ in what they said. In the second reading, every man said the same thing as every woman as well as every other man. In this reading *same* takes an implicitly coordinated antecedent consisting of the N's *man* and *woman.* Then in (139) the quantification domain would consist of arbitrary pairs of men and women. Such pairs may be further restricted by a multiply headed relative clause, as in (140).

(140) a. *Derselbe* Professor lobte *jeden Studenten* und kritisierte *jede Studentin, die zusammen einen Aufsatz verfasst haben.*
'The same professor praised every male student and criticized every female student who have written an article together.'
b. (?) In the *same* apartment, *no woman* lives and *no man* works *who are not married.*

Is a similar reading available for any other construction? Consider (141).

(141) *Every man* talked and *every woman* sang *simultaneously.*

In fact, (141) has two distinct readings parallel to (139).

2.5.7. The generalization

Given that the discussion of constructions involving a plural antecedent is more or less exhaustive, it seems that the following generalization holds for English:

(142) Generalization about plural antecedents and implicit coordination in English
If an element x takes a plural antecedent, then it also takes an implicitly coordinated phrase as its antecedent whose conjuncts may denote individual entities.

This generalization suggests that explicitly coordinated phrases and implicitly coordinated phrases play an equivalent role in natural language. However, it appears that the generalization (142) cannot be maintained for languages other than English, and even for English it presumably does not hold without exception, since resprocals and simple plural reflexives do not seem to tolerate implcitly coordinated NPs as antecedents. Furthermore, the constructions that we examined for English behave differently in other languages. Often the equivalent constructions allow only for a true plural antecedent, not an explicitly coordinated antecedent. For instance, German presents a very different picture concerning the equivalence of plural antecedents and implicitly coordinated antecedents consisting of singular constituents.

In German, plural reflexives may never take an antecedent consisting of implicitly coordinated singular NPs. (Note that the reflexive *sich* is neutral with respect to singular and plural.)

(143) a. *Hans* kaufte und *Maria* verkaufte Bilder von *sich*.
'John bought and Mary sold pictures of self.'
b. Diese Bilder von *sich* lobte *Maria* und kritisierte *Hans*.
'These pictures of self Mary praised and John criticized.'
c. *Sich selbst* lobte *Hans* und kritisierte *Maria*.
Self, John praised and Mary criticized

The only interpretation available for (143a) is the one in which John bought pictures of himself and Mary sold pictures of John (or possibly, for some speakers, herself), and similarly for (143)b. and (143c). (See also the discussion of reconstruction of reflexives with ATB movement later.)

However, possessive pronouns allow for implicitly coordinated antecedents, though preferably in a position in which they have the status of a pronominal, rather than an anaphor:

(144) a. ? *Ihren* Schlüssel verlor *Hans* und fand *Andreas*.
'Their key John lost and Andreas found.'
b. *Hans* glaubt und *Andreas* behauptet, daß man *ihren* Schlüssel gefunden hat.
'John believes and Andreas claims that one has found their key.'

Also the equivalent of *a total of, insgesamt* or *eine Gesamtheit von,* does not allow for implicitly coordinated antecedents:

(145) a. Hans las und Maria schrieb *insgesamt* zehn Bücher / *eine Gesamtheit von* zehn Büchern.
'John read and Mary wrote a total of five books.'
b. * der Autor und der Herausgeber von *insgesamt* zehn Buechern
'the author and the editor of a total of ten books'

(145a) can only be understood such that John read ten books and Mary wrote ten books; (145a) is false if John read only five books and Mary wrote only five books. Similarly, (145b) cannot refer to two people one of whom is the author of only five books and the other one the editor of only five books.

Finally, adverbs like *together* never take an implicitly coordinated antecedent in German:

(146) a. Hans spielte Klavier und Maria sang * zusammen / *(?) zugleich / zur selben Zeit.
'John played piano and Mary sang together / simultaneously / at the same time.'
b. Simultan erreichten Hans und Maria erreichten das Ziel.
'Simultaneously John reached the goal and Mary startet (to run).'
c. *Simultan / Zur selben Zeit erreichte Hans das Ziel und startete Maria.
'Simultaneously / At the same time John reached the goal and Mary started (to run).'

However, extraposed relative clauses, the equivalent of binominal *each* and exception phrases pattern as in English. This is illustrated in (147) - (149).

(147) a. *Hans* las und *Maria* schrieb *jeweils* zehn Bücher.
'John read and Mary wrote ten books'
b. der *Herausgeber* und der *Autor* von *jeweils* zehn Büchern
'the editor and the author of ten books'
(148) *Ein Mann* erschien und *eine Frau* kam, *die einander sehr gut kannten.*
'A man appeared and a woman came who knew each other very well.'
(149) *Jeder Mann* kam und *jede Frau* ging *ausser Hans und Maria.*
'Every man came and every woman left except John and Mary.'

There are other constructions in English that may take a plural antecedent, but which exhibit a lot of speaker variation with respect to whether they allow for an implicitly coordinated antecedent or not. Examples are the antecedent of PRO and the broad antecedent of *cach other.*

Some speakers allow the implicit coordination of *John* and *Mary* as the antecedent of PRO, others do not:

(150) a. *John* wants and *Mary* also wants *PRO* to live together.
b. *John* wants and *Mary* actually suggested PRO to separate.

Similarly, some speakers get a reading of (151) in which the implicit coordination of *John* and *Mary* is the evaluative antecedent of *each other*, others do not:

(151) *John* knows and *Mary* in fact regrets that they hate *each other*.

PRO in adjunct controlled clauses seem to be generally more able to take an antecedent that consists of the implicit coordination of singular NPs:

(152) *John* sang and *Mary* played before *PRO* talking to each other / in order PRO not to have to talk to each other.

To conclude, the examination of elements in English and German that take an implicitly coordinated antecedent shows two things. First, the ability to take take an implicitly coordinated antecedent is not, ot at least not only, semantically governed. For instance, it appears that in English some reciprocal expressions take an implicitly coordinated antecedent (*one another*), others don't (*each other*). This is seen in the following contrast.

(152') a. * *John* played and *Bill* sang without *each other*.
b. (?) *John* played and *Bill* played *one* without *the other*.

Furthermore, the same elements may take an implicitly coordinated antecedent in English, but not in German, for instance *a total of* and *together*. If the ability to take animplicitly coordinated antecedent was semantically governed, there should not be such a crosslinguistic variation. Second, it seems that that the ability to take an implicitly coordinated antecedent is not governed syntactically in a systematic way either. There does not seem to be a specific syntactic property designating the set of elements taking an implicitly coordinated antecedent in English - only certain subsets of this set seem to be so designated, for instance all collective simple adverbials in English allow for implicitly coordinated antecedents. So we can conclude that the ability to take an implicitly coordinated antecedent has to be marked in the lexicon for each lexical item or for a syntactic class of items.

2.5.8. The bound plural pronoun relation

There is another syntactic relation that involves plural antecedents which has not been discussed so far. This relation is interesting because it exhibits a special behavior with respect to the possibility of an implicitly coordinated antecedent. This relation holds between a plural pronoun and a plural antecedent, whereby the plural pronoun is interpreted as an individual variable ranging over the elements denoted by the group that the plural antecedent stands for. The relation holds between *John and Mary* and *they* in (153) in the reading in which John thinks that he is sick and Mary that she is sick and neither one has any thoughts about the health of the other.

(153) *John and Mary* think that *they* are sick.

This interpretation of (153) cannot be due to an implicit distributor. (153') with the overt distributor *both* is still ambiguous:

(153') *John and Mary* both think that *they* are sick.

The same relation arguably is involved in the evaluation of a possessive plural pronoun when it receives the interpretation of an individual variable, as in (154).

(154) a. *John and Mary* found *their* passport / *their* passports.
b. *John and Mary* greeted *their* spouses.

The crucial observation is that in this relation the plural antecedent cannot be the implcit coordination of singular NPs:

(155) a. *John* thinks and *Mary* firmly believes that *they* are sick.
b. *John* just found out and *Mary* knew for a long time that *they* are sick.
c. That *they* are sick, *John* believes, but *Mary* does not believe.

The thoughts of John and Mary in (155a) can only be about them as a group.

Consider now the cases with a plural pronouns as in (156) and plural reflexives as in (157).

(156) a. *John* found and *Mary* lost *their* key.

b. *John and Mary* lost *their* key.

c. *John* found and *Mary* lost *their* keys.

(157) a. *John* praised and *Mary* criticized *their* children.

b. *John* and *Mary* praised *their* children.

c. Which ones of *their* children did *John* praise and *Mary* criticize?

In contrast to (156b), the much preferred reading of the examples in (156a) and (156c) is the one in which John and Mary have common keys. Similarly, in contrast to (157b), the preferred reading of (157a) and (157c) is the one in which John and Mary are parents of the same children.

Further examples are given in (158) - (160).

(158) a. Which of Sue's pictures of *them* did *John* like and *Mary* hate.

b. *John and Bill* likes Sue's pictures of *them.*

(159) a. Which pictures of *themselves* did *John* like and *Bill* hate?

b. *John* liked and *Bill* hated these pictures of *themselves.*

c. *John and Bill* liked these pictures of *themselves.*

(160) a. *John and Bill* accept criticisms of *themselves.*

b. *John* accepts and *Bill* rejects criticisms of *themselves.*

(158a) and (158b). and (159a) and (159b) suggests that each of the pictures represents both John and Bill. (159c) does not have this implication. (160a) may be about individual criticism of John and individual criticism of Bill; (160b) can only be about criticism of John and Bill as a group.

Apparently, the syntactic relation involving bound plural pronouns in the individual variable interpretation can only be established in individual planes, not with respect to implicit coordination. But why this should be so still has to be explained, in particular since the phenomenon seems to occur crosslinguistically.

2.6. Explicit coordination and anaphoric antecedents with conjuncts in different planes

In this chapter, we have seen that structures with implicitly coordinated antecedents involve two plane assignments which each yield a partial interpretation of the sentence. In the first chapter, we have seen that 'respectively'-sentences receive a syntactic representation which allows for a 'global' construal of planes, but in principle also allows for the construal of minimal planes. Thus (160a) allows both for the complete m-plane assignment in (160b) and for the complete m-plane assignment in (160c):

(161) a. John and Mary met Sue and Bill respectively.

b. {<{*and, and*}, *John met Sue*, *Mary met Bill*>}

c. {<{*and*}, { *John, Mary*}>, <{*and*}, {*Sue, Bill*}>}

This predicts that the 'respectively' constructions should behave exactly parallel to constructions involving implicit coordination: they should exhibit the same phenomena with respect to explicit phrasal coordination that in the other construction involves implicit coordination. Explicit and implicit coordination should pattern parallel in relevant respects since they are instances of the same construction type, namely, simply, multidominance.

We can now see that the prediction generally holds. For instance, the following examples are acceptable, where sentences with reflexives in different conjuncts allow phrases with relational adjectives to take an implicitly coordinated antecedent.

(162) a. In adjoining laboratories, John and Mary examined himself and herself (respectively).

b. John and Mary watched himself and herself (respectively) with the same interest / with equal curiosity.

c. John and Mary bought himself and herself respectively the same book / different books.

d. John and Mary improved himself and herself respectively with the help of related techniques.

(162d), for instance, can describe the situation in which John improved himself with the help of technique x and Mary improved herself with the help of technique y, where x and y are related. All the examples in (162) allow for such a split reading of the phrase containing the relational adjective.

Again, as with constructions involving implicit coordination, the examples in (162) contrast with corresponding sentences with simple plurals or relational head nouns, where a split reading is impossible.

(163) a. John and Mary bought himself and herself respectively two books / these two books.

b. John and Mary improved himself and herself respectively with the help of relatives.

(163a) cannot describe a situation in which John bought himself only one book and Mary bought herself only one book. (163b) cannot describe a situation in which Mary improved herself with the help of x and John improved himself with the help of y, where x and y are relatives. Each one John and Mary must have achieved the improvement with a group of relatives. (163b) thus forms a minimal pair with (162d).

Furthermore, 'respectively'-sentences allow for binominal *each*, as in (164).

(164) *John* and *Mary* reminded *himself* and *herself* respectively about two books *each*.

(164) shows most clearly that the conjuncts of a phrasal conjunction may play a twofold role in the same sentence with one and the same interpretation. *John* and Mary in (164) may act simultaneously as individual antecedents for reflexives and as a single syntactic unit as a plural antecedent for binominal *each*.

Similarly *a total of* allows for an interpretation that takes into account the evaluation of all conjuncts:

(164) *John* and *Mary* bought *himself* and *herself* (respectively) *a total of* ten books.

(164) may describe the situation in which John bought himself only five books and Mary bought herself only five books.

'Respectively'-sentences pattern with sentences involving implicit coordination also in that they disallow reciprocals with the 'true reciprocal interpretation' relating to the conjuncts of a phrasal conjunction as a unit:

(165) *John* and *Mary* reminded *himself* and *herself* respectively about books about *each other*.

The only reading (165) can have is the one in which *each other* simply refers to John and Mary as a group.

A final question concerns the interpretation of bound plural pronouns. It appears that 'respectively'-sentences behave exactly the same way as sentences with implicit coordination in that bound plural pronouns disallow a reading as individual variables:

(165) a. *John* and *Mary* bought *himself* and *herself* (respectively) books about *themselves*.

b. *John* and *Mary* reminded *himself* and *herself* (respectively) of *their* keys.

(165a) preferably has the interpretation in which the books are each about John and Mary. (165b) suggests that John and Mary live together.

The data above show the true double nature of phrasal coordination. Conjuncts in a phrasal coordination may either play an independent role in individual big planes, or they may act together with the other conjuncts as plural antecedents. This double nature is particularly transparent with reflexive binding, as we will see now.

On the one hand, Goodall (1985) cites sentences such as those in (166) as evidence that anaphor binding in conjoined sentences involves conjunct phrase markers and not the structure after phrase marker union, or, in Muadz' terms, anaphor binding would be established in individual planes.

(166) a. John and Mary watched himself and herself respectively.

b. John$_i$ and Mary watched Sue and him$_i$ respectively.

c. * John$_i$ and Mary watched him$_i$ and Sue respectively.

Binding Condition A is satisfied with respect to each one of the two planes of (), namely *John watched himself* and *Mary watched herself.* In (b) no Condition B violation arises with respect to *John* and *him*, since *John* and *him* are not part of the same plane. A Condition B violation arises in (166c), however, since *John watched him* forms a plane.

On the other hand, there are clear cases where 'respectively'-sentences allow plural reflexives to take an explicitly coordinated antecedent, as in (167):

(167) *John* and *Mary* told Sue and Bill respectively about books about *themselves*.

However, there are also sentences in which a reflexive takes an antecedent in individual planes and another reflexive takes an explicit phrasal coordination as antecedent, whereby the conjuncts belong to different planes. Such examples are given in (168).

(168) a. *John* and *Mary* bought *himself* and *herself* (respectively) books about *themselves*.
b. *John* and *Mary* saw himself and herself respectively and pictures of themselves.
c. *John* and *Mary* compared *himself* and *herself* (respectively) to *themselves* (as a group) and decided they better work together.

This shows that the conjuncts of a phrasal coordination may determine complete sets of big and complete sets of small m-planes simultaneously. Both of these complete sets of m-planes may play a syntactic and semantic role in one and the same sentence simultaneously.

Like sentences with implicit coordination, 'respectively'-sentences also disallow collective predicates in the relevant reading. This is seen in the following examples:

(169) a. John and Mary consider himself and herself as excellent / * similar.
b. John and Mary consider himself and Bill as as excellent / * similar.
c. John considers himself and Bill as similar.

(170)c. apparently is not a sentence of the 'respectively'-type. The restriction against collective predicates follows in the same way as for implicit coordination structures.

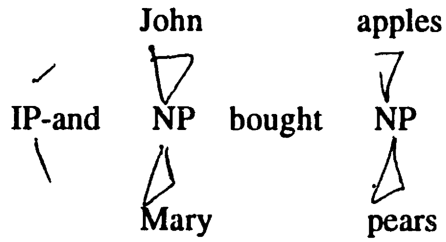
2.7. Other types of coordinated structures: gapping and bare argument ellipsis

2.7.1. Gapping and plural antecedents with conjuncts in different planes

As we have seen in chapter 1, according to Muadz (1991), the three-dimensional syntactic representation of a gapped sentence such as (171a) is as in (171b), i.e. before linearization in the mapping from S-structure to PF.

(171) a. John bought apples and Mary pears

b.



Obviously, the structure in (171b) is exactly the one of implicit coordination. It differs from the structures we have discussed only in that (171b) does not contain implicitly coordinated verbs. Thus, the constructions with implicit coordination and gapping basically differ only in the way they are linearized and in whether the individual planes contain different verbs or not. The following question then rises. Since the structure is of the same type as the syntactic representation of sentences with implicit coordination or of the 'respectively' type, do similar phenomena appear in gapped structures, i.e. phenomena in which an element takes a coordinated antecedent whose conjuncts belong to different planes?

The answer is not always yes. Correspondents in a gapped sentence cannot always serve as plural antecedents, for instance not in (172).

(172) a. * John bought apples at the same time / simultaneously / together and Mary pears.

b. * John bought apples for themselves and Mary pears.

c. * John bought apples for a total of ten dollars and Mary pears.

But there are cases where it is possible, namely in (173).

(173) a. At the same time / Simultaneously / Together, John bought apples and Mary pears.

b. In order to entertain themselves, John hired a musician and Mary a dancer.

c. For a total of ten dollars John bought apples and Mary pears.
d. For five dollars each John bought apples and Mary pears.

Apparently, what is crucial is whether the phrase taking the antecedent is in clause-initial position or in a clause-final position in the first conjunct. Notice that clause-initial adjuncts as in (173) are possible also when the conjuncts are full clauses:

(174) a. At the same time, John bought apples and Mary sold pears.
b. In order to entertain themselves, John engaged a musician and Mary hired a dancer.
c. For a total of ten dollars, John bought apples and Mary bought pears.
d. For five dollars each, John bought apples and Mary bought pears.

However, being clause-initial is not an absolute requirement. It suffices that the element taking the antecedent precede the correspondent that forms part of the antecedent, as in (175) (assuming the examples in (175) are true cases of gapping).

(175) a. John wrote the same person a letter in the morning and a postcard in the evening.
b. (?) John wrote to the same person in the morning and Bill in the evening.
c. ?? Mary showed the same movie / a total of ten movies to Sue and Bill to John.

(175b, c) are only marginally acceptable with the internal reading of *same* or with a reading of *a total of* relating to both conjuncts. But this can be simply traced to the fact that an NP with *same* or *a total of* are full NPs. There is a general condition that an argument has to be a clitic when it undergoes gapping together with the verb:

(176) a. * Mary showed a picture / the picture to Sue and Bill to John.
b. ? Mary showed it to Sue and Bill to John.

To conclude, gapping allows remnants and correlates to act together as plural antecedents, but only under certain circumstances, namely when the element taking the antecedent precedes the relevant correlate. This is unepected since gapping, as we have assumed, involves the same sort of three-dimensional structure as constructions as 'respectively'-sentences. What distinguishes gapping, however, from the latter kind of sentences is that it involves a different kind of linearization. Perhaps, the linearized structure of a gapped sentence plays a role in establishing the antecedent-anaphor relationship. Again, this would be a case some kind of 'linearization' has to occur prior to PF. Or perhaps, gapped sentences require a a two-dimensional or subordinate structure besides the coordinate structure, which can be subject to S-structure or LF conditions. I will leave these issues open for further investigation.

We will now see that the same behavior with respect to plural antecedents shows up with a construction closely related to gapping, namely bare argument ellipsis.

2.7.2. Bare argument ellipsis

Bare argument ellipsis, a construction in which a coordinator seems to coordinate a single argument with a clause, is illustrated in (177).

(177) a. John saw a movie and Mary too.
b. John saw a movie, but not Mary.
c. John saw a movie or Mary.

There are other constructions that behave parallel to bare argument ellipsis with conjunction or disjunction, for instance phrases with *instead* and *except* and comparative ellipsis. Since these constructions involve a different semantics (and, as I will argue, a different syntax), they will be discussed at another place, namely in chapter 5.

In chapter 1, bare argument ellipsis was analysed as a construction of the same type of gapping. This raises the question whether it behaves the same way as gapping also with respect to collective antecedents composed of a correlate and a remnant. In this section, however, I will first discuss a different analysis of bare rgument ellipsis than the present one and show that is makes inadequate empirical predictions.

A recent account of bare argument ellipsis has been proposed by Reinhart/Rooth (1991). The crucial assumptions in their account are the following. First, bare argument ellipsis does not involve deletion or empty nodes. Second, the phrase in peripheral position serves as the adjunction site for the parallel phrase in the first clause. This adjunction at LF yields a coordinated phrase at LF and the extracted clause is interpreted as a predicate with a lambda-operator binding the empty element left behind by LF-adjunction. That is, in (177a) *John* adjoins to *and Mary too* forming a coordinated constituent *John and Mary too*. The extracted clause is then interpreted as the predicate x[x saw a movie]. Thus, in this account (177a) comes out as equivalent to *John and Mary saw a movie* at LF. There are also some obvious problems with this account relating to the present concerns.

First of all, sentences such as (177a) and *John and Mary saw a movie* are not generally equivalent. The *and* can only be understood a clausal conjunction, not as phrasal conjunction. This can be seen from the fact that collective predicates are excluded:

(178) a. * John met and Mary, too.
b. John and Sue met and Mary, too.

Furthermore, and more importantly, bare argument ellipsis differs from conjunction structures as in *John and Mary saw a movie* in that it behaves the same way as gapping with respect to elements taking a plural antecedent. Thus, the antecedent of *same* or *themselves* in (179) cannot include *Sue*, and similarly for the elements in (180).

(179) a. John and Mary saw the same movie and Sue too.
b. John and Mary took pictures of themselves and Sue too.
(180) a. John and Mary read a total of ten books and Sue too.
b. John and Mary worked together/ simultaneously and Sue too.

This could be excluded in Reinhart/Rooth's account if one assumes that *same* cannot take an antecedent at LF, but only at S-structure. However, this is not plausible, and it would not account for the case of gapping discussed above.

Unlike in the case of gapping, bare argument ellipsis does not allow for the correspondents to act as a plural antecedent even when the element taking the antecedent precedes them, as in (181).

(181) The same man greeted John this morning and Sue too.

However, this can be attributed to the obligatory presence of *too*, which disallows a collective interpretation of the correspondents for independent semantic reasons.

Notes

1 The construction with relational adjectives in (1) corresponds to the internal reading of *same/different* discussed in Carlson (1987), as in (2).

(1) a. The same man / Different men met John and Mary.
b. John and Mary live in neighboring villages.
c. John and Mary trust related methods.
(2) The same man saw John and Mary.

But what exactly is the antecedent of NPs with relational adjectives? Carlson (1987) has suggested that *same/different* in the internal reading (without quantified antecedent) takes uniformly a complex event as an antecedent. Such an event may be described as a complex event (or group event) in various ways: by plural NP arguments, which indirectly determine complex events, conjoined verbs, and conjoined adverbials, as illustrated in (3).

(3) a. John and Mary met the same man.
b. John met and invited the same man.
c. John played the same sonata slow and fast.

(This idea was more formally elaborated in Moltmann, to appear). However, it seems that in certain cases *same/different* must take individuals as antecedents, namely when they modify a modifier of an NP referring to individuals, as in (4).

(4) the man and the woman from the same country

In (4), *same* compares the man and the woman directly without the mediation of an event. This suggests that the relevant semantic operation should also be applicable in (3a). Further evidence comes from the fact that *same* and its antecedent must be focussed. In (3a) *same* and *John and Mary* must be focussed (not *saw*). In contrast in (5), where the antecedent of *same* could only be an event, *same* and the conjoined verbs must be focussed:

(5) The same man entered and left the room.

It is plausible that focussing marks a syntactic relation and thus is indicative of the antecedent relation involving *same.*

Same/different are not the only relational adjectives allowing for implicitly coordinated antecedents. All relational adjectives in fact do. The following examples with NPs are from Jackendoff (1977).

(6) The boy and the girl with the same birthday / with mutual interests / with different-colored eyes / with a common background.

Examples with clausal conjunction were noted again by Jackendoff (1977) with subject ATB-movement and with Right Node Raising (see also Abbott 1975).

(7) a. The same man got drunk and was arrested by the police.
b. The same man is rarely easy to be please and eager to please.
c. The same man praised you and seemed to hate you. (Jackendoff 1977)
(8) a. John avoided and Bill ignored similar issues / the same man / men with the

same birthday.
b. John whistled and Mary hummed the same tune / at equal volumes.

2 Note that sentences such as (1a) in the text are not always equivalent to sentences such as (1). For instance, the conjunction of predicates generally does not allow an interpretation in terms of group formation (see chapter 1). Thus (1) implies that John and Mary both sat on the floor and lay on the bed. It is hard to get an interpretation in which John sat on the floor and Mary lay on the bed.

(1) John and Mary sat on the floor and lay on the bed.

However, the fact that there are restrictions for syntactic categories or syntactic functions for which conjunction can be interpreted by group formation is no objection to evaluating factors by group formation.

3 Hoekstra (1986) claims that the split antecedents of a relative clauses do not have to occupy identical positions in a sentences. The example he invokes to support this claim, taken from de Haan (1979), is given in (1).

(1) We always let those girls play with those boys who know one another from elementary school.

I could not find any speakers who accept this example. If there are any, then presumably because the predicate is symmetric with respect to the two positions occupied by the NPs. The construction seems to become more degraded with a predicate that is not symmetric in this respect, as in (2):

(2) * We always let those girls play without those boys who know each other from elementary school.

This shows that relative clauses with split antecedents cannot simply receive a semantic treatment such as the one within DRT that Hoekstra proposes, but requires specific syntactic relations for the application of the rules of semantic interpretation.

4 It seems that conditions on number and argeement always involve three-dimensional units, rather than being established in individual planes. Thus what has to distinguish between three sorts of syntactic relations, syntactic relations that can only be established in individual planes, syntactic relations that can be established both in individual planes and among three-dimensional syntactic units and syntactic relations that can only be established in among three-dimensional syntactic units such as number agreement.

5The split reading is for many speakers available in relative clauses, as in (1) and (2).

(1) a. (?) These are the two masterworks that Bill painted and John composed.
b. These are the masterworks that Bill painted and John composed.
c. The two masterworks that Bill painted and John drew are in this room.
d. Bill painted and John composed these two masterwork
e. These two masterworks Bill painted and John composed.
(2) These are the two women that Bill married and John proposed to.

There is a straightforward explanation for this difference between plural arguments and plurals as heads of relative clauses. Williams (1986) has noted that the N' of the head of a relative clause undergoes reconstruction (though not the full NP). This is shown in the following contrast:

(3) a. The picture of himself that John likes
b. the pictures of each other that John and Mary like
c. each other's pictures that John and Mary like

The anaphors in (3)a. and b. are contained in the N' and thus can undergo reconstruction, in contrast to the anaphor in (3c) in SPEC(NP) position. Returning now to (1a), it is reasonable to assume that a subconstituent not containing *two* undergoes reconstruction. Independent evidence of this comes from relative clauses with quantified subject in which the numeral of the relative clause head must take 'wide scope' over the subject, as in (4).

(4) the two masterworks that everybody likes.

(4) (only) has a reading in which the NP refers to two masterworks. It cannot refer to a group consisting of two masterworks per person. Thus, in (4)a. and b. only *masterworks* would be able to undergo reconstruction. Then the availability of the partitioned interpretation immediately follows. The structure of the NP with relative clause in (4a) after reconstruction would be as in (5).

(5) the two t [that Bill painted masterworks and John drew masterworks]

It is natural to assume (and it has often been assumed) that a plural such as masterworks may as a marginal case also refer to individuals, rather than groups. Then the relative clause in the structure in (5) refers to the group consisting of the masterwork that Bill painted and the masterwork that John drew. This group then will be further specified by *two*.

The cases in (1) differ from the cases discussed in the text crucially in that (1) involves reconstruction of N', whereby the numeral counts sums 'across the board', whereas the other cases could involve only reconstruction of the entire NP, which contains the numeral specification of the entire group.

6 Directional PPs have an intermediate status:

(1) a. On these two shelves Mary put a book and John put a newspaper.
b. I can't remember on which two shelves Mary put the book and John put the newspaper.

The partitioned interpretation is not excluded in (1)a. and b.; but it is worse than in true adjuncts.

7 There are certain exceptions to the possibility of a partitioned reading of simples in NP adjuncts. In the following b.-examples such a reading seems impossible:

(1) a. the woman with the bluejeans
b. * the man and the woman with the (two) bluejeans / with the blue eyes

The impossibility of (1b) presumably has to do with a semantic constraint on extraposed PPs in general. The relation of possession involved in (1b) seems to disallow even extraposition of PPs to clause final position:

(2) A man arrived * with bluejeans / * with bue eyes / from England.

8 For some reason, multiple antecedents of exception phrases seem to be restricted to subject position:

(1) * John saw *every woman* and Mary noticed *every man except Sue and Bill.*

Notice that exception phrases do extrapose from object position, as we have seen earlier.

Chapter 3:

Coordination other than *and*-coordination and implicit coordination

3.1. Introduction

In chapter 2, the discussion of implicit coordination has been restricted to coordination with *and*. We have seen that implicit coordination in the context of *and* coordination was always interpreted in the same way as explicit phrasal *and* coordination, namely by group formation. Two questions arise when other types of coordination are taken into account: first, is implicit coordination possible at all in the context of other coordinate structures (as the theory so far in fact predicts), and second, how is it interpreted?

In this chapter, I will examine other types of coordination with respect to implicit coordination, in particular coordination with *or* , relative clauses, which arguably involve coordination and comparatives. The general claims defended in this chapter are first, implicit coordination is syntactically available for all types of coordination and second, implicit coordination is always interpreted by group formation, regardless of the explicit coordinator in the coordinate construction. In those cases in which a coordinate construction is unacceptable with implicit coordination, it is so because of an incoherent overall semantic evaluation of the sentence. Beside these general claims, this chapter gives explicit syntactic and semantic analyses of relative clause constructions in terms of simultaneous coordinate and subordinate structures, and of two types of constuctions in which relational adjectives receive an internal reading in comparatives. I will first examine disjunction with respect to the ability of providing implicitly coordinated antecedents, then certain relative clauses and finally comparatives.

3.2. Disjunction and implicit coordination

Is implicit coordination possible not only in coordinate structures with the coordinator *and*, but also in coordinate structures with the coordinator *or*? From a syntactic point of view, the answer must clearly be positive, since ATB extraction is possible in coordinate structures with disjunction:

(1) What did Mary say t or Bill write t?

This is of course expected from the way phrase markers were conceived in chapter 1, since the possibility of joining nodes depends only on whether the sentence involves coordination, not which coordinator it contains.

More generally, it seems empirically confirmed that all types of coordinate structures allow for implicit coordination syntactically, in particular for the purpose of ATB extraction. This also holds for comparatives, which in some way involve coordination as will be discussed in section :

(2) What did Mary say t more often than John wrote t?

However, disjunction generally does not display the second sort of phenomenon that is indicative of implicit coordination, namely split antecedents for anaphors composed of parts of conjuncts. Thus *John* and *Mary* cannot constitute an implicitly coordinated antecedent for *each* in (3a), and similarly *same, together, simultaneously* and *one after the other* cannot take an implicitly coordinated antecedent in (3b) and (3c).

(3) a. * How many cars *each* did *John* buy or *Mary* sell?
b. * John *played* or Mary *listened* to the *same* music. (* in the relevant reading)
c. * John *sang* or Mary *played together / simultaneously / one after the other.*

Because of the possibility of ATB extraction from disjoined sentences, the unacceptability of (3) cannot be traced to implicit coordination being a construction specific to certain coordinators (*and*, but not *or*). Rather the examples in (3) more plausibly are ruled out because of the semantics of disjunction.

The examples in (3) can in fact be ruled out by the semantics of disjunction based on the same kind of interpretation of coordinate structures given in the previous chapter for conjunction. Recall that this type of interpretation consists of two partial evaluations of a coordinate sentence, one evaluating the implicit coordination, the other one evaluating the clausal coordination. It is clear that the evaluation of the clausal disjunction cannot rule out the examples in (3), since in this partial interpretation the contribution of the elements taking implicitly coordinated antecedents is disregarded. Can the evaluation of the implicit coordination be responsible for the unacceptability of the examples? Also this partial interpretation alone cannot be responsible for unacceptability of (3), given that implicit coordination is always interpreted by group formation. The evaluation of (3)b. with respect to the implicit coordinations would be the same as for (4), which is fine

(4) John and Mary played and listened to the same music.

However, (3)b. can still be ruled out, namely because of an 'incompatibility' of the evaluation of the implicit coordination and the clausal disjunction. The evaluation of the implicit coordinations in (3b) implies that John played or listened and that Mary played or listened to the music, which is of course not the implication of the evaluation of the clausal disjunction. As a general principle, the partial interpretation of the sentence on the basis of the overt clausal coordinator should entail the partial interpretation of the sentence on the basis of the implicit coordination except for the contribution of the element taking an implicitly coordinated plural antecedent. Since these two partial interpretations are formulated as relations and since the semantic effect of the element taking the implicitly coordinated antecedent is generally formulated as a subrelation, this entailment is formally unproblematic: the first relation should be included in the second relation, the evaluation of the implicit coordination without the semantic effect of the element taking the implicitly coordinated antecedent. Thus the relation evaluating the implicit coordination in (3b) without the semantic effect of *same*, namely (5c), includes the relation in (5d), which is the relation expressed by (5b), the partial evaluation of the clausal disjunction of (5a).

(5) a. John played and Mary listened to the same music.
  b. John played some of it and Mary to some of it.
  c. λxe[Ee'x(e'Pe & x'Px & played(e, John, x') & Ee'x'(e'Pe & x'Px listen to(e, Mary, x'))]
  d. λxe[played and listened to(e, G({John, Mary}), x)]

In certain context, disjunctive coordinate sentences do allow for implicitly coordinated antecedents, for instance in the following context:

(6) a. A: You said that Bill kicked Sue or Bill hit Mary?
  b. B: No, I said that Bill kicked or Bill hit the same person.

However, here *same* most plausibly operates on a metalinguistic level in the following way. Coordination in (6b) at the object semantically and syntactically involves disjunction. But coordination in (6b) also operates at a metalinguistic level. It involves an operation of conjunction applying to the uuterances that are described. Let us assume that (6b) describes an utterance u of the form 'Bill kicked t' and an utterance u' of the form 'Bill hit t'. Both of these utterances are parts of a bigger utterance u'' of the form 'Bill kicked t or Bill hit t'. We can say that u'' is the sum or group of u and u'. Thus, u'' can be considered the result of the same semantic operation of group formation that is associated with phrasal conjunction. Only in this case it applies to utterances u and u' corresponding to IPs. Thus, we can say that (6b) involves a coordinate structure of the form in (7a). This coordinate structure is evaluated roughly as in (7b), where 'SAY(*that Bill kicked t*)' is a predicate denoting the set of utterances of the form 'Bill kicked t' and ABOUT is the relation that holds between an utterance u and an entity x iff u is about x.

(7) a. conj(*I said that Bill kicked t, I said that Bill hit t*)

b. $\lambda u''x[\exists uu'(u'' = G(\{u, u'\})\ \&\ SAY(\textit{Bill kicked t})(u)\ \&\ SAY(\textit{Bill hit t})(u')\ \&\ ABOUT(u, x)\ \&\ ABOUT(u', x))]$

The semantic operation associated with *same* that was given in chapter 2 can now be applied to the relation in (7b) in the usual way. Thus, *same* in (6b) would roughly have the following semantic effect. Given that u is the B's earlier utterance B refers to in (6b), then for every x and x', if the utterance part u' of u involving Bill's kicking is about x and the utterance part u'' of u involving Bill's hitting is about x', then x and x' are the same. This is more formally given in (8):

(8) $\lambda u''x[\exists uu'(u'' = G(\{u, u'\})\ \&\ SAY(\textit{Bill kicked t})(u)\ \&\ SAY(\textit{Bill hit t})(u')\ \&\ ABOUT(u, x)\ \&\ ABOUT(u', x)\ \&\ PEOPLE(x))]\ \&\ \forall uu'x'x''\ (uPu''\ \&\ u'Pu''\ \&\ x'Px\ \&\ x''Px\ \&\ SAY(\textit{Bill kicked t})(u)\ \&\ SAY(\textit{Bill hit t})(u')\ \&\ ABOUT(u, x)\ \&\ ABOUT(u', x)\ \&\ PERSON(x)\ \&\ PERSON(x') \dashrightarrow x' \neq x'')]$

Thus *same* in (8) does not operate on the usual semantic level, but rather on a level that is construed on the basis of what the expressions in (6b) denote. At this level, also the coordinate structure of (6b) is represented. But the coordination at this level is not interpreted as disjunction, but rather as conjunction. I will not go further into the issue of what the procedure is for construing this level, what must or may be invariant and which expressions may operate at this level, rather than the usual semantic level. In any case, *same* is not unique in operating at this level. It has often been observed that certain expressions may operate on a metalinguistic level, for instance negation, or a level of speech acts, for instance conditionals.

Note that if the approach to semantic effect of *same* in (6b) is right, one also has to allow for quantification over mental events in cases such as (9).

(9) A: You were thinking that Bill kicked Sue or Bill hit Mary?
B: No, I was thinking that Bill kicked or Bill hit the same person.1

To conclude this section and to anticipate the following sections of this chapter, we can state the following generalization about implicit coordination:

(10) Generalization about Implicit Coordination
The syntactic construction of implicit coordination is possible in all coordinate structures. The lack of implicit coordination phenomena in coordinate structures can have only semantic sources.

This generalization will be further confirmed in the following sections, in which other types of coordination are considered that exhibit implicit coordination phenomena of the second sort.

3.3. Relative clauses and implicit coordination

In this section, I will discuss an interesting construction with relative clauses. This construction has been noted by Williams (1976), though it has to my knowledge never explicitly been analysed from either a syntactic or a semantic point of view. In this construction, the relational adjective *same* modifying the head NP of the relative clause has an internal reading, taking the content of the main clause and the content of the relative clause into account in the comparison:

(11) a. The same man that / who we saw yesterday came today.
b. The same student that knew the answer to the first question knew the answer to the second question.
c. Mary answered the same question that John answered yesterday.
d. I gave the book to the same man to whom I gave the record.
e. At the same time when John became professor, Mary became prima ballerina.

Note that the construction is available both for relative clauses with *that* and for relative clauses with a wh relative pronoun.

An important observation to make about this construction is that it is available only for relative clauses. It is unavailable for any other NP modifiers such as APs or PPs, regardless of their semantic content:

(12) a. * The same man angry at Bill became angry at John.
b. * The same nervous man was tired.
c. * The same answer by Mary was given by Sue.
d. * The same man with an umbrella came with a dog.

I will propose the following analysis of the construction. Relative clauses may in some way be coordinated with the main clause and thus provide an antecedent for *same* that is the implicit coordination of parts of the main and the relative clause. The difference between relative clauses and other attributes then can be traced to the inability of adjectival or prepositional NP modifiers to undergo coordination with the matrix clause. The reason for that can be considered a violation of the Law of the Coordination of Likes, since adjectival and propositional modifiers do not match in category with the main clause, a CP or IP.

There are two questions this account has to answer. First, why and how should the relative clause be coordinated with the main clause. Moreover, and most importantly, is there independent evidence that relative clauses involve coordinate structures? There are two discussions of relative clauses in the literature that try to give independent arguments for the coordinate status of relative clause constructions, namely first Williams' (1990) reanalysis of parasitic gap constructions as ATB extraction and second Muadz's (1991) adaption of Lebeaux's proposal for the derivation of sentences with relative clauses within his three-dimensional theory of coordination. Both arguments are not particularly strong, but they should be mentioned nonetheless.

Williams (1990) analyses all parasitic gap constructions as coordinate structures at LF. That way parasitic gaps are analysed as cases of ATB extraction. In his analysis, relative clauses with parasitic gaps as in (13) are coordinated with the matrix clause. If the relative clause is not extraposed, coordination with the main clause first requires extraposition at LF.

(13) a. Who does everyone who meets like?
b. He is a man that everyone that gives presents to like.

The structure of (13b) that Williams gives would be as in (14) within a three-dimensional account of coordination:

(14) he is a man [that everyone likes t]
COORD
[that gives presents to t]

At this point, I will not take a stand in the question of whether parasitic gaps can generally be analysed as ATB extraction. The analysis of parasitic gaps as ATB extraction in coordinate structures in general is a controversal issue (see also Haik 1985 and recently Munn 1991 for an analysis in the opposite direction, reducing ATB extraction to parasitic gaps). For more discussion of this issue see chapter 4.

Note that parasitic gaps in relative clauses cannot cooccur with *same* taking an implicitly coordinated antecedent:

(15) ?? Who did the same man who praised e criticize e?

Clearly the reasons why same in (15) blocks ATB extraction may be entirely independent of whether relative clauses involve coordination or not.

Muadz (1991) provides another argument that relative clauses should be analysed in terms of coordination, or at least by a representation with two distinct planes. His argument is a reinterpretation of Lebeaux's account of adjunct clauses and Condition C effects (cf. Lebeaux 1988, 1989, 1991). The crucial data involve a distinction between relative clauses and argument *that* clauses with respect to the application of Condition C of Binding Theory (cf. Chomsky 1982). Consider (16) and (17).

(16) a. **He* believes the claim that *John* is nice.
b. * Whose claim that *John* is nice does *he* believe?
(17) a. * *He* believes the story that *John* wrote.
b. Which story that *John* wrote did *he* believe

Lebeaux invokes generalized transformations in order to account for the difference between (16b) and (17b). The relative clause and the matrix clause start out as distinct phrase markers Only after wh-movement will the relative clause be adjoined to the NP. Hence Condition C will not be violated at any point in the derivation of (17b).

Muadz translates this treatment into his own framework as follows. The relative clause and the matrix clause are represented first in different planes, as in (18).

(18) plane 1: he believes which story.
plane 2: O that John wrote t

At S-structure these two planes are conflated for instance for reasons of predication. That is, the relative clause in the second plane has to enter the relation of predication to a subject, and this is possible only when it is adjoined to an NP. After conflation, no Condition C violation can result.

Note that *same* may occur in the same relative clause constructions with potential Condition C violations which have motivated Lebeaux's account:2

(19) (?) The same story that John praised he would never criticize.

The assumption that the relative clause and the main clause belong to different planes still requires theoretical elaboration and does not yet answer the question of how the right antecedent for *same* is provided in the examples in (11)? Moreover, Muadz's account raises the question of why the relative clause and the main clause should be represented in different planes. It is not obvious how different planes could result without splitting nodes, as in the representation in (18). There are two possible answers.

First, by a general principle, distinct phrase markers might always constitute distinct planes. That is, one can say each (two-dimensional) phrase marker by itself is a plane distinct from any other (two-dimensional) phrase marker. However, given the distinction between f-planes and m-planes in the present approach, such an account is more problematic. It is very unclear how the mere fact that there are distinct f-planes (which are provided by distinct phrase markers) should define a coordinate structure. M-planes according to the rules given in chapter 1 require that the m-planes share splitting nodes and involve coordinators. But neither of those requirements are met in the present case.

Second, the relative clause and the main clause of (11a) might themselves be implicitly coordinated at some level. Thus implicit coordination would semantically be evaluated the same way as *and* coordination. That is, (11a) might have a structure in which the main clause and the relative clause are dominated by the same CP node.

However, this account raises problems for the position of *same*. If the coordinate structure of (11a) is as in (20), then *same* is not a shared node.

(20)
```
        / the same man came today
     CP
        \ that came yesterday
```

When *same* is not a shared node, the condition on establishing syntactic relations in three-dimensional tree given in chapter 2 is violated. Are there ways to rescue a coordination analysis? One obvious possibility would be that *same* in (11a) undergoes QR, adjoining to CP so that it will be a shared node at LF:

(21)
```
                       / e came today
     The same man CP
                       \ that came yesterday
```

Note that the traditional arguments for QR hold for *same*-phrases; for instance *same*-phrases allow for antecedent-contained deletion, as in (22) (cf. May 1985, Fiengo/May 1991).

(22) John read the same book that Mary did.

However, there are two potential problems to this view. First, QR is generally held to yield adjunction to IP, not to CP (see May 1985). But CP adjunction is the only possibility in (22).

Second, if *same*-phrases could undergo QR in order to be become shared nodes, then this might rescue structures that are unacceptable. Thus with QR (23a) and (24a) should be acceptable, where the *same*-phrases could have undergone QR.

(23) a. * John met Sue at the same time and Bill Mary.
b. At the same time John met Sue and Bill Mary
(24) a. *John talked at the same time and Mary wrote about this opera.
b. At the same time John talked and Mary wrote about this opera.

However, (23a) and (24a) can be ruled out independently. Earlier in this chapter, I have mentioned the condition introduced in chapter 1 that the *same* phrase has to c-command the parts of the antecedent even at the 'linearized' structure. If this condition has to hold at S-structure, not at LF, then the unacceptablily of (23a) follows. (24a) would be ruled out by another principle, namely by the Coordinate Structure Constraint or the ATB principle as applied to LF. When the *same* phrase in (24a) has undergone QR, it binds a variable only in the first conjunct, not in the second one. Hence the prohibition against vacuous quantification is violated in the second plane at LF.

Why are the two constraints that rule out (23a) and (24a) not violated in the relative clause construction with *same*? The first constraint is certainly satisfied, since the *same* phrase generally c-commands the relevant part of the main clause as well as everything in the relative clause. What about the CSC? One could argue that the CSC is satisfied despite the fact that the *same* phrase is extracted only from one conjunct. The reason is that the second conjunct, the relative clause, also provides an element that the *same* phrase can bind, namely the relative pronoun or empty operator itself. (Note though that this element is not a variable itself.) The LF of (11a) then would be as in (25):

(25)
$$[\text{the same man}]_i\ \text{CP} \begin{cases} e_i \text{ came today} \\ \text{that } O_i\ e \text{ came yesterday} \end{cases}$$

However, there is evidence that the operator of a relative clause cannot serve as a variable in order to satisfy the prohibition against vacuous quantification. If this were so, then (26) should be fine, which it is not.

(26) * Everybody came and who asked a question

I will therefore not adopt the idea that relative clause constructions with same involve CP coordination and necessarily requires QR. Instead I suggest that what is coordinated in this construction are two distinct categories, a VP and a CP, as shown in (27):

(27)
$$\text{The same man} \begin{cases} \text{came today} \\ \text{that came yesterday} \end{cases}$$

Coordination of distinct categories is often possible, in particular when these categories are both predicates such as VPs or relative clauses. Such violations of the Law of the coordination of likes were noted by Sag et al. (1982) with examples such as (28):

(28) John is a lucky man and happy.

Clearly coordination of distinct categories presents a problem for the present theory of coordination. But this problem requires a general solution anyhow.

Another important question about the construction is, what exactly should the antecedent of *same* be in this construction? There are two possibilities. The first possibility is that *same* takes an implicitly coordinated antecedent, most plausibly the implicitly coordinated verbs of the relative clause and the main clause; i.e. in (11a) the implicit coordination of the two occurrences of *came*. However this possibility is rather implausible given that the construction involve coordination of a VP and a CP, which both function as predicates. The second possibility would be that *same* semantically applies directly to two predicates and compares the arguments satisfying the two predicates, i.e. in (11a) the predicate x[x came today] and the predicate x[x came yesterday]. *Same* presumably functions in this way also in I'-coordination, as in (29):

(29) The same man came today and will come tomorrow.

In addition to the coordinate structure, a sentence with a relative clause, of course, also has to have a subordinate structure, where the relative clause is adjoined to the NP it modifies. With Muadz I assume that the subordinate structure is required in order to establish a necessary binding relation between the relative clause operator and the head noun (or, alternatively, a predication relation between the relative clause and the head noun). I will assume that these two syntactic structures for relative clauses are both base-generated. The generation of the coordinate structure might be necessary only in order to provide an antecedent for *same* when necessary.

Both the coordinate and the subordinate structure of relative clause constructions have to receive a semantic interpretation. As in the case of the two m-plane assignments for constructions with implicit coordination (cf. chapter 2), I assume that these two interpretations are partial meanings of the sentence and have to be combined to give the full sentence meaning. The interpretation of the coordinate structure provides the evaluation of *same*; the interpretation of the subordinate structure disregards *same* and involves the set-theoretic intersection of the property expressed by the head noun and the property expressed by the relative clause.

Let me sketch the two partial interpretations for (11a) in the following way. On the basis of the subordinate structure, (11a) is evaluated roughly as equivalent to (31a), thus approximately as in (31b).

(31) a. The man that came yesterday came today.

b. ιx[man(x) & came yesterday(x) & came today]

On the basis of the coordinate structure, (11a) is roughly evaluated as equivalent to (32a), i.e. as (32b).

(32) a. The same man came yesterday and today.

b. λx[came yesterday and came today(x) & Ax'x"(x'Px & x"Px & came yesterday(x') & came today(x") --> x' = x")]

The union of the two partial interpretations in (31b) and (32b) then gives (33) approximately as the complete sentence meaning of (11a):

(33) E!x[man(x) & came yesterday(x) & came today] & came yesterday and came today(x) & Ax'x"(x'Px & x"Px & came yesterday(x') & came today(x") --> x' = x")]

The analysis explain the following peculiarity of the construction withn relative clauses and relational adjectives. Not all relational adjectives may take an implicitly coordinated antecedent in a 'relative clause coordination'. In fact, the construction is possible only with *same*, i.e. with relational adjectives expressing identity:

(34) a. * A different man that / whom we saw yesterday came to see us today.

b. * Mary answered a similar / comparable / related question that / which John answered yesterday.

c. John solved * an equal number / the same number of problems that Mary did.

The restriction to relational adjectives expressing identity can be derived from the semantics of the construction as given above. It is clear that the interpretation of the subordinate structure requires that properties expressed by the head NP and the relative clause be intersected. Hence the evaluation of this representation would be incompatible with the internal reading of a relational adjective other than *same* modifying the head NPs.

3.4. Comparatives and implicit coordination

3.4.1. The phenomena

In this section, I will discuss a construction with relational adjectives in comparative clauses in which the relational adjective takes an antecedent that consists of the phrase or parts of the phrase following *than* and its correlate. This construction provides evidence for an often suggested coordinate character of comparative constructions, which will be discussed in more detail in chapter 4. The following examples with the relational adjective *same* have a reasonable interpretation in which *same* relates to the compared elements in the comparative construction. They are classified into four distinct types. These types differ in acceptability or in important structural properties.

<u>relational adjectives in amount NPs in nongeneric sentences:</u>

(35) a. The same amount of alcohol made Mary more drunk than John.

b. During the same period of time John wrote books than Mary letters.

<u>relational adjectives in other NPs in nongeneric sentences</u>

(36) a. (?) The same movie impressed more women than men.

b. (?) The same medication became more popular in America than in Europe.

c. (?) The same problems troubled mathematicians more than physicists.

d. (?) The same movie was more criticized by men than praised by women.

(37) a. (?) The same rockstar made more parents upset than teenagers enthusiastic.

b. (?) At the same time / During the same period of time, more students asked questions than professors gave answers.

c. (?) In the same year, more single men adopted more girls than married women bore sons.

<u>generic sentences:</u>

(38) a. The same medication helps children more than adults.

b. The same amount of alcohol has a greater effect for women than for men.

<u>an amount comparison quantifier in German:</u>

(39) a. Genausoviel Medizin würde mehr Kindern in Afrika als Kindern in Amerika helfen.

'The same amount of medicin would help more children in Africa than children in America.'

b. Genausoviel Alkohol hat unter denselben Umständen einen größeren Effekt auf Frauen als auf Maenner.

'The same amount of alcohol under the same circumstances has a greater effect on women than on men.'

The construction is best acceptable with either amount NPs in nongeneric sentences as in (35) or

[illegible]

in generic sentences as in (38). The construction is available with NPs not involving a comparison of amounts in nongeneric sentences as in (36) and (37) only for some, but not all speakers. (39) illustrates that the construction does not depend on the adjectival nature of relational adjectives, but may also appear with quantifiers expressing a comparison of amounts, in this case the German quantifier *genausoviel* 'an equal amount'.

The comparatives in (35a), (36a-c) and (38) are phrasal comparatives and those in (36d) and (37) clausal comparatives. Phrasal and clausal comparatives enter the construction in the same way. (35b) shows that the construction is possible also with comparative subdeletion.

3.4.2. An analysis of the construction in nongeneric sentences

Before discussing further the properties the different types of constructions, I will present an analysis of comparatives as a construction involving coordination. I then show how, based on a for both structures. Concerning the semantic motivations, roughly speaking, the subordinate structure provides the syntactic basis for the evaluation of the comparative operator, whereas the coordinate structure provides the syntactic basis for the semantic evaluation of relational adjectives.

In this chapter, I will discuss only the coordinate structure of comparatives as in (35-37). In the coordinate structure, *than* functions as a coordinator with the semantic interpretation of *and.* The comparative morpheme *-er* does not play a role in this structure and hence will be disregarded. Instead, for instance, *more* is to be understood as *x-much.* (see Bresnan 1976). The coordinate structure of a phrasal comparative construction with relational adjective such as (35a) can now be given as in (40).

(40)

John
The same movie made NP - than x-much drunk
Mary

Given that *than* in (40) functions syntactically and semantically as *and, same* in (40) now can take an antecedent in the usual way, namely the coordination of John and Mary. The coordinate structure of (35a) is then syntactically and semantically equivalent to (41):

(41) The same amount of alcohol made John and Mary x-much drunk.

In (41) the semantic interpretation of *same* proceeds in the usual way, as in other cases of the internal reading of *same.*

The coordinate structure of clausal comparatives can be given in the same way. The only difference is that here the antecedent of the relational adjective may require implicit coordination. Thus, for instance, the coordinate structure of (36b) is as in (42) with implicit coordination of the subject NPs and the VPs of the main clause and the *than* clause.

(42)

x-many students asked questions
During the same period of time IP-than NP VP
x-many professors gave answers

Given that *x-many students* and *x-many professors* and *asked questions* and *gave answers* are implicitly coordinated, the coordinate structure of (36b) can be evaluated as equivalent to (43):

(43) During the same period of time x-many professors and x-many students asked questions and gave answers.

3.4.3. The analysis of relational adjectives in generic comparatives

In this section, I will show that relational adjectives in generic comparatives as in (38) have a fundamentally different syntactic and semantic status from relational adjectives in nongeneric comparatives. Only in the nongeneric case does the relational adjective function in the way described above, namely as taking an internal reading in the coordinate structure of the comparative construction. I will argue that in the generic case, the relational adjective does not directly (semantically or syntactically) relate to the content of the comparative. Rather, the NP containing the relational adjective is a generic NP that is part of the restriction of the generic operator. As such it cannot enter the relationship that NPs with relational adjectives in the internal reading normally enter to another constituent or coordination in the sentence. Instead, the relational adjective semantically operates only on the restriction of the generic operator, which will contain relevant information that has been accommodated pragmatically. Thus what seems to be an internal reading of relational adjectives in generic comparatives is not based on a syntactic relation at all.

As a first difference between the two constructions to be noted, the generic construction with comparatives and relational adjectives is more acceptable than the nongeneric one. That genericity really is the crucial factor can be seen from the fact that examples such as those in (36) - (37) become better when they are made generic or involve an explicit quantification over cases, as in (44):

(44) a. The same kind of pills generally becomes more popular in America than in Europe.
b. The same rockstar often makes more parents upset than teenagers enthusiastic.

Let me now show in detail that relational adjectives in the generic construction have a distinct syntactic and semantic function from relational adjectives in the nongeneric construction. There are three diagnostics that distinguish the two functions of relational adjectives in generic and nongeneric comparatives: first the relative position of the adjective with respect to the compared element; second, the position of the relational adjective relative to the comparative operator (island constraints on the scope of the relational adjective); and third, the ability of the NP containing the relational adjective to function as an antecedent for an anaphoric pronoun in the same sentence.

First, the examples in (36) and (37) (with nongeneric readings) exhibit a restriction on the position of the NP containing the relational adjective. In this construction type, the phrase containing the relational adjective seems to be obligatorily in sentence-initial position. Thus, in the following examples, an internal reading of *same* or *simultaneously* is excluded:

(45) a. More women were impressed by the same movie than men.
b. John gave better recommendations for the same medicin in America than in Europe.
c. More students asked questions at the same time / simultaneously than professors gave answers.
d. More single men adopted more girls during the same year than married women bore sons.

Being in initial position is not a strict requirement. Instead it suffices that the phrase with the relational adjective c-command the correlates of the compared element (the correlate in the main clause of the phrase following *than*). This is seen in (46), where the NP containing *same* precedes elements involved in the comparison.

(46) a. John invited the same collegues to more parties than business meetings.
b. John talked during the same period of time more about psychology than about mathematics.
c. John tought the same students more about astrology than about mathematics.
d. Mary showed the same visitors more drawings than paintings.

This might be related to an observation in the previous chapter about gapping: In *and*-coordinated clauses with gapping, relational adjectives and other expressions seem to take an implicitly coordinated antecedent only in a position preceding the correlates in the gapping construction, as in (47):

(47) a. At the same time / At different times John ate an apple and Mary a pear.
b. John ate an apple at the same time / at different times and Mary a pear.

This is further evidence that phrasal comparatives are of the same construction type as gapped sentences. Moreover it supports the following condition on the relation between relational is excluded:

(45) a. More women were impressed by the same movie than men.

b. John gave better recommendations for the same medicin in America than in Europe.

c. More students asked questions at the same time / simultaneously than professors gave answers.

d. More single men adopted more girls during the same year than married women bore sons.

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c. John tought the same students more about astrology than about mathematics.

d. Mary showed the same visitors more drawings than paintings.

This might be related to an observation in the previous chapter about gapping: In *and*-coordinated clauses with gapping, relational adjectives and other expressions seem to take an implicitly coordinated antecedent only in a position preceding the correlates in the gapping construction, as in (47):

(47) a. At the same time / At different times John ate an apple and Mary a pear.

b. John ate an apple at the same time / at different times and Mary a pear.

This is further evidence that phrasal comparatives are of the same construction type as gapped sentences. Moreover it supports the following condition on the relation between relational adjectives and their antecedents in coordinate constructions.

(48) Condition on relational adjectives and their antecedents in coordinate constructions

In a coordinate structure, a relational adjective has to c-command the parts of its antecedent also in the 'linearized' structure.

What is relevant in the present context is that this condition does not hold for relational adjectives in generic comparatives. In generic comparatives, the NP containing the relational adjective may be in any position and even follow the compared items:

(49) a. A woman becomes more drunk from the same amount of alcohol than a man.
b. At night John sleeps better in the same bed than during the day.
c. Often more parents get upset about the same rockstar than teenagers become enthusiastic.

The second diagnostics distinguishing the function of relational adjectives in generic comparatives from the one they have in nongeneric comparatives is the absense of locality conditions on the scope of the relational adjective in generic comparatives. In generic comparatives, the relational adjective also does not display any island effects, as seen in (50).

(50) a. ? A woman often becomes more drunk from a drink containing the same amount of
alcohol than a man.
b. ? (Generally) More people fall asleep when John tells the same joke than start laughing.

The same sentences become significantly worse when they are not used generically, as in (51):

(51) a. * A woman became more drunk from a drink containing the same amount of alcohol
than a man.
b. * More people fell asleep when John told the same joke than started laughing.

Thus we have the following condition on the scope of the relational adjectives, which has to be satisfied in nongeneric comparatives.

(52) Condition on the scope of relational adjectives
The scope of relational adjectives is subject to island constraints

In generic comparatives, relational adjectives apparently are exempt from any restrictions on their relation to their antecedent parts of their scope. This peculiarity of relational adjectives in generic comparatives recalls the behavior of generic indefinite NPs, wide scope *or* or free choice *any*. Generic indefinite NPs and free choice *any* basically take wide scope regardless of their syntactic position.

Aoun/Hornstein/Sportiche (1982) have argued that free choice *any* does not classify as a quantifier, but rather patterns with names. the same observations can be made about indefinite generic NPs. Furthermore, the same arguments can be applied to NPs modified by relational adjectives in generic comparatives. The diagnostics for 'names' as opposed to quantifiers that Aoun/Hornstein/Sportiche (1982) employ are the following. First, the 'scopal behavior' of the expression is independent of its syntactic position. Second, the expression do not exhibit weak crossover effects. Third, anaphoric reference if possible across sentence boundaries. The referential status of NPs with relational adjectives in generic comparatives becomes apparent in a third diagnostic distinguishing them from those in nongeneric comparatives.

The third diagnostic distinguishing the function of relational adjectives in generic and in nongeneric comparatives concerns the behavior of anaphoric pronouns. In the *than* clause, the NP containing the relational adjective may be replaced by a pronoun:

(53) a. *Similar circumstances* may make Mary as happy as *they* make John sad.
b. Often *the same rockstar* makes as many parents upset as *he* makes teenagers enthusiastic.

With pronouns relational adjectives may take an implicitly coordinated antecedent even in constructions such as *better... the more*, as in in examples in (54), which are related to comparatives, but unlike comparatives, disallow for gaps or phrasal constructions.

(54) a. *The same song* becomes better the more often *it* is heard.
b. John likes *the same sonata* better the more often he plays *it*.

This use of the pronoun is hardly available in nongeneric comparatives:

(55) a. ?? *Similar circumstances* made Mary as happy as *they* made John sad.

b. ?? *The same rockstar* made as many parents upset as *he* made teenagers enthusiastic.

c. ?? *The same song* became better the more often *it* was heard.

The pronoun in (54) has a different function from the usual anaphoric pronouns as in (56):

(56) *The same men* sat down when *they* got tired.

They in the subordinate clause refers to the entire group of men, forcing a deictic reading of *same* in the main clause.

And coordination behaves the same way. That is, if the second conjunct of a coordinate sentence with *and* contains a pronoun anaphoric to an NP with a relational adjective in the first conjunct, the pronoun has to refer to the entire group referred to by the NP and the relational adjective has to get a deictic reading. This is seen in the contrast between the possible interpretations of (57a) and (57b):

(57) a. The same man laughed and yelled.

b. *The same man* laughed and *he* yelled.

Only (57a), but not (57b), allows for an internal reading of *same*. *Same* in (57b) can only have a indexical interpretation.

Apparently what licences the pronoun in the examples in (54) is the referential function of the NP containing the relational adjective. That is, the NP containing the relational adjective does not function like an operator which has to stand in a syntactic relation to an antecedent of a gap, but rather functions like a name, which is semantically complete without standing in a syntactic relation to another syntactic element in the sentence.

Notice that anaphoric reference to the NP modified by the relational adjective is possible also outside of the clause, subject only, like other indefinite generic NPs to modal subordination.

(58) *The same sonata* becomes better the more often it is heard. *It* will improve every time.

Concerning Weak Crossover, the data also seem to be as predicted. That is, NPs with relational adjectives in generic comparatives do not lead to Weak Crossover violations.

(59) a. At its premiere, the same movie usually impresses more women than men.
b. (?) His teacher often gives the same child more fear than pleasure.

If NPs with relational adjectives in generic comparatives have in fact the same status as indefinite generic NPs and free choice *any*, the critical question is, how should the relational adjective in an NP with that function be interpreted? I will argue that the semantic operation associated with the relational adjectives in generic comparatives applies in the restriction of a generic operator. By accommodation, the restriction will specify appropriate situations which relational adjective could compare.

Consider (38a) repeated here:

(60) The same amount of alcohol makes a woman more drunk than a man.

This generic sentences most plausibly ranges over pairs of situations <s, s'>, one in which a woman is drinking alcohol (in s) and another one in which a man is drinking alcohol (in s'). The situtaion s is associated with the main clause. The reason that it is specified as it is is first that *a woman* as another generic NP in (60) is also part of the restriction of the generic operator and second that the woman becoming drunk in that situation (part of the assertion of (60)) presupposes that the woman drank alcohol in that situation. It is a commonly assumed principle that the presuppositions of a generic sentence are accommodated into the restriction of the generic operator (see Schubert/Pelletier 1989). The second situation s' is associated with the than phrase and is specified in an exactly paralle manner, given a man is another generic NP that is part of the restriction of the generic operator. The semantic operation evaluating *same* now applies to these two situations, specifying that the amount of alcohol the woman is drinking in s is the same as the amount of alcohol the man is drinking in s'.

Filling in the restriction of a generic sentence, in particular specifying the appropriate situations the sentence ranges over is a common procedure in the understanding of generics. This was discussed by Schubert/Pelletier (1989), who give the example in (61), where the generic operator is implicitly restricted to situations in which cats are dropped to the floor.

(61) Cats usually land on their feet.

3.4.4. Restrictions on relational adjectives in comparatives

Let me now turn to certain restrictions on the construction with comparatives and relational adjectives. First, there are semantic restrictions on the relational adjectives that take an antecedent in comparatives. Relational adjectives and other expressions not implying similarity may not take an antecedent in a comparative with *than*:

(62) a. # Different movies impressed more women than men.
b. # Different medications have wider distribution in America than in Europe.
c. # Unrelated problems trouble more mathematicians than physicists.
(63) # Consecutively / Separately / During different periods of time, more students asked questions than professors gave answers.

The reason why only *same* and certain other relational expressions expressing similarity are allowed in comparatives with *than* appear to be purely semantic in nature. The ability of *same* to take an antecedent in comparatives cannot, for instance, be explained syntactically by the fact that it is the only relational adjective that allow for equative *as* clauses in English:

(64) John read the same book / * a similar / comparable book in the evening as Mary in the
morning.
(65) a. John read different books / more books than Mary.
b. John read the same / similar / comparable books as Mary.
(66) a. * John entered an adjacent room as / than Mary.
b. * John solved related problems as / than Mary.

The reason is that this restriction seems to be a syntactic restriction peculiar to English. In other languages, for instance in German, all relational adjectives expressing similarity can in the comparative take an equative complement:

(67) Hans hat dasselbe Buch / ein vergleichbares / aehnliches / ebenso langes Buch gelesen wie Maria.
'John has read the same / a comparable / similar / equally long book as Mary.'

Nonetheless, in German, as in English, the construction under discussion is restricted to relational adjectives expressing identity or at least similarity:

(68) Dasselbe Buch / ?? Aehnliche / * Verschiedene Buecher hat (haben) mehr Frauen beeindruckt als Maennner.
'The same book / Similar / Different books have impressed more men than women.'

This construction is possible also with other clause types that pattern with degree comparatives, for instance equatives, comparatives with *different*, and *rather* clauses (which are a type of comparative according to Napoli/Dieterich 1982).

(69) a. The same professor taught Mary as much mathematics as John Latin.
b. During the same period of time John learned Arabic as quickly as Mary French.
(70) a. With the same means John achieved a different result than Mary.
b. The same professor taught John a different subject than Mary.
(71) a. The same proposal would rather cause a riot than settle the problem.
b. The same candidate would rather keep his present position than change his personal habits for the new job.

Crucially, here the semantic restrictions on the relational adjective are different. With equatives, the relational adjective need not express similarity. Even *different* is acceptable.

(72) a. Different amounts of alcohol make a woman as drunk as a man.
b. Incomparably difficult tasks gave John the same amount of headache as Mary.
c. Unrelated problems may keep John awake as much as Mary.

Notice that the relational adjectives in (72) expressing dissimilarity are possible both in generic (72a, c) and nongeneric comparatives (72b).

What kind of semantic parameters are responsible for which relational adjectives may take an internal reading in which comparative constructions? It seems that the crucial parameter involved is that a single sentence may involve only one relation of dissimilarity. This principle, arguably a constraint on the semantic complexity of a sentence, is, in first approximation, stated in (73).

(73) <u>The condition on a single relation of dissimilarity in a sentence</u>

A clause may express explicitly at most one relation of dissimilarity among the values

of two distinct constituents.

Since *-er* comparatives themselves express a relation of dissimilarity, they disallow a relational adjective with an internal reading in the same sentence which also expresses dissimilarity. In contrast, equatives involve only a relation of similarity. Therefore, in equatives relational adjectives with an internal reading are possible that express a relation of dissimilarity. The same holds of course for comparatives with *different* and *same* respectively. Equatives and comparatives with *same* also allow for relational adjectives in the internal reading expressing similarity, as in (69-71). This is, of course, not excluded by the principle, since it sets only an upper limit on relations of dissimilarity.

The condition (73) as it stands is not unproblematic and presumably to be qualified further. (73), as it stands, excludes (74), which is fine.

(74) Different students found different solutions.

Furthermore the condition in (73) should not apply to generic comparatives, which often allow relational adjectives expressing dissimilarity in (non-equative) comparatives:

(75) Different amounts of alcohol will make John more drunk than Bill.

Now that we have seen that relational adjectives may take antecedents in comparatives, another question is, how do other expressions taking a plural antecedent behave in comparative clauses? We have already seen that collective adverbials such as *simultaneously* may take implicitly coordinated antecedents as well. This is, of course, expected since they take the same antecedents (i.e. events) as relational adjectives.

Also plural reflexives in picture NPs seem to be marginally allowed in the relevant construction:

(76) (?) Pictures of *themselves* impressed *John* more than upset *Mary*.

However, this may be due to the fact, mentioned earlier, that plural reflexives in picture NPs may generally take a split antecedent (cf. Bouchard 1987). The other constructions behave differently.

Binominal *each* is unable to take an implicitly coordinated antecedent in comparatives:

(77) * Two sonatas *each* were played by *John* three times more frequently than by *Mary*.

In (77) *each* cannot take the group consisting of John and Mary as its antecedent.

The same restriction holds of *a total of*:

(78) John played a total of ten sonatas three times more often than Mary.

(78) cannot describe a situation in which John played (only) five sonatas three times more often than Mary played (only) three other sonatas.

The different behavior of relational adjectives on the one hand and binominal *each* and *a total of* on the other hand still requires an explanation.

Notes

2 Unfortunately, Lebeaux's data are not as complete as they should be to justify the conclusion that Lebeaux and, following him, Muadz draw. Lebeaux overlooks that potential Condition C violations crucially depend on there being an attitude verb involved, an observations pointed out to me by Henk Zeevat. Unlike Lebeaux's examples, which always involve coreference with respect to the subject of an attitude predicate, the following example in (1b) and (2b) are not as bad as they should be:

(1) a. * *He* read the report that *John* is guilty.
b. (?) Which report that *John* is guilty did *he* read.
(2) a. * Mary showed *him* the report that *John* is guilty.
b. (?) Which report that *John* is guilty did Mary show *him*?

Thus, the application of Condition C to constructions with complement clauses in fronted wh phrases depends in some way on whether the complement clause must represent an attitude of the subject referent or not. Only in the first case, will a Condition C violation result.

[3]There is further evidence for coordination of the relative clause with the internal reading of *same* and for the specific semantic interpretation given above. There are certain semantic conditions that the two phrases *same* compares described events of certain kinds. For instance, the events described by the relative clause and by the main clause must in some way be parallel or be of the same type:

(1) a. ?? The same student who will take the exam came today.
    b. ?? The same man who just drank apple juice is the editor of the local newspaper.
(2) a. The same student who took the first exam will take the second exam.
    b. The same student who came yesterday came today.
    c. The same man who is the editor of a local newspaper is also the editor of an international fashion magazin.

This constraint appears to be a general constraint on the comparison of events, or more precisely the participants in an event. It holds also for *same* taking an explicitly coordinated antecedent, as in (3), and for *same* in comparative sentences (see section 3.3.).

(3) a. ?? The same student came today and will take the exam.
    b. ?? The same man is the editor of the local newspaper and just drank apple juice.

Why should this constraint hold? Semantic parallelism is obviously not a constraint on coordination in general. For instance, (4) is fine as a sentence characterizing a previously mentioned John.

(4) John is the editor or the local newspaper and just drank apple juice.

There are two possible sources therefore for the semantic parallelism. It could either be a requirement on the semantic antecedent of *same* or it may be a general requirement on the members of a group event. I will leave this open for further investigation.

Chapter 4:

Comparatives

The first three chapters of this dissertation have focussed on a three-dimensional syntactic theory of coordination and the semantic interpretation of three-dimensional phrase markers. This chapter will only in part relate to the syntax and semantics of coordination. The main issues in this chapter are syntactic and semantic aspects of comparatives. However, comparatives in some way also involve coordination and the relation between comparative constructions and coordination is what relates this chapter to the preceding three chapters.

Thus this chapter has two goals. The first goal is to develop a general semantic and syntactic analysis of comparative constructions in English and related languages; the second goal is to clarify the way in which comparatives might incolve coordination. I will focus on three issues concerning the syntax and semantics of comparative constructions.

First, I will discuss the general semantic function of comparative clauses and the relation between the comparative operator and the comparative clause. Following a suggestion by Pinkal/Lerner (1992), I will argue that comparative clauses most generally have the function of universal quantfifiers over degrees. Unlike what has been proposed by Lerner and Pinkal, however, I will argue that the syntactic basis for this universal quantification is not the internal structure of comparative clauses which it shares, for instance with free relatives, but rather resides both in the nature of the comparative operator and the comparative clause introducer.

Second, I will propose a theory about the identification of the empty element in comparative deletion sites. I will argue for an account which assimilates comparative deletion to antecedent-contained deletion. I will propose a general treatment of antecedent-contained deletion in which the antecedent containing a quantifier or operator is copied into the deletion site via vehicle change of the quantifier/operator as a variable.

Third, I will give an account for scopal behavior of quantifiers in comparative clauses. I will show that the scopal behavior of quantifiers in comparatives clauses is independent of comparative clauses, but rather can be reduced to general mechanisms by which quantifier scope is determined in wh constructions, which include free relatives and interrogatives.

The general syntactic and semantic analysis of comparatives will also serve to allow for a discussion of the relation of comparatives to coordination, which is the second goal of this chapter. It has often been argued that comparatives have coordinate character. My thesis about the relation between comparatives and coordination will be that comparatives may have two distinct syntactic structures, a coordinate structure and a subordinate structure. Furthermore, these two structures both receive partial interpretations which together constitute the full meaning of the sentence. This holds for clausal comparatives as well as for phrasal comparatives.

I will first discuss the syntax and semantics of clausal comparatives in general, in particular, the relation between the comparative operator and the comparative clause and the identification of the empty element in comparative deletion constructions. I will adopt a semantic analysis according to which comparative clauses act as universal quantifiers over degrees. I then discuss the syntax and semantics of phrasal comparatives. I will argue that phrasal comparatives cannot generally be reduced to clausal comparatives by deletion rules. But I show how the semantics proposed for clausal comparatives can be straightforwardly carried over to phrasal comparatives. Finally, I will discuss comparative subdeletion, as another case of a comparative involving a coordinate structure.

4.1. Clausal Comparatives

4.1.1. The general syntactic and semantic structure of clausal comparatives

4.1.1.1. The proposal

Let me start by outlining the general syntactic and semantic analysis of clausal comparatives that I will propose in this chapter.

First, I will make a particular assumption about the semantic function of comparative clauses. In a recent paper, Pinkal (1989) proposes that comparatives should semantically be treated as universal quantifiers over degrees. I will adopt this proposal, which I will justify in subsequent sections. Consider the example in (1):

(1) John is taller than he was.

The semantic representation of (1) is given in (2), where [*-er*] denotes a relation between degrees d and d' such that d is greater than d'. Adjectives such as *tall* denote relations between individuals x and degrees d such that *tall* holds between x and d iff x is tall to the degree d, where d is John's actual height.

(2) Ad(was tall([*John*], d) --> Ed'([*-er*](d, d') & is tall([*John*], d')))

Second, I will defend the following account of the syntactic structure of comparatives as the basis for the logical form in (2). I will follow Chomsky's (1977) analysis according to which comparatives involve nonovert wh movement. Thus at S-structure, (1) has the following representation:

(3) John is taller than [$_{CP}$O$_i$[he was t$_i$]].

Here an empty operator in SPEC(CP) binds an empty element in predicative position.

The syntactic structure in (3) raises two questions. [1] What is source for the universal quantification over degrees? [2] How can the empty element bound by the operator be interpreted in the appropriate way?

Concerning the first question, I will argue that the function of the comparative clause in (1) as a universal quantifier over degrees is based on a syntactic relation between the comparative operator *-er* and the *than* phrase, not, for instance, on the position of the empty operator alone.

Concerning the second question, the appropriate syntactic structure on which the semantic interpretation should be based should be one in which the empty element in (3) is replaced by *t-much tall*, as in (4)

(4) John is taller than O$_i$ he was [t$_i$-much tall].

Only now does the empty operator appropriately bind a degree variable t.

I will defend a particular account about how this replacement of the variable in (3) takes place. I will treat the empty element t as an instance of antecedent-contained deletion, adopting a similar treatment of this construction as May (1985) and Fiengo/May (1990). Unlike the latter account, however, I will not assume quantifier raising, instead I will assume a copying rule which allows a quantifier to be copied as a variable (which can be considered an instance of vehicle change). The LF of (1) is derived in the following way. The predicate *taller* is copied as *t-much tall*, where t is a degree variable.

In the semantic interpretation of (1), the comparative *taller* is treated as having two functions. On the one hand, it is interpreted as 'x-much tall'. With respect to this function and given the presence of a *than* clause, the part of (1) *John is taller* is interpreted as the set of degrees of tallness John has. On the other hand, the comparative operator *-er* is interpreted as a relation that takes as its first arguments degrees satisfying the degree property expressed by the main clause and as its second arguments degrees satisfying the degree property expressed by the comparative clause. Thus *taller* is of the form [*-er* t-*much tall*] at LF. The syntactic relations relevant for the interpretation of (1) are represented in (5).

(5) [O_i John is [-er_k x_i-much tall]]$_k$ [than [O_i he was [t_i-much tall]]]]$_k$

I assume a syntactic and semantic treatment of operators and quantifiers in situ based on scope indexing in the sense of Williams (1986) and Haik (1985), not quantifier raising. Thus the operator *-er* in (5) receives its scope and interpretation on the basis of the fact that it is coindexed first with the matrix clause (without the comparative clause) and second with the comparative clause. As a general principle, since *-er* is coindexed with the clause *O John is -er x much tall*, it will be disregarded when this clause itself is semantically evaluated. The clause itself will simply denote the set {d|John is d-much tall}.

Other comparative constructions receive related syntactic and semantic analyses. Equatives as in (6) are syntactically and semantically analysed the same way as comparatives, except that in the semantic representation [*-er*] is replaced by [*as*], which denotes the relation of equality or perhaps the relation 'at least as'.

(6) John is as tall as he was.

Other comparative constructions require more modifications of the analysis given above. In particular, I will argue that *same*-comparatives as in (7) does not involve quantification over objects, but rather reference to objects:

(7) John read the same book today as he read yesterday.

Semantically, (7) is analysed roughly as in (8):

(8) Ex[read today(John, x) & [*same*](x, ιy[book(y) & read yesterday(John, y)])

The representation of (7) at LF is derived in a similar way as for (1) by copying *the same* *book* as [e *book*] into the object position of *read*. The LF is given in (9) together with the indication of the syntactic relations on which the interpretation is based.

(9) [O_i John read [the same]$_k$ e_i book]$_k$ [as O_i he read e_i book yesterday]$_k$

Here, the operator O acts as a lambda operator binding the first variable e. This variable does not stand for degrees, but only for an argument position for an object that is the object of *read* and is a 'book'. The function as a description of the comparative clause introduced by *as* is based again upon a syntactic relation between the comparative operator *same* and the *as* phrase.

In what follows, I will give first give a semantic justification of this proposal and then discuss the syntax of comparative constructions.

4.1.1.2. Justification of the semantic analysis: The behavior of NPIs in comparatives

Let me first present the main motivations for the semantic analysis of comparative clauses as universal quantifiers and, as a contrast, the *as* clauses of *same* comparatives as deccriptions. This analysis is motivated by a number of semantic peculiarities of comparative clauses. Most important among those are the behavior of comparative constructions with respect to negative polarity items, and the behavior of quantifiers and connectives in the comparative clause. We will see that these peculiarities basically hold for clausal comparatives in the same way as for phrasal comparatives.

The semantic analysis of comparative clauses as universal degree quantifiers can best be defended against the background of alternative proposals that have been made in the literature. There are two proposals for the semantics of comparatives that I will discuss in order to justify the semantic analysis I will adopt. The first proposal was given by Russell (1905), where he proposed that comparative clauses are definite descriptions of degrees. In this analysis (10a) is interpreted as (10b):

(10) a. John is taller than he was
b. er(ιd[John is d-tall], ιd[he was d-tall)

I will call this proposal the **degree-description approach.**

The second proposal comes from von Stechow (1984). von Stechow modifies Russell's analysis in such a way that the comparative clause refers not to a unique degree, but to the maximal degree:

(11) er(max d[John is d-tall], max d[he is d-tall])

This proposal can be called the **maximal-degree approach**.

In contrast to these two proposals, I will call the present account, the **quantificational approach**.

Let me now come two the most important semantic properties of comparative clauses that decide among those proposals and speak in favor of universal quantification over degrees.

The strongest argument for the view that comparative clauses act as universal quantifiers over degrees comes from the fact comparative clauses license negative polarity items (NPIs) and the way NPIs in comparative clauses are interpretated.

It has often been noted that comparatives license negative polarity items:

(12) a. John is taller than any other student.
     b. John is happier than he has ever been.

The occurrence of *any* as in (12a) cannot be reduced to a free choice occurrence of *any* , since comparatives allow for NPIs that lack a free choice reading, for instance *ever* as in (12b).

Occurrences of NPIs in comparatives raise the following two questions. First, why are they licensed at all? Second, how should a quantifier like *ever* and *anybody* get the right evaluation in a comparative clause, namely as 'referring' to all persons or times? The right answers to both questions are provided both by the maximal-degree approach and the quantificational approach.

In the maximal-degree approach, NPIs would be licensed for the same reason that NPIs are licensed in superlative NPs as in *the highest mountain that anybody has ever climbed* . (Though why NPIs in superlatives are not licenced is itself not quite clear.)

In the quantificational appoach, the comparative clause constitutes the restriction of a universal quantifier and thus a downward entailing environment (cf. Ladusaw 1979). Furthermore, the existential quantifier representing the NPI is in the scope of a universal degree quantifier, which has the effect that all relevant entities are involved in the evaluation of the sentence.

Despite the equivalence of the maximal-degree approach and the quantificational approach to comparatives with respect to the licensing and interpretation of NPIs, there are decisive arguments against the former and in favor of the latter theory. First, comparative clauses may quantify over sets of numbers that lack a maximal element, as in (13). This was noted by Pinkal (1989).

(13) 2 is greater any rational lower approximation of the square root of 2.

If in order to account for (13) within the maximal-degree approach, 'maximal element' would be replaced by 'least upper bound' in the logical form of a clausal comparative construction. But then the same problem arises with comparative clauses that quantify over a set of numbers which does not include the least upper bound. Such a case may be (14) (though (14) may be objectionable for an independent reason, namely because w does not naturally enter an ordering relation with respect to natural numbers).

(14) w is greater than any finite number is.

(14) comes out as false if the comparative clause would denote the least upper bound of the set of finite numbers.

Equatives and and comparatives with *less* behave exactly the same way:

(15) a. John is as tall as any other student.
  b. John is as happy as he ever was.
(16) a. John is less tall than any other student.
  b. John is less happy than he has ever been.

Thus we can conclude that all these comparative constructions should by analysed by universal quantification over degrees. For (15b) we would roughly have the following logical form, which accounts for the 'universal force' of the NPI as an existential in the restriction of a universal quantifier. t_0 in (17) stands for the time of utterance.

(17) Ad(Et(t before t_0 & happy(John) at t --> Ed'(happy(John) at t_0))

Let me now provide evidence from NPIs that not all comparatives involve universal quantification. There is one comparative construction, which is syntactically of the same type as the other comparative constructions, but involves a different semantic analysis. The reason for that is that it does not behave the same way with respect to NPIs. Generally, comparative clauses with *same* do not allow NPIs:

(18) a. ?* John has the same height as any other student has.
b. ?* John has the same height as any other student.

Note, however, that those with *different* do:

(19) a. Mary wore a different dress than she wore ever before.
b. Mary wore a different dress than ever before.

There are several possible accounts one might give for the different behavior of *same* and *different* with respect to NPIs.

In the first account, in *same/different* comparatives, the NPI is not licenced by the inherent content of the comparative *than/as* clause, but rather by the nature of comparative operator: *different* has inherent negative content, which in this account would be responsible for the possibility of NPIs, but *same* does not. Then in this account the comparative complement of both *same* and *different* comparatives could both be treated as a description of an object, rather than a universal quantifier over degrees. The difference with respect to NPIs would now be traced to the fact that with *different* comparatives the description is in the context of negation, but with *same* comparatives it is not. Thus, the *different* comparative in (20a) would be analysed as (20b), with the content of *different* spelled out as the negation of a proposition expressing equality.

(20) a. John read a different book than Mary wrote

b. - ι x[read(John, x) & book(x)] = ι x[wrote(Mary, x) & book(x)]

However, there are two problems with this analysis. First, in a semantic context such as (20b) generally NPIs are not licensed. For instance, a case such as (21) should receive the same type of analysis as in (20b), but the NPI in the second definite NP is not licensed.

(21) * This book is not identical to the textbook anybody ever read.

Moreover, the complement of *different* does not seem to differ in downward-entailingness from the complement of *same*. Thus the inference from (22a) to (22b) is as valid as the inference from (23a) to (23b), provided that the presupposition that Mary read and praised a book is satsified.

(22) a. John read a different book than Mary read.
 b. John read a different book than Mary read and praised.
(23) a. John read the same book as Mary read.
 b. John read the same book as Mary read and praised.

The second problem with the analysis is that it does not account for the interpretation of NPIs in *than* clauses modifying *different*. The NPI *ever* in (19a) cannot just refer to a single time in order for (19a) to be true. Rather it has the status of an existential quantifier in the scope of a universal quantifier. But this does not come out in the analysis of the complement of *different* as a description. If the *than* clause modifying *different* had the function of a description, it would suffice if *ever* referred to a single time.

The second account assumes that the comparative complement may have a different semantic function with *same* and with *different*. With *different* it would act as a universal quantifier, but with *same* as a description. Thus, *different* comparatives would receive the same logical form as *-er* comparatives and equatives, where as same comparatives would require a somewhat different logical form. Thus (19a) would have the logical form in (24).

(24) $\forall$x[dress(x) & wear(Mary, x) at t' & t' < t --> $\exists$y $\exists$t'(dress(y) & & wear(Mary, x) at t' - & different(x, y))]

This immediately solves the two problems with the first analysis. I will therefore adopt the second account.

This difference between *same* and *different* comparatives in this account suggests that whether universal quantification or a description is involved in the interpretation of a comparative construction is a rather arbitrary choice. A possible explanation of the difference might be based on the difference between the determiners of the *same* and *different* NPs. *Same* NPs have a definite determiner, whereas *different* NPs have an indefinite determiner. However, it is not clear to me why this should be so either.

There are, however, other constructions in which the same arbitrariness in the semantic interpretation seems shows up. In particular, it seems to show up in the same way with constructions with *before* and *after*. *Before* and *after* allow for clausal and phrasal complements in a way similar to comparative constructions:

(25) a. John came after Mary came.
b. John came after Mary.
(26) a. John came before Mary came.
b. John came before Mary.

The phrasal constructions in (25b) and (26b) behave like phrasal comparatives in that the complement is elliptical with respect to material in the main clause. Thus *after Mary* in (25b) is elliptical for *after Mary came*. Because of the similarity of the 'after'- and 'before'- constructions to clausal and phrasal comparatives will call them **'quasicomparatives'**.

Like 'same'- and 'different'-comparatives, 'after'- and 'before'-quasicomparatives behave differently with respect to NPIs. This was noted by Richard Larson, as reported in Higginbotham (1988). Only 'before'-quasicomparatives allow for NPIs, not 'after'-quasicomparatives:

(27) a. John came before anybody else came.
b. John came before anybody else.
(28) a. *John came after anybody else came.
b. *John came after anybody else.

Following the suggestion in Higginbotham (1988), this difference can be accounted for if 'before'-quasicomparatives involve universal quantification over times, whereas 'after'-quasicomparatives involve existential quantification. Further evidence for this treatment comes from the observation that (29a) is not contradictory, but (29b) is a contradiction (cf. Higginbotham 1988):

(29) a. I went there after you went there and you went there after I went there.
b. I went there before you went there and you went there before I went there.

(29b) is contradictory since in the first conjunct, the 'before'-clause involves universal quantification over all events of the addressee's going 'there'; hence all these events have to be earlier than the event of the speaker's going 'there'. But this is in contradiction to the second conjunct.

To summarize, the behavior of NPIs in comparatives shows the following. First, comparatives generally have the semantic status of universal quantifiers over degrees or objects (in the case of *different* comparatives). Second, there is one exception to the status of comparative clauses as universal quantifiers, namely *as* clauses in *same* comparatives. This exception seems to be due to a lexical peculiarity, rather than to the comparative construction itself. In this respect, the difference between *same* comparatives on the one hand and degree comparatives and *different* comparatives on the one hand is a phenomenon similar to the difference in semantic status between *after* and *before* clauses.

There is one other piece of evidence that comparative clauses act as universal quantifiers, namely the semantic behavior of disjunction in comparative clauses. This will be discussed in the next section, which will treat the behavior of connectives and quantifiers in comparative clauses in general. The main goal of the next section, though, is not to confirm the status of comparative clauses as universal quantifiers, but rather to show that comparatives, whatever their semantic status, pattern exactly parallel with other wh constructions with respect to the scope of quantifiers and connectives.

4.1.1.2.2. Quantifiers and connectives in comparative clauses

In this section, I will discuss the interaction of the scope of connectives and quantifiers with the operator representing the comparative clause. In relation to the connectives, I will support a view that the behavior of *or* in comparative clauses provides further evidence for the status of comparative clauses as universal quantifiers (cf. Pinkal 1989). The discussion of quantifiers in comparative clauses will establish a new and more important claim. The behavior of various quantifiers in comparative clauses, for instance *every*, *most* and *no* has often puzzled semanticists working on comparatives. I will argue that comparative clauses behave exactly parallel to other wh constructions in relation to this behavior of quantifiers. The scopal behavior of quantifiers in comparatives is thus regulated by more general mechanisms of quantifier scope relative to wh phrases. Based on a syntactic representation of quantifier scope based on scope-indexing (cf. Williams 1986), I will distinguish two different classes according to the rules for scope-indexing they are associated with.

Among connectives, *or* will be the only interesting one for the present purpose. It has often been noted that the connective *or* behaves special in comparative clauses (cf. von Stechow 1984, Larson 1986, Pinkal 1989). The relevant observation is that *or* in comparative clauses may have the reading of *and*. For instance, (30a) may mean (30b) or (30c). Though *or* in comparative may also have a wide scope disjunctive reading according to which (30a) means (30d).

(30) a. John is taller than Bill or Joe are.
b. John is taller than Bill and Joe.
c. John is taller than Bill and John is taller than Joe.
d. John is taller than Bill is or John is taller than Joe is.

Clearly, *or* in the reading (30b) of (30a) is not the wide scope *or* discussed in Partee/Rooth (1982) and Larson (1985), which would correspond to the paraphrase in (31a) or (31b):

(31) a. John is taller than Bill or Joe, I don't know which one.
b. John is taller than Bill or John is taller than Joe.

One might suggest that the *or* in (30a) is the conjunctive *or* corresponding to free choice *any* (cf. Higginbotham 1989), as in (32):

(32) a. John drinks beer or wine.

b. John drinks beer and John drinks wine.

However, there is good reason not to assume that *or* in (30a) is the conjunctive *or* in (32a). Conjunctive *or* as in (32a) is licenced only in modal or generic contexts, and those contexts do not include comparatives in any obvious way.

An important observation about the conjunctive reading of *or* in comparatives is that it is not in the same way available in other wh constructions, for instance in wh interrogatives, as in (33a), or free relatives, as in (33b).

(33) a. John knows what Mary or Sue have said.
b. John liked what Mary or Sue have said.

(33a) can hardly mean John knows what Mary and Sue have said, and (33b) can hardly mean John liked what Mary and Sue have said.

But it is of course expected that the conjunctive reading in the other wh constructions should be available if the context is explicitly generic or modal. This is in fact the case, as the examples in (34) show.

(34) a. John always knows what Mary or Sue have said.
b. It is impossible to know what Sue or Mary have said.
c. John always likes what Sue or Mary have said.

Thus we can conclude that the conjunctive reading of *or* in comparatives is a phenomenon independent of the status of comparative clauses as a wh construction. Rather it should have to do with the particular semantics of comparatives. In fact, the behavior of *or* in comparative clauses supports the analysis of comparative clauses as universal quantifiers.

This was noted in fact by Pinkal (1989). The conjunctive reading of *or* simply follows from the semantics of the comparative clause as a universal quantifier: the disjunction is inside the restriction of the quantifier and hence seems to have the effect of a conjunction (see also Cresswell 1976 for an equivalent proposal). Thus (30a) has the logical form in (35).

(35) Ad(tall(Bill, d) v tall(Joe, d) --> Ed'(-er(d', d) & tall(John d'))

'As'-clauses in 'same'-comparatives do not have the status as universal quantifiers, but rather are descriptions. It is then expected that *same*-comparatives should not allow for the conjunctive reading of or. In this respect, they should also differ from 'than'-clauses in 'different'-comparatives.This in fact seems to be the case:

(36) a. John read the same book that Sue or Mary read.
b. John read a different book than Sue or Mary read.
c. John read the same book that Sue read and Mary read.
d. John read a different book than Sue read and Mary read.

(36a) hardly allows for a reading given in (36c). But (36b) seems to allow for the reading in (36d).

As we said at the beginning, comparative clauses also allow for the wide scope disjunctive reading of *or*. Regarding this reading, comparatives seem to pattern together with other wh constructions. Thus (34a) and (34b) have the following readings:

(37) a. John knows what Sue has said or John knows what Mary has said.
b. John likes what Sue has said or John likes what Mary has said.

Thus, whereas the conjunctive reading of *or* im comparative clauses can be traced to the specific semantic interpretation of comparative clauses, the disjunctive wide scope *or* is a uniform phenomenon across wh constructions and should be treated by a general account of wide scope *or* (see Rooth/Partee 1982 and Larson 1985 for proposals).

Let me now come to the second issue to be discussed in this section, namely to the scope of quantifiers in comparative clauses. The relevant phenomena have often been discussed in the literature (see in particular von Stechow 1984, Larson 1986, Pinkal 1989, Lerner/Pinkal 1992). Certain quantifiers, in particular the increasing quantifiers *every*, *most* and *many*, may may take scope outside the comparative clause. This is seen in the examples in (38). (38a) and (38b) may describe situations in which the students that are compared with John have different heights:

(38) a. John is taller than every other student is.
b. John is taller than most / many students are.

Clearly, given the proposed analysis of comparatives, with narrow scope of the quantifier, (38a) and (38b) should make sense only if all the students have the same height. But this is not the preferrd reading. The other reading, in which the students have different heights, should at least also be allowed. (I will come to the issue of the availability of the first reading later.) The two logical forms for the two readings of (38a) are given in (39).

(39) a. Ad(Ax(student(x) & tall(x, d)) --> Ed'(er(d', d) & tall(John, d'))
b. Ax(student(x) --> (Ad(tall(x, d) --> Ed'(er(d', d) & tall(John, d')))

Why should these quantifiers be able to take wide scope over the universal degree quantifier associated with comparatives? Is this a phenomenon peculiar to comparative constructions or does it have a more general nature? The analyses in the literature, which I will not be able to discuss in any detail, implicitly assume that the phenomenon is peculiar to the comparative construction (cf. Larson 1986, Lerner/Pinkal 1992). What I want to do in the following is to show that the phenomenon is independent of the comparative construction, but is due to general mechanisms by which quantifier scope interactions are regulated in wh constructions.

Let us look at the pattern in (38) from a more general point of view of wh constructions, in particular in free relative clauses and interrogatives. We see that wide scope over the wh operator is possible with the same set of quantifiers in free relative and interrogatives. For interrogatives this has often been noted (see Groenendijk/Stokhof 1982, May 1985, Williams):

(40) a. John knew what every student / many / most students read.
b. John read what every student / many / most students wrote.

(40a) can have two meanings. With *most* it can mean either of the following. First, John knew about x such that x is the thing a majority of the students read. Second, for every x among a majority of the students, John knew what x read. A similar two readings are available for (40b). With *most*(40b) can mean either of the following. First, John read something which a majority of the students wrote. Second, for every x among a majority of the students, John read the thing that x wrote.

Now as it is a known fact that quantifiers may take scope over the wh operator in interrogatives, it is an equally known fact that this holds only when the quantifier is in subject position, not in object position (see May 1985 and Williams 1986, but see also Lasnik/Saito 1992 for a different view). In interrogatives, it is generally been noted that the wh phrase has to take scope over the quantifier in object position:

(41) John knows who read every book / most books / a lot of books.

(41) implies that there is one person of whom John knows that he or she has read every book.

This asymmetry between quantifiers in subject position and quantifiers in object position also holds for free relatives:

(42) John stopped what bothered everyone/ most people / a lot of people in his family.

(42) with *everyone* implies what John stopped doing is a thing that bothered everyone in John's family. (42) with *everyone* cannot describe a situation in which for everyone x in John's family there is a different thing y such that y bothered x and John stopped y.

Now the crucial question is, does this asymmetry also show up with quantifiers in comparative clauses? The data, though they are not as clearcut, suggest that this is in fact the case. Consider (43).

(43) a. More students read a book than read every newspaper.
b. More students read only this book than read many articles.
c. Fewer students read this book than read most articles.

The most prominent reading of (43a) is a reading in which the number students that read a book exceeds the number of students that read every newspaper, and similarly for (43b) an (43c).

Given that comparatives have the same internal structure as interrogatives and free relatives, the quantifier scope interactions with comparatives should be explained in the same way, namely either on the basis of quantifier raising as in May (1977, 1985) or on the basis of the syntactic relation between the trace and the quantifier in situ as in

Williams (1986, 1988). I will assume an account of quantifier scope based on scope indexing, not QR. A general treatment of the quantifier ambiguities in wh constructions will be given in the next section.

So far we have considered only three quantifiers, *every*, *most* and *many*. However, not all quantifiers pattern the same way as threse three quantifiers with respect to relative scope. There are a number of quantifiers that cannot take wide scope over the wh operator, in particular negative and other decreasing quantifiers such as *no* and *few*.

Comparative clauses or phrases that contain negative quantifiers are anomalous, as in (44). This was noted by von Stechow (1984):

(44) a. # John is taller than no other student is.
b. # Mary is happier than she has never been.

Let us assume that *nother student* and *never* in (44) take narrow scope. Then the unacceptability of the negative quantifiers in (44) follows staightforwardly from the semantics of comparatives. Given the quantifier *no other student* in (44a) takes narrow scope, (33a) would mean the following: for every height d that no student has there is a height d' greater than d that John has. But this would mean that John is both infinitely taller than every other student, since the heights that no student has include every height that surpasses the heights of all the other students. (44b) is excluded in a similar way.

What would happen if *no student* in (44a) takes wide scope? Then (44a) would mean the following. For no other student x, for every height d that x has, there is a height d' greater than d that John has. This would mean that John is the smallest student. We are then led to a puzzle because this is a reasonable meaning, which (44a), however, cannot have. I will come back to this problem shortly.

Other wh constructions pattern exactly the same way as comparatives with respect to the absence of a wide scope reading of negative quantifiers. This can be seen with the embedded interrogative in (45a) and the free relative in (45b).

(45) a. John knew what no student said.
b. John read what no student wrote.

(45a) allows only for a single reading in which *no student* takes narrow scope. In this reading, John knows about an x such that no student said x. Such a reading, though, does not make sense for (45b).

No is not the only quantifier that disallows a wide scope reading. The decreasing quantifier *few* patterns the same way. This is seen for comparatives, embedded interrogatives and free relatives in (46).

(46) a. # John is taller than few students are.
b. John knows what few students said.
c. John repeated what few students said.

The examples in (46) all exclude a reading in which *few students takes* scope over whatever the function of the wh clause is. Wide scope of *few students* in (46a) would in principle lead to a reasonable interpretation: the set of students John is taller than has few members. But (46a) is impossible in this reading; similarly, (46b) is impossible in the reading 'for few students x, John knows what x said'; finally, (46c) is impossible in the reading 'for few students x, John repeated what x said'.

(46a) is anomalous, whereas (46b) and (46c) allow for a reading in which *few students* takes narrow scope. The reason for the anomaly of (46a) is that with narrow scope of *few students* (the only possibility), (46a) would mean the following. For every height d such that few students have d, there is a height d' greater than d such that John has d'. This is not an impossible interpretation if few students holds of every nonempty 'small' set of student with a particular height. However, the same anomaly as for the case of *no* results if 'few students' also includes empty sets. This is not implausible: *few students came* is not incompatibel with no student having come.

The pattern of the scopal behavior of quantifiers in wh constructions raise the following two general questions.

[1] What treatment of quantifier scope can adequately sccount for the data. Should quantifier scope be accounted for on the basis of Quantifier Raising or in some other way, for instance scope indexing (cf. Williams 1986).

[2] Is the different behavior of different classes of quantifiers due to the semantic

properties of those quantifiers or is it dues to lexical or syntactic properties?

I will not be able to answer these questions satisfactorily or to give an explicit account of scope interactions in wh constructions. My main goal in this section was simply to show that comparatives do not at all behave special with respect to scope interactions, but pattern the same way as other wh constructions. But I will provide a few considerations that bear on the answers to the above-mentioned questions.

Regarding the first question, the data speak against a treatment based on QR, since QR is a movement rule that should apply to elements regardless of their semantic properties. Furtehrmore, the condition on the scope of *no* and *few* do not seem to be constrained by conditions on movement such as QR.

There is anothet observation that might bear on an answer to the first question. The obligatory narrow scope of *no* and *few* in subject position with respect to a wh operator may be related to another scopal peculiarity of those quantifiers. Namely, it may be related to the inability of *no* and *few* in object position to take scope over the subject. This is seen in (47a) where a reading is impossible in which *two men* takes narrow scope with respect to *no woman*:, and in (47b) where *every man* cannot take narrow scope with respect to *no woman*. That is, the scope of *no woman* in (47) can be only the VP, not the IP. The same holds for *few women* as in (48).

(47) a. Two men saw no woman.
  b. Every man saw no woman.
(48) a. Two men saw few women.
  b. Every man saw few women.

Concerning the first question, one might suggest general rules for which domains may constitute the scope of particular quantifiers. For instance one might say that the scope of *no* and *few* is always the domain dominated by the lowest maximal projection dominating *no* and *few*. Thus in object position it is the VP, whereas in subject position it is the IP. Furthermore, let us say that a wh operator in SPEC(CP) always takes the CP as its scope. Then, when *no* or *few* is in subject position in a CP with a wh operator in SPEC(CP), then the the wh operator must take wider scope than *no* or *few*. For the scope of the quantifiers *every, most* and *many* might say the following. The scope of *every, most* and *many* is either the lowest maximal maximal projection dominating the QP or the second lowest maximal projection. This would be an account of quantifier scope as absolute scope. These two identification condition for the scope of the two types of quantifiers are given in (49).

(49) <u>Identification condition for the scope relation for *every, most,* and*many*</u>

Let T be a phrase marker.

<x1, x2, x3>$\in$ TYPE1-QUANT(T) iff x1$\in${*every, most, many*}, x2 is the restriction of x1 and cat(x3) is the lowest or second lowest maximal projection in T dominating cat(x1^x2).

(50) <u>Identification condition for the scope relation for *no* and *few*</u>

Let T be a phrase marker.

<x1, x2, x3>$\in$ TYPE1-QUANT(T) iff x1$\in${*no, few*}, x2 is the restriction of x1 and cat(x3) is the lowest maximal projection in T dominating cat(x1^x2).

This account is not complete yet. It only exclude a wide scope reading of *no* and *few* oder the wh operator. It does not say yet how the wide scope reading of type 1 quantifiers can really come about. If a quantifier in subject position takes wide scope, the CP receives two scope indices, one from the wh operator and one from the quantifier. Thus, the scope representation of (38a) would be as in (51).

(51) John is taller than [$CP_{i,j}$ [than O_i $every_j$ student is t-much tall]].

The problem with the representation in (51) is that it still doe not allow for a wide scope of every student. But the idea now that that every student can be assigned wide scope indirectly, in the following way. The CP itself counts as a quantifiers and hence is assigned scope. This means that its scope index may be assigned to the IP containing it. But in (51) the scope index of the CP is what I will call **complex scope index** i, j . This complex scope index is assigned as a unit to the higher IP node. Thus we get the representation in (52).

(52) [$IP_{i,j}$ John is taller than [$CP_{i,j}$ [than O_i every student is t-much tall]

Clearly, the representation in (52) does not disambiguate scope. But now the idea is that a category with two scope indices can always receive two translations, one in which operator associated with one scope index receives wide scope and one in which the operator associated with the other scope index receives wide scope. This two interpretations come about by two different orderings of the interpretations of the two syntactic relations in (53):

(53) a. <O every student is, John is taller than every student is> quant(T).
b. <every, student, John is taller than every student is t-much tall> univ-quant(T).

For the wide scope reading of *every student*, (53a) is first evaluated before (53b) is evaluated.

Assignment of complex scope indices also account for the following example from Williams (1986).

(54) Who do you think everyone saw at the rally?

In (54) *every* can take scope over the wh phrase and hence can take a scope larger than the minimal clause that contains it. But the reason for this, in the present approach, is that the wh clause is itself assigned scope. Its scope index may a complex scope index consisting of the scope index of the wh operator and the quantifier. Thus the representation of (54) with scope indexing would be as in (55):

(55) Who [$_{IP\ i,j}$ do you think [$_{CP\ i,j}$ O_j everyone$_i$ saw at the rally]]

This account of the scope is further also applies to scope in inverse linking cases. The two types of quantifiers behave differently with respect to inverse linking. Consider (56):

(56) a. Two representatives from every country / most countries / many countries came.
b. Two representatives from no country / few countries came.

We can apply exactly the same rules that were given to account for wh clauses to these cases together with the assumption that complex scope symbols can be assigned. The scope representation for the first sentence of (56a) with narrow scope is given in (57). The scope representation which allows the wide scope reading is given in (56b).

(57) a. [$_{IPj}$[$_{NPj}$ Two$_j$ representatives [$_{PP\ i}$ from every$_i$ country]] came].

b. [IPi, j[NPi, j Twoj representatives [from everyi city]] came].

In contrast, given the condition (50), the first sentence of (56b) can only have the representation in (58), which allows for only the narrow scope interpretation.

(58) [IPj [NP j Twoj representatives [PP i from noi country]]came].

I will not further elaborate this account of scope representation, but rather briefly address the second question raised above. A lot of empirical material that bears on the second question has been provided by Liu (1990). Liu's main interest are quantifier scope asymmetries between quantifiers in object position and quantifiers in subject position. Liu notes that different quantifiers behave differently in this respect, but suggests that these different classes of quantifiers do not share a common semantic property. For instance, she observes that quantifiers that behave the same way as decreasing quantifiers such as *no* and *few*, i.e. type 2 quantifiers, include *at least two, more than two, exactly one, between five and ten, one third* and others. She concludes that this class of quantifiers do not seem to form a semantically definable classes.

To summarize, it appears that quantifier/wh scope interactions in comparatives pattern the same way as in other wh constructions. However, there a number of open issues about how an adequate treatment of the quantifier/wh scope interactions shoudl look like. First, it is unclear how a theory of relative scope should look like; second, it is unclear why quantifiers that behave the same way with respect to their scope possibilities pattern as they do, since they do not generally seem to form a semantically definable class.

4.1.1.2.3. Appendix: The degrees involved in comparatives

In the analysis of comparatives, I have assumed a degree-based semantics of adjectives and comparatives in which adjectives are basically conceived of as relations between individuals and degrees. I have made the particular assumption that an adjective like *tall* holds between an entity x and a degree d just in case d is the actual height of x (and, without a comparative, exceeds a certain expectation value). That is, for a degree d' smaller than d, *tall* does not hold between x and d'.

However, an alternative assumption might be that an individual that stands in the relation 'tall' to a degree d should also stand in that relation to all degrees smaller than d. That is, one might pose the meaning postulate on an adjective like *tall* given in (59).

(59) For any x, d and d', tall(x, d) & d'<d --> tall(x, d').

There is some evidence in favor of this alternative. Let me briefly discuss this evidence and show that it is not valid despite first appearances.

The relevant constructions are ones in which the comparative clause contains a factive verb as in (60), a phenomenon first noted by Carden (1977) and taken as evidence for the inclusion of smaller degrees in the semantics of comparatives by Manaster-Ramer (1978):

(60) John is taller than Mary realized.

In (60), the verb *realize* in the embedded clause is factive and takes as its argument a proposition with the content that John is tall to a degree smaller than its actual height. But this is possible only if (59) holds.

The assumption that all smaller degree have to be included has several consequence for the formal semantic analysis of comparatives. First of all, Russell's analysis could not be maintained, since the uniqueness of a degree would not be guaranteed. Therefore, one would either have to adopt the maximal degree approach or a quantificational approach. Second, including all smaller degrees in the extension of an adjective leads to certain problems in the treatment of quantifier interactions in the quantificational approach to

However, given the range of degrees comparatives are supposed to quantify over, this would lead to readings that are never available. For instance, (62) on this reading should be true if John is taller than the smallest one among all the students other than John, since the 'heights' the smallest student would have are exactly those common to all students. But such a reading is plainly impossible.

There do no seem to be any plausible explanations for the absence of this reading within the view that comparatives involve smaller degrees. Either comparatives, for some reason, never allow the narrow scope reading, or the narrow scope reading is somehow impossible in the case of quantification over degrees - as opposed to quantification over objects. There does not seem to be independent evidence for either one of these alternatives. It seems that the narrow scope reading that we are discussing is also excluded in comparatives that involve quantification over quantities or qualities, rather than heights. Thus also the following examples exclude the relevant reading:

(63) a. John owns more books than every professor owns.
b. John writes better than every professor writes.

(63a) excludes a reading in which John owns more books that the average professor and and (63b) a reading in which John writes better than the average professor.

There does not seem to be any plausible solution to the scope problem.We are therefore lead to a paradox: either there is something wrong with the evidence for the inclusion of smaller degrees or comparatives require an analysis that I have not been able to imagine.

However, a closer inspection of the data dissolves the evidence for the inclusion of smaller degrees given above. It appears that the construction with factive verbs in comparative clauses is rather marginal, dependent both on the comparative construction and on the choice of particular factive verbs. Smaller degrees than the maximal degree are never possible in independent sentences or in other embedded contexts:

(64) a. # John is two feet tall, but yesterday I realized that he is one foot tall.
b. # Mary realized how tall John is, namely one foot, though he is in fact two feet tall.
c. # One foot is how tall John is; in fact he is even two feet tall.

Moreover, as was pointed to me by David Pesetsky, the construction in question seems to necessarily involve imprecise knowledge. (60) cannot describe a situation in which Mary 'realized' that John is five feet tall and it turns out that he six feet tall. It must describe a situation such as the following. Mary realized that John is taller than most boys and now it turns out that he is taller than most men.

The construction with comparatives in (60) is possible only with certain factive verbs, in particular predicates of becoming aware such as *realize, become aware.* It is impossible with other factive verbs such as *know, find out* or *regret*:

(65) # John is taller than Mary knew/found out/regretted.

The possibility of factive verbs in (60) thus depends on particular lexical properties and on the kind of knowledge that is involved.

Notice also that languages differ with respect to which verbs may enter the construction. The equivalent of *realize* in (at least my dialect of) German, for instance, does not enter the construction:

(66) #? Hans ist groesser als Maria festgestellt hat.
John is taller than Mary has realized.

To summarize, the construction in question is rather marginal and subject to particular lexical and semantic conditions. Thus, we can conclude that comparatives should involve only the maximal degree. No significant problem then arises with the narrow scope reading of quantifiers in comparatives. The only assumption one has to make for a sentence such as (62) is that in the narrow scope reading it is presupposed that all students have the same height. In fact, there is evidence that there is a reading of (62) with this presupposition. Such a reading becomes the only available reading when the main clause contains a negation as in (67), as was noted by I. Heim (p.c.):

(67) a. John is not taller than everybody else is.
b. John can't do more than everybody else can do.

In fact, the negation in the main clause seems to force the narrow scope reading. Again, free relatives seem to pattern the same way, though this does not hold for interrogatives:

(68) a. John didn't read what every girl read.
b. John does not know what everybody read.

The influence of negation on the wide scope reading remains to be investigated.

4.1.2.2. The syntactic basis of the interpretation of comparative clauses

In this section, I will discuss general problems with the internal syntactic structure of comparative clauses and motivate the particular proposal that I have presented at the beginning of this chapter. The relation between the syntax and the semantics of comparatives raises two major issues.

[1] What is the relation between the relation between the comparative operator, namely *-er, as, same* or *different* and the comparative clause introduced by *than* or *as*. In particular, the question arises what determines the interpretation of the comparative construction, the comparative operator or the comparative clause introducer or the entire construction?

[2] How is the empty element in comparative deletion constructions 'identified', in the sense of for instance e in *John is taller than Mary is e* being interpreted as 'x-much tall'?

I will discuss these two issues in the next two subsections.

4.1.2.2.1. The syntactic basis for the semantic function of comparative clauses

The purpose of this section is to defend a particular view on the syntactic basis of the universal quantification over degrees, namely the view that the comparative operator and the comparative operator are jointly respnsible for the universal degree quantification.

This view partially answers the question that about how the semantic interpretation comes about on the basis of the syntactic structure of the comparative clause. I will refrain from an explicit compositional semantic analysis, but restrict myself to identifying one of the conditions for such an analysis, namely identifying on what it depends that comparative clauses act universal quantifiers over degrees or descriptions of degrees.

It is not obvious what exactly in the syntactic structure should be responsible for the semantic interpretation of comparative clauses as a universal degree quantifiers or degree descriptions. Let me therefore first discuss a standard assumption about the syntactic structure of comparative clauses and present a recent proposal about the syntactic basis of comparative clauses as universal degree quantifiers. After rejecting this proposal, I will propose my own view on the relation between the syntactic structure and the semantic interpretation of comparatives.

According to Chomsky (1977), comparative clauses involve movement of an empty operator as in (51b) for (51a):

(69) a. John read more books than Mary read.

b. John read more books than [O Mary read t].

Assuming the semantic analysis given in the preceding section is correct, the question is, how does the semantic interpretation come about on the basis of the syntactic structure in (69b)? In particular, what is responsible for the universal quantification and what is responsible for the relation between the degrees?

Pinkal (1989) and Pinkal/Lerner (1992) have recently proposed that it is the fact that comparative clauses are wh constructions (69a) that enforces the universal quantification over degrees. As an independent reason for this correlation between wh constructions and universal quantification, Pinkal observes that the structure in (69a) is the same as the one of free relatives. Crucially, Pinkal assumes that free relatives are generally interpreted by universal quantification. For instance, the free relative in (70) seems to have the function as a universal quantifier:

(70) John told Mary what he did yesterday.

Thus the claim is that the universal quantification over degrees in comparatives comes about by the general function of wh constructions, in particular free relatives. In this view, comparatives are free relative clauses referring to degrees.

This proposal is problematic in several respects. Most importantly, it seems that relative clauses do not generally act as universal quantifiers in the way comparative clauses should act. Moreover, it appears that simple free relatives do not have an inherent quantificational force at all. There are three sorts of evidence for this. First, free relatives do not interact in scope with other quantifiers. This is seen in the contrast between (53a) and (53b), where *some student* acts as an existential quantifier in the scope of a universal quantifier only in (71b), not in (71a). The same is shown in (72), where inverse linking with a universal quantifier taking scope over *a book* is possible in (71b), but not in (72a).

(71) a. What was shown in the exhibition impressed some student.
b. Everything that was shown in the exhibition impressed some student.
(72) a. John wrote a book about what happened last year.
b. John wrote a book about everything that happened last year..

Second, an indefinite NP in a free relative generally does not have the logical status of an existential quantifier in the scope of a universal quantifier. (73a) seems to involve only a single student, in contrast to (73b), which involves as many students as there are things written by students.

(73) a. John read what a students wrote.
b. John read everything a student wrote (but nothing written by a professor).

Third, unlike the restriction of universal quantifiers, free relatives generally do not license NPIs:

(74) a. ?? John likes what Mary has ever written.
b. John likes everything Mary has ever written.

These three diagnostics show conclusively that free relative clauses do not have an inherent force as universal quantifiers. Rather, it appears that in those cases in which they seem to have an inherent force as universal quantifiers it is for either of two other reasons. First, they refer to a maximal group or the sum of elements satisfying the descriptive content of the clause (cf. Jacobson 1988). Second, the clause in which they occur is generic and therefore induces what seems to be a universal reading of the free relative - in the same way as with indefinite NPs. The first case occurs in one reading of

(71); the second one in (75). (76) illustrates the parallel behavior of indefinite NPs in generic sentences.

(75) a. John reads what a student writes / what interests him.
b. John generally reads what a student writes / what interests him.

(76) a. John reads a book.
b. John generally reads a book.

In (75a) and (75b) the free relative is in the restiction of a generic operator and therefore seems to have universal force. This is the same phenomenon as in (76), where in one reading of (76a) and (76b) *a book* is in the restriction of a generic operator and therefore seems to have universal force.

The fact that free relatives have inherent universal force and seem to have different semantic functions in generic and nongeneric sentences suggests that they count semantically as indefinite NPs. On the other hand, the fact that they may refer to the maximal set of entities satisfying their descriptive content suggests that they have the status of definite plural or mass NPs such as *the books on the shelf* or *the water in the tub*. Note that also definite NPs may have a generic reading in appropriate contexts, for instance as in (77):

(77) a. John reads the thesis of a student / the book that interests him.
b. John generally reads the thesis of a student / the book that interests him.

It is therefore most plausible that the semantic function of a free relative is that of a description, referring to the maximal entity satisfying the desciption.

The only free relative clauses that inherently act as universal quantifiers as those with *ever*. *Whatever* clauses differ from other free relatives in all three respects. First, they can act as universal quantifiers taking scope over an indefinite NP as in (78a). Furthermore, indefinite NPs contained in a *whatever* clause may act as an existential quantifier in the scope of a universal quantifier, as in (78b). Finally, *whatever* clauses accept NPIs as in (78c).

(78) a. Whoever entered the room started talking to a student.
b. John read whatever a student had written.

c. John read whatever anybody had written.

In *whatever* clauses clearly the suffix *-ever* bears the universal quantificational force (though *-ever* may alternatively indicate ignorance of the referent on the part of the speaker, see Jacobson 1988).

There are other differences between comparative clauses and free relative clauses beside their semantic function. The most obvious difference is that unlike in free relatives, overt wh degree phrases as in (59a) are excluded in comparatives. The only wh phrase that (in certain dialects of English) may appear in comparative clauses is *what* as in (59b) (cf. Chomsky 1977).

(79) a. *? John read more books than how many books Mary read.

b. John read more than what Mary read.

But in (79b) *what* clearly is an antecedent-contained proform, which has to be replaced by wh x-*many books* at LF (see the next section); thus, since the wh phrase in free relatives generally is not an antecedent-contained proform, (79b) does not have the usual structure of free relatives.

Another objection one might raise against the identification of comparatives with free relatives describing degrees concerns the syntactic status of free relatives. In the syntactic literature, it is generally assumed that the wh phrase in free relatives either forms the head of the structure (cf. Bresnan/Grimshaw 1979) or matches categorially with the head (cf. Groos/Riemsdijk 1981). These two views are represented in the structures (80b) and (80c) respectively, which analyse (80a):

(80) a. John read what Mary wrote

b. John read [$_{NP}$[$_{NP}$what][$_{S}$Mary wrote]]

c. John read [$_{NP}$e[what Mary wrote]]

Given any of the two proposals on free relatives, the comparative clause (72a) would have to have the categorial status of a degree phrase. Prima facie evidence that there are such comparative constructions would be examples like (81):

(81) John is taller than 2 meters.

But it is rather implausible that all clausal comparatives should have the categorial status of degree phrases. For one thing this would make impossible an analysis of certain comparatives as coordinate structure (see chapter 3 and section in this chapter), since degree phrases cannot be coordinated with an entire sentences. Furthermore, it would incorrectly predict that comparative clauses can be selected by the same categories as degree phrases, which is not the case. Comparative clauses are can only be selectd by the comparative clause introducers *than* or *as* and no other syntactic element, unlike degree phrases and free relatives ranging over degrees.

(82) a. John's height is exactly two meters / how tall Mary is.

b. * John's height is exactly Mary is.

(83) a. John weighs 200 pounds / how much Mary weighs.

b. * John weighs Mary weighs.

Bresnan and Grimshaw's analysis and Groos and van Riemsdijk's analysis, though, are not the only possible analyses of free relatives. One might alternatively propose that free relatives are always CPs and that Case matching and categorial selection is made possible by the ability of the verb to have access to the SPEC(CP). Then free relative would have exactly the same internal structure as embedded interrogatives and comparatives according to usual assumptions (see also Jacobson 1988). Note, however, that this view runs into trouble with categorial selection. For instance, CPs cannot be the complement of most prepositions. But free relatives generally can:

(84) a. John talked about *(the fact) that it is raining.

b. John talked about what interests him.

Furthermore, NPs can freely be coordinated with free relatives, but not CPs:

(85) a. John read the letter and what Mary wrote.

b. ?? John read the letter and that it would be raining.

Thus, it is rather doubtful that free relatives generally have the status of CPs.

To summarize so far, we can conclude that comparative clauses do not act as universal quantifiers because they are free relatives or, more generally, because they are a wh construction. That is, Lerner and Pinkal's claim seems untenable. There is yet another argument against Lerner and Pinkal's claim. This is that not all comparative clauses act as universal quantifiers, as Lerner and Pinkal would predict. We have seen that the *as* clause of *same* comparatives does not have the function of a universal quantifier, but rather the one of a description.

We therefore have to give a different answer to the question of what the relation is between comparative clauses being a wh construction to the fact that comparative clauses act as universal quantifiers. Quite generally it is plausible to assume that wh constructions have a common structural meaning. I will adopt the proposal by Cooper (1983) and, following him, Jacobson (1988), who suggest that the common meaning of wh constructions is that of a lambda term. Thus (86a) first represents the predicate in (86b).

(86)a. How tall a man is John?
b. λd[John is d-tall]

Semantically, distinct wh constructions then differ in what kind of semantic operation applies to such a term. In the case of constituent questions, the result is, depending on one's theory of the semantics of questions, for instance a set of propositions (answers); in the case of free relatives, it most plausibly is a description; in the case of comparatives, it is universal quantification. With restrictive relatives, the lambda term itself clearly is the interpretation of the relative clause; no further semantic operation on the lambda term is required in this case. Other wh constructions such as topicalization and 'tough'-movement may yet involve other semantic operations on the lamda term.

Thus the empty or overt operator in wh constructions uniformly is evaluated as a lambda operator at the initial stage in the interpretation of the wh clause. We therefore can assume the following schema for the interpretation of wh constructions:

(87) $[0_i\ [X\ t_i\ Y]] = \lambda x[X\ x\ Y]$

Given the common meaning of wh constructions, the semantic operation on the lambda term must always be conditioned by something else in the clause. In the case of constituent questions, it may be the q-morpheme (cf. Baker 1970, Nishigauchi 1990); in the case of free relatives, it may be the fact that the wh clause is in a referential position;

in the case of comparatives, it is the fact that the comparative clause is the complement of a specific comparative clause introducer (*than* or *as*), which again is selected by a specific comparative operator. The question then is, does the universal quantification over degrees come about on the basis of the comparative clause introducer or is it also dependent on the comparative operator?

For the identification of the syntactic basis for evaluating the comparative clause, it is useful to have a more general look at different comparative constructions and their syntactic and semantic differences and similarities. Two elements are crucial in comparative constructions: on the one hand the comparative operator-*er., as, same* or *different* and on the other hand the comparative clause introducer*than* or *as*. The comparative constructions considered above do not seem to be the only constructions where this relation matters. Other constructions are manner clauses as in (88a) and resultatives as in (88b) and (88c):

(88) a. John built the wall so that one could not see the mountains anymore.
b. So many people came that there were no seats left.
c. Too few people came to fill the room.

The relation of *so* and *too* to the *that* clause in resultatives has been discussed in the literature by Gueron/May (1984) and Baltin (1987).

In order to see what the general semantic status of the comparative operator and expressions with the same function such as *so* and *too* in (88) is, the following observation is crucial. Comparative constructions never require a comparative clause. The degree or object provided by the comparative clause can generally also be given contextually, as seen in (89a) - (89c). This also holds for resultative clauses, as seen in (89d):

(89) a. John is taller.
b. Bill is very tall, but John is as tall.
c. Bill bought the same / a different car.
d. John is so / too tall.

From this we can conclude that the comparative operator alone simply expresses a relation between degrees, between degrees and objects, or, in the case of *so* and *too*, presumably a relation between degrees, objects and properties and propositions. For the various kinds of comparative and resultative constructions we roughly have the following relations, where x, x' are variables ranging over objects, M a variables ranging over manners, Q a variable ranging over properties and P a variable ranging over propositions.

(90) a. -er(d,d') iff d is greater than d'.
b. as(d,d') iff d = d'
c. same(x, x') iff x=x'
d. different(x, x') iff -x=x'
e. so1(M, P) iff P is a consequence of M
f. so2(d, x, Q, P) iff P is a consequence of x being Q to the degree d
g. too(d, x, Q, P) iff P is impossible because of d

Given the analysis of comparatives above we have the following list of comparative operators, comparative clause introducers and functions of the comparative clause, which is naturally expanded to resultatives.

(91)

comparative operator	comparative clause introducer	semantic function of comparative clause
-er	*than*	universal quantifier
as	*as*	universal quantifier
same	*as*	description
different	*than*	universal quantification
*so*1	-	description of proposition
*so*2	-	description of proposition
too	-	description of counterfactual proposition

Comparing the comparative clause introducer with the semantic function of the comparative clause, it is clear that the comparative clause introducer cannot be responsible for the semantic interpretation. For instance, *as* may introduce both a comparative clause that acts as a universal quantifier and a comparative clause that acts as a description. The only overt expression in comparative clauses that can be responsible for the interpretation of the comparative clause can be the comparative operator. However, we have seen that the comparative operator alone simply expresses a relation between degrees or objects. Therefore, the comparative operator and the comparative clause introducer together have to be responsible for the semantic interpretation of the comparative clause. This generalization is expressed in (92).

(92) The semantic function of a comparative clause depends both on the comparative clause introducer and the comparative operator associated with the clause.

We thus have the following syntactic relations on which the interpretation of a comparative construction with *-er* is based. First, the comparative clause and the degree variable in the main clause are arguments of *-er*. Second, *-er* and *than* are responsible for the fact that the comparative clause involves universal quantification.

4.1.3. A formal treatment of quantifier scope and interpretation and a compositional analysis of comparatives

In this section, I will show how the semantic analysis of comparative can be built in a compoaistional way within the framework of provided in chapter 1. First I will generalize the rules for scope assignment and provide a formal account of the interpretation of wh constructions. I will take the example in (93) with an appropriate phrase marker T.

(93) John is taller than Bill is t-much tall.

I will posit the following translation rules of wh traces:

(94) If t is a wh trace, then [t]T = x, where x is a variable of the appropriate type for t.

The relation involved with the wh trace is given in (95):

(95) a. <t, O Bill is t-much tall>∈ wh

b. <u>The identification condition for wh:</u>

<x1, x2> wh iff if x1 is the head of x2 a wh trace, cat(x2, P, M) is the lowest
CP

dominating cat(x1, P, M).

The correlated semantic operation is given in (96a).

(96) a. The semantic operation WH

$<[O], [x1], [x2]> = \lambda y[[x2]\,[x1]/y]$

b. $<wh, WH> \in corr.$

I will assume the following syntactic relation and semantic operation for clausal comparatives.

(97) a. The syntactic relation CLAUS-COMP

<<-er, than>, John is d-much tall, O Bill is t-much-tall>∈CLAUS-COMP(T).

b. Identification conditions for CLAUS-COMP:

<<x1, x2>, x3, x4> claus-comp(T) iff x1 is a comparative operator, x2 a comparative clause introducer selected by x1, cat(x3, T) is an IP dominating x1 and x2, x1 is the head of a major constituent of x3, x4 is the complement of x2, cat(x2^x4, T) is adjoined to cat(x3, T).

(98) The semantic operation claus-comp:

a. $O([x1], [x2], [x3], [x4]) = \forall d([x4]d \dashrightarrow \exists d'[x3](d') \;\&\; [x2](d', d)).$

b. <CLAUS-COMP, claus-comp>∈corr.

We can now apply this to the exmple in question:

(99) <than, er, John is taller, O he was d-tall>∈CLAUS-COMP(T).

[John is taller than O he was t-tall] = claus-comp(<[than], [er], [John is taller], [O he was t-tall]>)

We can now turn to quantifier - wh operator scope interaction in comparatives and other wh constructions, for instance (100).

(100) John is taller than O every student is t-much tall

The syntactic relations for the wide scope reading of *every student*: is given in (101a) and for the clausal comparative in (101b).

(101) a. <every, student, O every student is t-much tall>$\in$ UNIV-QUANT(T)

b. <<-er, than>, John is taller, O every student is t-much tall>$\in$CLAUS-COMP(T)

As a n instance of inriect scope assignment we get (102).

(102) <every, student, John is taller than O every student is t-much tall> $\in$ UNIV-QUANT(T).

Let us finally consider the rules for compositional interpretation to (103).

(103) John is taller than O no student is.

We get the following syntactic relations.

(104) a. <no, student, [no student is t-much tall]> NEG-QUANT(T)

b. <<-er, than>, John is taller, O no student is t-much tall> CLAUS-COMP(T)

As an appendix to the analysis, let me briefly indicate how how the analysis can be extended so as to account for the modification of the comparative operator by *much, three inches* or *three.*, as in (105).

(105) a. John is much taller than Bill is.

b. Bill is three inches taller than Bill is.

c. John read three more books than Bill read.

I will assume that *much* and *three inches* in (105a) modify the relation expressed by *-er*. I will assume that *much* expresses a four-place relation that holds of a quadruple <P, d, d', @> if the distance beween d and d' with respect to the property P is greater than a certain expectation value @. If *much* modifies *taller*, then P stands for the property of 'tall'. This is the result of a semantic operation that corresponds to the syntactic relation of autonymous theta-marking in Higginbotham (1985). Furthermore, the argument places for the degrees are identified, by a semantic operation that corresponds to the syntactic relation of theta-identification in Higginbotham (1985). Thus *much -er* expresses the relation in (7) with respect to *tall*:

(106) [*much taller*] = dd'[[*much -er*]([tall], d, d', @)]

Similarly, *three inches* in (105b) will denote a relation between degrees properties, d and d' such that the distance between d and d' with respect to P is three inches. Thus we have (107):

(107) a. three inches(P, d, d') iff the distance between d an d' with respect to P is at least three inches

b. [*three inches taller*] = d'd"[three inches -er](tall, d, d')

In similar ways, specifiers of other comparative operators can be treated. For instance, *twice as tall*, as in (108a), will be assigned a meaning of the form in (108b):

(108) a. John is twice as tall as Bill.

b. [*twice as tall*] = dd'[*twice as*] ([*tall*], d, d')

4.1.4. The 'identification' of the empty element in comparative deletion constructions

Let me now come to the second issue that I wanted to discuss concerning the syntactic basis for the interpretation of comparatives, namely the problem of the 'identification' of the empty element in comparative deletion constructions. The proposal that I want to defend is to reduce comparative deletion to antecedent-contained deletion and to argue for a particular view on antecedent-contained deletion in general.

Let me illustrate the problem of comparative deletion with (109).

(109) John read more books than Mary read.

Chomsky (1977) showed that comparatives exhibit island constraints and hence should involve wh movement of a (usually) empty operator. Thus the S-structure of (109) would be as in (110).

(110) John read more books than [$_{CP}$O$_i$ [$_{IP}$Mary read e$_i$]].

However, the syntactic structure of (109) as in (110) is as such insufficient for the semantic interpretation for two reasons. First, the operator O should range over degrees, not objects. But the variable e in (110) is a variable ranging over objects. Second, even if the operator O in (110) would in some more complicated way range over degrees, not objects (unlike the variable it binds), (110) would fail to imply the following. (109) compares the number of books John read to only the number of books, not journals or newspapers, Mary read. That is, the degree operator in (110) is evaluated only with respect to the number of books, not anything else, Mary read. This information is not represented in (67b).

An adequate syntactic basis for the semantic interpretation of (109) could be only a representation such as (111), where e is a variable ranging over degrees or numbers.

(111) John read more books than O_i Mary read e_i-many books.

That is, the quantifier *many* and the noun *books* must somehow be represented in the syntactic structure, at least at LF, for (106). Thus the problem that the comparative deletion construction in (109) poses is how to identify the empty element as being equivalent to the NP *e-many books*.

There are a number of ways in which the empty element in comparative deletion constructions could in principle be identified in this way. Basically, there are the following three possible approaches.

[1] The empty element is base-generated as structured empty element (layered trace) whose constituents enter binding relations to the empty operator or to corresponding parts in the main clause. I will call this the **layered-trace approach.**

[2] The NP *e-many books* is base-generated in the comparative clause and later deleted at PF. I will call this the **PF deletion approach.**

[3] The NP *e-many books* in the comparative clause is the result of copying. This copying operation can be conceived in two ways, depending on whether quantifier raising is assumed or not. It either copies the NP *e-many books* as the result of quantifier raising of the comparative operator (as in the treatment of Antecedent-Contained Deletion in May 1985 and Fiengo/May 1991) or it copies the NP *more books* with

vehicle change of the comparative operator as a variable (as suggested by Vanden Wyngaert/Zwarts 1991). I will call this approah in its two versions the **antecedent-contained deletion approach**.

There is one issue about the construction in (109) which will play a major role in deciding between the three approaches. This is the problem that the binding relation between the operator in the SPEC(CP) position of the comparative clause and the degree variable in the NP violates the Left Branch Constraint (cf. Ross 1967), that is, subjacency or the ECP (see Grimshaw 1987 and Corver 1989 for discussion). Again there are several possible solutions to this problem. One solution is based on the assumption of pied-piping at LF, another one on the assumption that subjacency only holds at S-structure, not hold at LF.

I will defend an account of comparative deletion within the third approach to the identification of the empty element in comparatives. This account assumes quantifier scope to marked by scope indexing in the sense of Williams (1986) and makes the following two special assumptions.

[1] The copying operation does not just copy, but also modifies the comparative operator as a variable (and thus in a way involves vehicle change).

[2] Following an idea suggested for antecedent-contained VP-deletion by Haik (1987), I will assume that the empty operator in comparative clauses binds distinct categories at S-structure and at LF: at S-structure, the operator binds an NP variable and at LF a degree variable.

Adopting the assumption that subjacency is suspended at LF, both problem mentioned in the preceding section are solved and the fact that comparative clauses exhibit island constraints is accounted for.

I will first discuss the three approaches to comparative deletion in some greater detail and then argue for the account that I will propose and present a number of phenomena that give additional support.

The first approach to the problem of comparative deletion was proposed by Pinkham (1982). Pinkham suggested that the empty element in (109) is base-generated as a fully structured NP consisting of a degree variable, an empty quantifier and an empty pronominal noun, as in (112):

(112) John read more$_k$ books$_k$ than O$_i$ Mary read [t$_i$ [$_Q$pro$_k$] [$_{N'}$pro$_k$]]

The degree variable is bound by the empty operator O. Furthermore, both the empty quantifier and the empty noun (and in other cases also an empty adjective) in the comparative clause in (112) enter a binding relation to correlates in the main clause, indicated by the subscript k.

There are a number of problems with Pinkham's proposal. Most important are the following two.

[1] The binding relation involving the empty quantifier and the noun appears to be of a very unusual kind. It clearly does not coincide with any of the binding relations of Binding Theory, and it does not seem to occur in other contexts than comparatives. If structured empty NPs could generally be base-generated and if this binding relation was generally available, then examples such as (113) should be acceptable:

(113) * John told the$_k$ man$_k$ that Mary liked [[pro$_k$] pro$_k$].

[2] The structure given in (112) is precisely the structure of a comparative subdeletion, involving extraction of a left branch or binding of a variable in a left branch. This is a standard case of a violation of the Left Branch Constraint, a constraint first introduced by Ross (1967). The Left Branch Constraint is given in (114).

(114) No NP which is the leftmost constituent of a larger NP can be moved out of this NP.

The Left Branch Constraint generally is considered a subcase of subjacency. In order to apply the Left Branch Constraint to the case in (114), one would have to consider subjacency not only a condition on movement, but also a condition on chains. Subjacency in (112) then is violated because the operator and the variable in (112) are separated by two bounding nodes, the CP node and the NP node. (See Corver 1990 for a detailed discussion of the Left Branch Constraint, also within the Barriers framework of Chomsky 1989).

There are two ways one might solve the problem of the violation of the Left Branch Constraint within Pinkam's approach.

[1] The first solution would be to assume that the binding relation between the degree operator and the degree variable in (111) is not established at S-structure, but only at LF, and furthermore, that subjacency is suspended at LF, as is often maintained (see in particular Huang (1982), Lasnik/Saito (1992) and others). However, this would conflict with Chomsky's (1977) above-mentioned observation that the operator-variable relation in comparatives generally obeys island constraints. Island constraints certainly hold at S-structure already.

[2] The second way one might solve the problem is be to assume pied-piping of the empty NP. In this account, the S-structure of (109) would be (115), where the degree phrase has been moved together with the empty quantifier and the empty noun:

(115) John read more books than [[O[pro][pro]]$_i$ Mary read t$_i$].

Here no binding relation between the operator and a variable need to be established since the operator has itself been moved to SPEC(CP) with pied-piping.

In (115), pied-piping of a complex empty phrase has been used to get around a subjacency violation at S-structure. Pied-piping of an overt phrase containing an empty element is also a common strategy to get around subjacency violations at LF (cf. Nishigauchi 1990). For the problem under discussion, pied-piping seems to be a reasonable solution. But still the problem of the identification of the empty elements in the layered trace remains.

There are a number of further problems or at least open issues with Pinkham's proposal. For instance, setting phenomenon of comparative subdeletion aside, it is unclear why all subconstituents of the empty NP have to be empty, that is, why, for instance, (116a) is not a possible sentence:

(116) a. * John read more books than Mary read bad.

b. John read more good books than Mary read [e [pro][bad][pro]]].

To sum up so far, there seem to sufficient reasons not to adopt Pinkham's proposal for the identification of empty elements in comparative deletion constructions. Let me now turn to the second approach to the comparative deletion problem, the PF deletion apporach.

The PF deletion approach assumes that the NP is base-generated in the relevant form and deleted at PF under some relation of equivalence with the NP in the main clause. In this account the S-structure as well as the LF of (109) would be as in (117):

(117) John read more books than [O Mary read e-many books].

This account is in the spirit of recent developments within the principles-and-parameters approach (cf. Chomsky 1992).

However, the PF deletion approach faces the same problem as the layered-trace approach. In the PF deletion approach, the binding relation between the operator and the variable violates subjacency (i.e. the Left Branch Constraint) if this binding relation should hold at S-structure, not only at LF. Establishing the binding relation at S-structure certainly is necessary in order to account for the island constraints.

Again one might try to solve the problem of the subjacency violation by assuming pied-piping, but this would lead to similar difficulties.

We can conclude that both the layered-trace approach and the PF deletion approach face severe problems with subjacency violations and therefore do not seem to be tenable.

Let me now turn to the third approach to comparative deletion, the antecedent-contained deletion approach. In this approach, an NP of the appropriate form is copied from the main clause into the comparative deletion site. This approach assimilates comparative deletion to antecedent-contained VP deletion as in (118):

(118) John saw every movie that Mary did.

An account of comparative deletion as an instance of antecedent-contained deletion (ACD) was first proposed by Larson (1985). Let me briefly make a few remarks about ACD in general before showing how a general account of ACD can be applied to comparative deletion.

The problem with ACD as in (118) arises in the following way. If the antecedent is copied directly into the empty position an infinite regress arises, as in (119):

(119) John saw every movie that Mary saw every movie that Mary saw every movie...

A similar problem raises if comparative deletion was subject to such a copying rule. Thus by strict copying we would get an infinite regree as in (120) for (109).

(120) John read more books than Mary read more books than Mary read more books...

May (1985) proposes a solution to the problem of ACD with quantified NPs (as in 118). (See also Fiengo/May 1991 for a further development of this approach.) This solution is based on the assumption that the NP as a quantificational NP has to undergo QR. Only after raising the NP out of the VP is the VP copied into the VP deletion site, as in (121):

(121) a. Every movie that Mary did John saw t.
b. Every movie that Mary saw t John saw t.

The copying operation applies at a level called 'LF".

This account could straightforwardly be carried over to the deletion sites in comparative clauses. Let us assume that the *than* clause together with the morpheme *-er* (as some kind of 'discontinuous constituent') undergoes QR. For (109) this gives (122a). After copying the antecedent NP into the comparative deletion site we get (122b):

(122) a. -er [than [Mary read t]] John read x-much books
b. -er [than [Mary read x-many books]] John read x-many books.

Notice that comparative clauses also allow for AC VP deletion, as in (123).

(123) John read more books than Mary did.

If AC VP deletion were to be accounted for in a uniform way, then the possibility of VP deletion in comparative clauses shows that QR of the comparative clause together with the comparative operator (*-er*) is required anyway.

The copying approach to comparative deletion does not necessarily hinge on Quantifier Raising. It is possible to conceive of a copying rule in which the copied element is modified in some way. In particular, in the case of quantificational sentences, the quantifier would be replaced by a variable in the copying process. Similarly, in comparative sentences, the comparative operator together with the comparative *than* or *as* clause would be replaced by a degree variable. This modifying copying rules are given in (124), where 'O_k...CP_k' represents the comparative operator together with the comparative clause.

(124) Copying rules with vehicle change (approx.)

(i) <X QP Z, V t W> --> V X t Z W

(ii) <Y O_kX CP_k Z, Vt W> --> V t X W

According to (124)(ii), the result of copying the NP *more books than...* into the comparative deletion site is *e-many books.*

A copying rule which modifies an element in the process has been assumed within May's (1985) original account also by Fiengo/May (1991). However, here the modification concerns the replacement of a name or an R-expression as a pronoun. This is necessary in order to avoid a Condition C violation after copying has taken place in cases such as (80):

(125) Sue showed John everything he wanted her to.

With strict copying, (125) would result in (126), a violation of Condition C, since the first occurrence of *John* is c-commanded by the coreferential *he*.

(126) * Everything he wanted her to show John t, Sue showed John t

In order to account for (126), Fiengo and May assume the rule of vehicle change in (127), which changes the status of a nonpronominal element to a pronominal element:

(127) [-pron] --> [+pron]

One may allow vehicle change in a more general way, permitting quantifiers to change into variables. Independent evidence for this conception of the copying operation for ACD has been given by Vanden Wyngaert/Zwarts (1991).

Within this approach, there are still certain cases that have to be ruled out. For instance, one has to exclude that (128a)could have the structure in (127b):

(127) a. John read more books than Mary read and wrote more letters than Mary wrote.
b. John read more *books* than O Mary read e-many *books* and wrote more *letters* than Mary wrote e-many *books*.

A way to exclude the structure in (127b) would be by imposing a condition that an element may be copied only once. But still this would allow for the structure (128) for (127a):

(128) John read more *books* than O Mary read e-many *letters* and wrote more *letters* than O Mary wrote e-many *books*.

(127b) might have to be ruled out by imposing certain locality or parallelism conditions on copying.

The antecedent-contained deletion approach to the comparative deletion problem still has to account for why comparative constructions exhibit island constraints. Let us assume that subjacency does not hold at LF or LF'. Hence the structures resulting from copying at LF' such as (110) do not violate the Left Branch Constraint.

The problem then is how to deduce the relevant subjacency violations at S-structure. Clearly, in order to establish a binding relation between the degree operator and a variable at S-structure, the empty NP cannot be structured so that the empty operator binds a degree variable. Otherwise, it would lead to the familiar problem of a Left Branch Constraint violation in all cases.

The only possible solution to this dilemma seeems to be the following. At S-structure, the operator binds the NP trace itself, even though the NP trace would not be the appropriate bindee for the purpose of interpretation. An account of this sort has in fact been proposed for VP deletion by Haik (1987).

Let me briefly present the main motivations for Haik's proposal. Haik takes as her point of departure the observation that VP deletion is possible only in contexts in which there is an overt or nonovert operator binding an element in the VP. Typical examples are relative clauses as in (129) and comparatives (which Haik does not discuss in any detail).

(129) a. John parked his car where Mary did.
b. John read every book that Mary did.

Since the operator in a VP deletion context has to bind a variable at S-structure, the empty VP must be represented in syntax.

Haik also notes that VP deletion exhibits island constraints, as in (130).

(130) * John met everyone that Bill wondered when he could.

This is seen as additional evidence for the operator-variable relation at S-structure (subjacency being a condition on chains, not on movement).

However, Haik argues against a base-generated structured empty VP. Her main argument is that this would not exclude overt prepositions in structured empty VPs, as in (131):

(131) Mary talked about everyone that Peter did [[e] [about [e]]].

Instead she proposes that the VP be represented by a single empty element at S-structure. This empty element, though categorially inappropriate, is bound by the operator at S-structure. According to this proposal, the S-structure of (129b) is as in (132).

(132) John read every book O_i Mary did t_i.

The operator would bind the appropriate element only at LF after quantifier raising at LF and copying of the VP at LF', as in May's (1985) account. This gives (133):

(133) Every book O Mary read x, John read x.

But why should an operator be able to bind a categorially inappropriate element? Haik's answer to this question is the following modified version of the prohibition against vacuous quantification (cf. Chomsky 1985):

(134) At all levels, an operator has to bind a variable, no matter what category it is, so long

as the meaningful operator-variable relation is restored at LF'.

Haik's account of AC VP deletion can be carried over to comparatives in order to solve the problem of the subjacency violations at S-structure. (Note, though, that potential subjacency violations at S-structure were not the main motivations for Haik's proposal.) Applying Haik's account of AC VP deletion to comparatives, the comparative in (135a) has the S-structure in (135b). Here the degree operator O binds a categorially inappropriate NP-variable. This binding relation is subject to subjacency, but is as yet not interpretable semantically. At LF', the empty NP is replaced by a modified copy of its antecedent, as in (135c):

(135) a. John read more books than Mary read.

b. John read more books O than Mary read e.

c. John read more books than Mary read e-many books.

In (135c), the appropriate binding relation is established, though subjacency is violated - as it may be at the level of LF'.

Let me summarize the account of the identification problem with comparative deletion so far. In the proposed account, comparative deletion is assimilated to AC VP deletion. The two constructions are treated in an exactly parallel way in two respects. [1] Both constructions involve a categorially inappropriate binding relation at S-structure which is subject to subjacency. [2] Both constructions involve copying of an antecedent at LF' by replacing a quantifier or comparative operator (plus comparative clause) by an appropriate variable. This way a semantically adequate binding relation will be established at LF'.

Let me now apply this analysis to the comparative constructions that were left out of consideration sofar, namely *same/different* comparatives. Comparatives with *same/different* can be treated syntactically in basically the same way as other comparatives. Consider (136).

(136) a. John read the same book as Mary bought.
b. John read a different book than Mary bought.

As in the case of degree comparatives, the *as* clause in (136a) has to be interpreted with respect to the noun *books*. (136a) does not compare the book John read to anything Mary bought, but only the book Mary bought.

Thus, the LF should be as in (137):

(137) John read the same book as O_i Mary read bought t_i book.

Here t is not a degree variable, but rather a variable for the arguments of *book*. In order to derive (137), I will assume that in (136a) *the same book* is copied as *t book* into the empty object position of *bought.*

The only problem that (137) raises is, is what kind of syntactic position the variable t occupies. Unlike for the degree variable in comparatives in the narrow sense and equatives, which occupy the specifier position of a quantifier phrase, the specifier position is not standardly associated with the semantic function of the object variable. However, this is the case for the adjectival position. I will assume that the variable t in (137) occupies the same adjectival position as same and different in the antecedent NP. Note also that adjectives denote arguments of the head noun. Thus, it is both syntactically and semantically plausible that t in (137) occupies an adjectival position in the NP. I will furthermore assume that the NP lacks a determiner - in the same way as, for instance, bare plurals. Thus, we have the following structure for (137):

(138) $[[\emptyset]_D[[t]_A\ [book]_A]]_{DP}$

4.1.5. Further evidence for the proposed account of comparative deletion

I will now present two types of phenomena that give further evidence for the account of comparative deletion that I have presented. Both types of phenomena seem impossible to handle in either the layered trace approach or the PF deletion approach.

The first problem are empty clausal complements of attitude verbs as in (139):

(139) John read more books than I expected / suspected / hoped / feared / said.

I will call this construction **'clausal comparative deletion'**. Let me first present and reject two possible views on clausal comparative deletion before presenting my own analysis within the antecedent-contained deletion approach.

At first sight, clausal comparative deletion seems to involve a Null Complement Anaphora construction (as was suggested by Napoli 1975). However, it turns out that clausal comparative deletion does not exhibit a number of properties characteristic of Null Complement Anaphora. First clausal comparative deletion and Null Complement Anaphora involve different classes of verbs. For, instance, verbs like *fear, expect, hope*, and *say* generally do not take Null Complement Anaphora, as seen in (96), though they allow for clausal comparative deletion as in (95):

(96) A: John has arrived.
     B: I know / I suspected / * I feared / * I expected / * I hoped / * I had said.

In fact, clausal comparative deletion seem to be possible with any verb taking a *that* clause complement and therefore (95) should be a construction distinct from Null Complement Anaphora.

Another possible view of the phenomenon would be to consider it some kind of phrasal coordination: the attitude verb might be coordinated by *than* with an implicit attitude verb in the first conjunct in the spirit of Ross' performative hypothesis (cf. Ross 1967). In this view, the structure of the first sentence of (95) within the planar account of coordination would be as in (98).

(98) I ASSERT
     IP-than   John read more books.
     I expected

Then clausal comparative deletion reduce phrasal coordination as in (97), whatever account one might give for that.

(97) John read more books than Mary.

There are, however, two problems with this analysis of clausal comparative deletion.

[1] Unlike ordinary phrasal comparatives, (98) would not involve the coordination of constituents, *I ASSERT* and *I expected* being coordinated by *than*. An alternative coordination analysis of clausal comparative deletion, though, is possible: (98) can be read as a RNR structure in which two IPs are coordinated and the embedded IP *John read more books* 'has undergone' RNR. However, the problem with analysis is that the first sentence of (95) would not exhibit the usual linearization for RNR sentences. Generally, a RNR sentence with the structure in (98) is linearized either as *I ASSERT than I expected John read more books* or as *I expected than I ASSERT that John more books.*

[2] The analysis makes requires incorrect assumptions about the scope possibilities of the comparative operator. For many speakers, the comparative *more* may not occur in a clause embedded under an overt attitude verb which correlates with the verb with the null complement:

(99) a. *? [John claimed that more students failed] [than I had assumed].
     b. *? [John discovered that more students failed] [than I expected].

(99)a. cannot mean that John claimed that a higher number of students failed than the number of students that I assumed that John claimed that failed. But if the analysis in (98) was correct, it would predict that such a reading is available: (99a) would have exactly the structure of (98), given the presence of the implicit perfomative verb.

Let me now propose a different analysis of clausal comparative deletion. There is a natural account of clausal comparative deletion as an instance of ACD in the way ACD was analysed earlier. I will assume that in clausal complement deletion constructions the object position of the attitude verb is filled by an empty element which is bound at S-structure by an empty operator in SPEC(CP) of the comparative clause. This is shown in (100).

(100) John read more books than [O_i I expected t_i].

As in the case of comparative deletion of NPs, the degree operator O does not bind a semantically appropriate element. But this is not required in order to satisfy the S-structure requirement that the trace be identified as a variable. Note that the trace in (100) should be a CP trace and not an NP trace (hence the name of the construction). This can be seen from the possibility of clausal comparative deletion in the following contexts, which allow only CPs, not NPs:

(101) John has stolen more money than Mary is aware (*of).

(102) a. John is taller than it was believed.

b. John is as tall as it has been claimed.

(103) John knows more than it first seemed / appeared.

In the derivation of the LF of (98), *John read more books* is copied as *John read t-many books* into the empty clausal complement position with the operator subsequently binding the degree variable. This is shown in (104):

(104) John read more books [Oi I expected John read ti-much books].

This analysis of clausal comparative deletion receives support from the fact that the relation between the empty operator and the variable obeys island constraints:

(105) a. * John is taller than Mary invented a rumor that I said.

b. * John is taller than I asked whether Mary said.

c. * John is taller than I met a woman who said.

(106) John is taller than Mary said that Bill expected.

Turning back to the discussion of the beginning of this section, namely the comparison between Null Complement Anaphora and clausal comparative deletion, there is still a general question which has to be answered. We still have to say exactly what distinguishes verbs allowing for null complement anaphora from ordinary verbs. This question is important because clausal comparative deletion shows that the latter also allow for empty complements (though not in all contexts). A way to conceive of the distinction is the following. Verbs that allow for null complement anaphora allow for implicit arguments that need not be represented in syntax (see Hellan ?,...). In contrast, the object argument position of verbs not allowing for null complement anaphora has to be represented in syntax. This is achieved in the present account because the object position is represented at S-structure by a trace, a variable which is bound by an empty operator. This trace is obligatory, as the operator is obligatory in the SPEC(CP) position following *than* at S-structure. This is shown by the fact that the construction is subject to island constraints.

Further evidence for this account of the distinction between for null complement anaphora and clausal comparative deletion comes from the possibility of empty sentential subject in the second construction, but not in the first one. The possibility of empty sentential subjects in clausal comparative deletion constructions is seen in (107).

(107) a. John was stronger than was necessary.
b. John was stronger than was widely believed / suspected by everybody.

In contrast, there are no 'null complement subject anaphora' possible in English, as seen in (108):

(108) A: John came.
B: * Is wellknown.

This is so because according to the Extended Projection Principle (cf. Chomsky 1985), the subject position is a syntactically required position for every verb. This does not hold for the object position. Hence there can only be 'null complement object anaphora'.

The distribution of empty CPs in comparatives is of interest also in other respects. As a general observation, empty CP subjects in comparatives are restricted to contexts in which they originate in a position governed by a verb, as seen in (109):

(109) a. * John was stronger than showed that the drugs are useless.
b. * More people came than could prove that the performance was a failure.
c. * John is taller than indicates / suggests that he is Mary's son.
d. * John runs less fact than convinces me that he should participate in the race.

In this respect, the construction with comparatives patterns the same way as *as* clauses that modify the clause as a whole, as in (110) and (111), as described by Stowell (#):

(110) a. Mary became sick, as was predicted / widely believed / suspected by everybody.

b. Mary is sick, as became obvious shortly.

c. John passed the exam, as was likely / seemed probable.

(111) a. * Mary became sick, as proved the drink was poisened / as became apparent shortly.

b. * John owns the gun, as indicates / shows that he is guilty.

In order to derive the restriction on empty CPs in *as* clauses, Stowell proposes that the ECP should not only hold at S-structure and LF, but also at D-structure, as stated in (112):

(112) Stowell's assumption

The ECP has to be satisfied at all syntactic levels.

The ECP requiring antecedent government or lexical government then can be satisfied by an empty operator only if the operator originates in a position governed by the verb.

Clearly the same condition (112) would explain the distribution of empty CPs in comparative clauses.

However, there are serious problems with Stowell's assumption. It makes too strong predictions. As an opens problem for his analysis, Stowell notes himself that the condition given in (112) would incorrectly rule out *that* relative clauses with empty subjects as in (113):

(113) the man that O e left

Moreover, when applied to comparatives, it would rule out empty NP subjects in comparative clauses as in (114).

(114) a. More people came than O e left.

b. As many people came as O e left.

c. The same man came as O e left.

d. A different man came than O e left.

Given the data in (113) and (114), the proper empirical generalization regarding the distribution of empty elements in *as* clauses and comparative clauses seems to be the following. Only empty CPs have to originate in a lexically governed position; empty NPs may also be subjects at D-structure. Thus we have the following condition:

(115) Empty CPs have to be lexically governed at D-stucture.

Why should there be a difference between empty NPs and empty CPs with respect to the satisfaction of the ECP? The difference may be traced to the fact that, given the DP hypothesis, the degree variable which is bound by the degree operator is the head of a DP, but not a CP. However, I will not pursue this question further.

There are still other open problems with the analysis. Let me mention one of them. Antecedent-contained VP deletion is possible in both comparative clauses and relative clauses, as in (122).

(122) a. John read more nooks than Mary did.
b. John read every book that Mary did.

But mysteriously this does not hold for antecedent-contained CP deletion, which is possible only in comparative clauses, not in relative clauses:3a

(121) * John read every book (that) Mary said.

So far I have given a treatment of clausal comparative deletion only within the antecedent-contained deletion approach to comparative deletion. I have not discussed the question how the other accounts fare with respect to this problem. Let me briefly show that clausal comparative deletion presents a problem for both the layered-trace approach and the PF deletion approach.

In the layered-trace approach, clausal comparative deletion would require base-generated structured empty clauses, as in (122).

(122) John is taller than I expected [CPOi[IP[NPe][Ie][Ve][AP[[ei]e]]]].

Again, this would lead to the usual problem with subjacency. Furthermore it would multiply the problems of how the empty elements in the empty clause are identified.

Pied-piping as a solution to the subjacency problem seems implausible for clausal comparative deletion constructions because clauses generally do not pied-pipe - at least not at S-structure, and this, under the present assumption, is the only relevant level for subjacency.

(123) * [That John is how tall] did Mary believe t?

The PF deletion approach faces similar problems. If the clause is base-generated as in (124), the subjacency problem results:

(124) John is taller than [O_i I expected that John is t_i-much tall].

Pied-piping here is particularly implausible, because pied-piping of an overt clause at S-structure is impossible, as was seen in (123).

Thus, we can conclude that clausal comparative deletion presents a good argument in favor of the antecedent-contained deletion approach of the sort advocated here.

4.1.6. The appearance of pronouns in the comparative deletion site

The second sort of additional evidence for the antecedent-contained deletion approach to comparative subdeletion that I have proposed is the the possbility of an overt ('antecedent-contained') pronouns in comparative deletion contexts in some languages. A particularly interesting phenomenon is this respect is the occurrences of pronouns in comparatives in German, which I will briefly mention

Clausal comparative deletion constructions in German do not only exhibit wmpty clausal elements; they also allow for an overt pronoun in place of it. The two options are generally both equally available as the complement of the attitude verb in the comparative clause:

(117) Hans ist größer, als ich (es) erwartet habe.
John is taller than I have expected (it).

The possibility of an overt proform can be accounted for in the antecedent-contained deletion approach to comparative deletion by simply by allowing the copying rules at LF to replace a proform. But the possibility of an overt antecedent-contained proform can hardly be handled in an approach where the empty elements are base-generated as structured empty phrases, unless one allows for the replacement of the layered trace by a pronoun at PF. In the PF deletion approach, one would also have to assume a pronoun replacement operation, in addition to a deletion operation.

The occurrence of the pronoun in the clausal comparative deletion site in in (117) raises the question when antecedent-contained overt pronouns are possible or impossible in comparative deletion sites. One kind of antecedent-contained proform that occurs in comparative deletion contexts is *what* in some dialects of English. This was noted by Chomsky (1977):

(118) John ate more apples than what Mary ate.

However, the occurrence of a pronoun in place of an empty NP in comparative deletion contexts is rather marginal. Even in German, where CP proforms in comparative deletion contexts are allowed, empty NPs can in general not be replaced by an antecedent-contained proform:

(119) * Hans hat ein besseres Buch gelesen, als ich es gelesen habe.
'John has read a better book than I have read it.'

However, there are some contexts in which this is possible in German, as will be discussed in the next section. According the analysis I will give then, (119) is excluded by an independent condition which says that that an antecedent-contained definite proform is possible only when there is a sense in which the proform and the correlate corefer; this is impossible in (119) because the book John read is distinct from the book I read. By contrast, a sense of coreference is possible in (118) because the proposition that John is d-tall is identical to the proposition that John is d'-tall, disregarding the potential distinctness of the variables. As will be discussed in the next section, a plausible hypothesis is that German generally has the option of antecedent-contained proforms in comparative deletion sites, though the occurrence of pronouns is restricted by certain independent constraints.

What is still unclear in the analysis of (119) is what the operator should bind, since there is no trace present at S-structuie. Again I will assume that the operator binds the pronoun itself, an element, which like a corresponding at S-structure, is categorially inappropriate. But a meaningful operator-variable relation will be restored at LF' via copying.

Regarding the relation between the operator and the variable, it is important to note that comparatives with a trace and comparatives with a pronoun differ in that the latter more readily permit violations of island constraints:

(120) a. *Hans ist größer, als ich gefragt habe, ob Maria erwartet hat.
'John is taller than I asked whether Mary expected.'
a'. Hans ist groesser als ich gefragt habe ob Maria es erwartet hat.
b. *Hans ist größer, als ich ein Gerücht gehört habe, daß Maria erwartet hat.
'John is taller than I heard a rumor that Mary expected.'
b'. Hans ist groesser als ich ein Greucht gehoert, habe dass Maria es erwartet hat.

It is not clear what the status of the pronoun should be. If the pronoun itself is bound by the operator, it would have the function of a resumptive pronoun. Resumptive pronouns, however, are generally excluded in German. In any case, the pronoun obviously not form a chain with the operator which would be subject to subjacency.

The possibility of antecedent-contained proforms in German furthermore raises the question why languages such as English do not have the option of an overt proform. This difference between the two languages remains to be investigated.

4.1.8. Appendix: comparatives and pronouns in French and German

In this appendix, I will briefly discuss some peculiarities in French and German comparative constructions which relate to the problems discussed in the previous section. French comparatives are important in this respect in particular because they have provided the main motivations for Pinkham's layered-trace approach to comparative deletion. I will show that these motivations lose their force in view of further data and the possibility of an alternative treatment. Both French and German allow for pronouns in the comparative deletion site, though in very different ways. I will show that the occurrence of pronouns in French comparatives can be accounted for within the present treatment of comparative deletion. Furthermore, I will argue that the construction with pronouns in German comparatives give particular support of the treatment of comparative deletion as antecedent-contained deletion.

Pinkham (1982) observes that comparative constructions in French may exhibit a pronoun in the comparative deletion site. (128) is an examples in which the pronoun *en* has to obligatorily occur.

(128) Marie a écrit plus de livre que Jean en a lu.
Mary has written more books than John of them has read

Pinkham takes this as an argument that comparative constructions in general do not involve wh movement, but rather involve base-generated pronominal elements. The head noun of the NP in the comparative deletion site consists in an overt pronoun (*en*) in French, whereas it consists in an empty pronominal noun in English. In Pinkam's analysis, (128) has the structure in (128'), which is exactly parallel to the structure she assumes for comparative deletion English, which was given as () in section 1.4.1.

(128') Marie a ecrit plus de livre$_k$ que$_i$ Jean [$_{NP}$[$_Q$pro$_i$][$_N$en$_k$]] a lu.

However, the argument for the layered trace approach from French comparatives does not seem particularly strong. The construction in (128) still very plausibly involves wh movement of an empty operator, both for empirical and conceptual reasons.

There are two sorts of empirical evidence that (128) involves wh movement. The first one comes from the fact that overt wh movement of *combien* is possible in the parallel interrogative construction in (129):

(129) Combien est-ce-que Marie en a écrit?
how much Mary of it has written

This shows that also in (129) wh movement of an implicit operator could have taken place at S-structure. Therefore, the construction in (128) is by itself not sufficient to support an argument against wh movement in comparatives.

The second kind of evidence is that pronouns do not occur in not all comparatives in French. In particular, a pronoun is impossible with attributive comparative adjectives. In fact, in those cases clausal comparatives are impossible completely; only phrasal comparatives are allowed:3a

(130) a. * Marie a écrit des meilleurs livres que Jean en / les a lu.
Mary has written bettter books than John of them / them has read
b. * Marie a écrit des meilleur livres que Jean a lu.
c. Marie a écrit des meilleurs livres que Jean.
Mary has written better books than John
d. Marie a écrit des meilleurs livres que ceux que Jean a lu.
Mary has written better books than those that John has read

This probably corresponds to the fact that extraction of an adjectival specifier *comment* is impossible:

(131) Louis a écrit des tres beaux livres. * Comment est-ce-que en a écrit Marie?
Louis has written very beautiful books. How has of them has Mary written.

Thus, data suggest that the occurrence of pronouns in French comparatives is restricted to those contexts in which the extraction of an overt degree phrase is possible for independent reasons.

An interesting question, which I will, however, not pursue further, is, why are pronouns allowed and in fact required in the construction in (128) and why is a construction such as (130a) impossible, where a pronoun is disallowed. This question can be put perhaps equivalently as follows. Why is *combien* extraction possible, but not *comment* extraction?

Pinkham observes that pronouns in French comparatives are subject to island constraints in the same way as the empty elements in English comparatives. She, correctly, takes this as an argument that French and English should be analysed in a uniform fashion. But rather than taking this fact to support an analysis for English with base-generated pronouns, one may equally well take it as an argument that French comparatives with pronouns involve wh movement, in particular since it is not clear why the relevant pronoun-binding relation should be subject to the same constraints as wh movement.

Still the pattern of the occurrence of pronouns in French comparatives is more complicated. Let me mention just one puzzle. As was also noted by Pinkham, another context in comparatives in French in which pronouns are possible, and in fact required, is the position of predicative adjectives:

(133) Marie est plus grande que Jean (ne) l'est.
Mary is taller than John it is
'Mary is taller than John is.'

Here the correlation with combien extraction does not hold. *Combien* extraction is impossible from the specifier position of a predicative adjective:

(134) * Combien est-ce-que Marie (n') est grande?
how is Mary tall
'How tall is Mary?'

To sum up, we have seen that the occurrence of pronouns in French comparatives do not support a layered-trace approach, but has, in part, to do with whether specifier movement is possible in the relevant construction.

Let me now turn to comparative constructions in German in which pronouns occur in the comparative deletion site. In German, there are several contexts in which comparatives may also contain a base-generated pronoun, rather than an empty element. In all contexts, the pronoun is only optional. One of them has already been discussed in the previous section, namely clausal comparative deletion constructions with pronouns in place of an ampty clause. Another occurrence of pronouns in comparatives are indefinite pronouns in predicative positions, as in (135).

(135) Hans ist ein besserer Arzt, als Frank einer ist.
'John is a better doctor than Frank is one.'

The most interesting context in which pronouns may appear, however, are generic comparative clauses, especially generic or existential comparative clauses. In these contexts, definite pronouns may optionally appear instead of a gap. The relevant data are given in (136).

(136) a. Maria macht bessere Kleider als es *sie* in diesem Laden gibt / als man *sie* in diesen

Mary makes better clothes than there are in this store / than one can find them in
Laden finden kann / * als ich *sie* machen kann / ? als *sie* hier verkauft werden / ? als man *sie* in diesem Land macht.
than I can make them / then they are sold here / than they are made in this country.

b. In diesem Land wachsen schönere Blumen, als *sie* in Deutschland wachsen.
in this country more beautiful flowers grow than they grow in Germany

Definite pronouns replacing a gap in this construction are subject to certain constraints. First, the comparative clause always has to be generic or at least existential.
Second, the semantic context in which the pronoun occurs has to involve the quality of entities the pronoun refers to. The pronoun is impossible in quantitative comparatives:

(137) * Hans besitzt mehr Pferde, als es sie auf dieser Weide gibt.
John owns more horses than there are on this lawn

Unlike pronouns in French comparatives, however, definite pronouns in this context are not subject to island constraints. But the same sentences without the pronoun are subject to island constraints.

(138) a. Maria macht bessere Kleider, als Anna behauptet, dass Max (sie) macht.
Mary makes better clothes than Ann claims that Max makes (them).

b. Maria macht bessere Kleider als Hans ein Gerücht gehört hat, dass man *(sie) in diesem Laden findet.
Mary makes better clothes than John has heard a rumor that one can find (them) in this store

c. Maria macht bessere Kleider als Anna sich fragt, wann es *(sie) in diesem Laden gibt.
Mary makes better clothes than Ann asks herself when there are (them) in this store

Recall that clausal comparative deletion constructions in German pattern exactly the same way with respect to island constraint effects, depending on whether a definite pronoun appears in place of the gap or not. This again indicates that the empty operator the constructions in (138) binds the pronoun itself, not another empty element in the comparative clause (and in this respect the construction differs precisely from French comparatives with the pronoun*en*, which are subject to island constraints).

I propose the following account of definite pronouns in German comparatives as in (138). First, the pronoun at S-structure is bound by the comparative operator. Since the pronoun is not an empty element, the operator-variable relation is not subject to subjacency. Second, the pronoun will be replaced at LF by a coreferential element of the following form [$_{NP}$*t-viel gute*][$_{NP}$*Kleider*] ('t-much good clothes'). This element consists in two NPs. I will come to the question why this can be so later. For the moment let us concentrate on the second NP.

This element can be coreferential with the pronoun only if *clothes* refers to a kind, not a particular set of clothes. This expalins the occurrence of the definite pronoun in existential contexts. Kind-referring definite NPs are generally acceptable in existential contexts, as in (139) (cf. Woisetschlaeger #):

(139) There is the smell of fire in this room.

In this account, the pronoun must be coreferential with the N' of the antecedent at LF, that is with 'clothes'. More generally, I will say that all definite pronouns in the relevant occurrence in comparative constructions have to be coreferential with an antecedent in the main clause. This general condition is stated in (140):

(140) A definite pronoun must be coreferential with the copied element that replaces it at LF.

A coreference condition clearly would not make sense for indefinite pronouns, as in the comparatives in French and for indefinites in predicative position in German. Indefinite pronouns generally do not have to be coreferential with anything.

Because of the requirement of coreference with an antecedent, the pronoun in the examples in (40) has to refer a kind, rather than to concrete entities, namely it has to be coreferential with the NP consisting of the N' *Kleider*. This explains why in definite pronouns are impossible in comparative clauses that are not generic or existential. For instance, (140) excludes the occurrence of definite pronouns in (141):

(141) a. * Hans liest *ein besseres Buch*, als Maria *es* liest.
'John reads a better book than Mary read.
b. * Hans liest *mehr Bücher*, als Maria *sie* liest.
'John reads more books than Mary reads.'

In (141a), *es* would have to be coreferential with *an x-good book* from the main clause. But this is impossible since the the book John reads is different, at least in quality, from the book Mary reads. Similarly, in (141b) *x-many books* would have to be coreferential with *sie*. But this is impossible, since the set of books John reads differs at least in quantity from the set of books Mary reads.

This analysis also applies to equatives and *same* comparatives:

(142) a. # Hans liest ein ebensogutes Buch, wie Maria *es* liest.
'John reads an equally good book as Mary reads it,'
b. # Hans liest dasselbe Buch, wie Maria *es* liest.
'John reads the same book as Mary reads it.'

(142)a. and b. are not ruled out semantically, but rather pragmatically. The coreference constraint requires, as a presupposition, that the book John reads is identical to the book Mary reads in (142)a. and b. But this is at least as strong a proposition as the assertions made in (142)a. and b. As a general principle, the presuppositions of a sentence should not entail the assertions of the sentence. In fact, (142)a. and (142)b. do not sound bad grammatically, they rather sound anomalous.

For the analysis of definite generic pronouns in comparatives, I have assumed that the comparative clause also contains an NP containing a degree variable, a quantifier and an adjective, which is separate from the NP consisting of the head noun. The comparative operator in the comparative clause binds a degree variable x at LF. Thus, (136a) has the following representation at LF in the relevant respects:

(143) Maria macht [$_{NP}$-er t-viel gute] [$_{NP}$[Kleider]]$_i$ als O$_j$ man [$_{NP}$t$_j$-viel gute] [$_{NP}$Kleider]$_i$ in diesem Laden findet.
Mary makes -er t-much good clothes than one t-much them in store finds

The analysis in (143) posits two NPs as the element replaing the pronoun, one for the N' *Kleider*, which acts as a referential term is coreferential with *Kleider* in the main clause and one for the adjective and the specifier containing the degree variable. How should this be possible? I will assume that the possibility in German for an NP to be divided into a specifier that has the categorial status of an NP and an N' that has the categorial status of an NP as well has to do with the following. Following Bennis (1983), I will assume that there is a general restructuring rule in German which separates a specifier from an NP and gives both the specifier and the remaining N' each the status of a full DP (however, see Corver 1989 for a critical discussion of Bennis' account). This rule for the relevant case is given in (144).

(144) [NPSPEC(NP) A N'] --> [NPSPEC(NP)A][NPN"]

Applied to (143a), this rule would take as its input the NP [NP*er t-viel gute Kleider*] and yield the structure [NP*t-viel gute*][NP*Kleider*] as its output.

It also makes *was für* split and quantifier split as in (44) possible. In a plausible analysis of *was für* split as in (145a), the restructuring of *was für Leute* into an NP of the form *was* and an NP (or PP) *für Leute* allows the extraction of was and saves (145a) from being a Left Branch Constraint violation. Similarly, the restructuring of an NP of the form *keine Leute* into a pronominal and adjectival NP *keine guten* and an NP *Leute* allows *Leute* to be topicalized in (145b).

(145) a. Was sind t für Leute gekommen?
what have for people come
b. Leute sind keine guten t gekommen.
people have come none

There is another contexts in German in which a definite pronoun occurs in the same way as in generic comparatives, namely *such as* clauses. *Such as* clauses allow a definite pronoun in German, but not in English. This is seen in (147) and (148). Furthermore, as with definite pronouns in generic comparatives, the occurrence of definite pronouns in *such as* clauses does not exhibit island constraint effects, as seen in (149).

(147) a. such flowers as (*they) grow in Holland
b. such clothes as Mary found (*them) yesterday in this store

(148) a. solche Blumen, wie (sie) in Holland wachsen
such flowers as they grow in Holland
b. solche Kleider, wie Maria (sie) gestern in diesem Laden gefunden hat
such clothes as Mary found (them) yesterday in this store
(149) a. solche Kleider, wie Maria sagt, dass Hans (sie) entworfen hat
such clothes as Mary says that John designs (them)
b. solche Kleider, wie Maria gefragt hat, ob Hans *(sie) entwirft
such clothes as Mary has asked whether John designs (them)
c. solche Kleider, wie Maria die Behauptung aufgestellt hat, dass Hans *(sie) entwirft
such clothes as Mary has made the claim that John designs (them)

Such as clauses are a kind of attributive equative clause, expressing the identity of certain qualities. For instance, the *such as* clause in (147b) expresses the identity of the quality of the clothes Mary found in the store with the quality of the referent of the NP headed by *clothes*. Thus, *such as* clauses are also a type of comparative construction.

Unlike other comparatives, *such as* clauses, in a sense, always involve a comparison of kinds. Furthermore, the correlate of the trace or pronoun in the *as* clause is always a kind-referring term, since the correlate is the N' itself. Thus in (148b) the corereferential element replacing the pronoun at LF in the *as* clause is the N' *Kleider,*. which by itself constitutes an NP by the restructuring rule (144). In (148b), *sie* is coreferential with the NP *Kleider*. Furthermore, there is another NP consisting of an empty specifier, a variable ranging over qualities. This variable is bound by an empty operator in SPEC(CP) of the *as* clause. This specifier belongs an NP distinct from the NP consisting of *Kleider* , by the restructuring rule in (144). Thus, for (148a) we have the following representation at LF, where *solche Kleider* 'such clothes' is analysed as *wie t-artige Kleider*, appropximately 'as clothes of kind t', with t being a variable ranging over kinds or qualities of clothes. By the usual rule of vehicle change *wie t-artige* is copied as *t-artige.*

(150) [$_{NP}$wie t-artige] [$_{NP}$Kleider$_i$] [$_{PP}$wie [$_{CP}$O$_j$ Maria [$_{NP}$t$_j$-artige] [$_{NP}$Kleider$_i$] gestern in diesem Laden gefunden hat]]

I will assume that the structure [t-artige][Kleider] semantically stands for kinds of clothes.

The pronoun in the *as* clause is licensed even in nongeneric sentences, as was seen in (148b). This follows from the fact that the construction itself requires reference to kinds and thus reference to kinds need not be enforced by the specific semantic content of the rest of the sentence.

To conclude, the occurrence of pronouns in generic comparatives and such as clauses in German can be accounted for within the antecedent-contained deletion approach to comparative deletion that I have proposed. In this account, the pronoun is replaced by a restructured NP that is copied (with vehicle change) from the main clause.

4.1.7. Evidence for coordination in clausal comparatives

In this section, I will come back to an issue that ws brought up already in chapter 3, namely the coordinate character of comparatives. In chapter 3, a coordinate structure for comparatives was assumed which yields the syntactic basis for part of the interpretation of a sentence. In this section, I will discuss the purely syntactic evidence for this coordinate structure. I will argue that a sentence may have two distinct simultaneous structures, a coordinate and a subordinate structure throughout the derivation. However, unlike the subordinate structure, the coordinate structure is only optional. In fact, it is not available at all in certain cases.

It has often been noted that clausal comparatives pattern like coordinate structures in certain respects (see for instance Napoli 1983, Hendriks 1991). I will first present the evidence for coordination that comparatives may exhibit, showing that coordination may be involved in some, but not all, clausal comparatives. I will argue that at the same time, comparatives always involve a subordinate structure. Thus comparatives may involve two structures, a coordinate structure and a subordinate structure. I will discuss the possibilities of positing two distinct syntactic structures for comparatives and in this context reexamine the syntactic evidence for coordination.

Napoli (1983) argues that clausal comparatives behave like coordinate structures in that they allow for Right Node Raising and ATB-movement. The possibility of ATB extraction was already noted by Bresnan (1976).

(63') a. a man who Mary called t an idiot as often as June called t a cretin

b. someone I believe John has visited t as many times as my brother has visited t

(63) More people admire than love this woman I met yesterday in the park.

Without discussing this evidence further at this point, let me discuss the consequences and possible treatments of a coordinate structure for comparatives.

Given the three-dimensional treatment of of RNR and ATB movement of chapter 1, the coordinate structure of comparatives would require the following representations.

more people admire

(64) a. CP -than this woman

O t love

does John love t more

b. Who CP -than

O[Mary admires t]

In these structures *than* is treated as a coordinator, coordinating two CPs. Note that the structure in (64b) requires CP recursion.

There are certain constructions where clausal comparatives certainly do not involve coordination. In particular, they violate the Law of the Coordination of Likes in attributive constructions as in (65):

(65) a. A better doctor than John has ever been will treat Mary.

b. More money than was offered to John was offered to Mary.

In (65) the CP *John has ever been* would have to coordinated with the NP or the head noun of *a better doctor*, which is impossible. Recall that exceptions to the Law of the Coordination of Likes are permitted only when the conjuncts have the same syntactic and semantic function, which would not be the case in (65).

Another case where the Law of the Coordination of Likes is violated was noted by Napoli (1983) (in attribution to Hankamer). In (66), the *than* clause is contained in the first conjunct of an AP coordination and hence cannot be coordinated with the entire sentence:

(66) John writes faster than Mary reads and better than Bill.

Clausal comparatives can be coordinated with the 'main clause' only when they are extraposed. Only then would the usual rules of linearization and the Law of the Coordination of Likes not be violated.

There are also a number of respects in which comparatives behave rather like subordination than like coordination. For instance, wh movement is not entirely subject to the Coordinate Structure Constraint in that the wh phrase may have a gap in the main clause only, not in the comparative clause:

(68) Who saw Mary earlier than Bill saw Sue.

Furthermore, quantifiers in the first clause may generally bind pronouns in the comparative clause. Thus, the quantifiers in the main clause c-command the pronouns in the second clause:

(69) a. *Every student* read more than *his* professor wrote.
b. * *Every student* came and *his* professor left.

A subordinate structure for clausal comparatives is not only required for syntactic reasons, but, given the present framework, is necessary also to provide an appropriate syntactic basis for the interpretation of the comparative operator. Crucially, unlike the connectives *and* and *or*, the comparative operator *-er* is not symmetric, since it expresses an asymmatric relation. However, in the three-dimensional approach to coordination, different conjuncts in a coordination cannot be distinguished in syntax, since distinct planes have all the same status syntactically. That is, in the three-dimensional approach to coordination, coordinators are necessarily symmetric; and hence a coordinate structure can never adequately represent the arguments of a comparative operator. Note that holds also for the particular asymmetric struture of coordnation that I have proposed. Also here no ordering relation holds among the conjuncts and the status of the coordinator as an adjunct of one conjunct has only formal reasons and does not bear on the order of the arguments it takes.

Not all comparative operators are asymmetric in the same way as *-er*. For instance, *as* seems to be a symmetric comparative operator. However, with certain specifiers it also leads to an asymmetric relation, as in (69'):

(69') John is almost / not quite / as tall as Bill.

In fact (69') suggest that the meaning of *as* is 'at least as', rather than equality among degrees. We can therefore conclude that comparative operators always have to denote ordered pairs, rather than sets of unordered elements.

The fact that comparatives exhibit both properties of subordination and of coordination can be accounted for if comparatives are assigned two syntactic structures, one being a multiplanar coordinate structure, the other one a 'linearized' structure with subordination. This requires that linearization of coordinations may apply before PF at S-structure, an assumption Muadz (1991) also makes for adjunct clauses. Certain syntactic elements or operations then would be licensed in one structure, but not in the other one. For instance, in comparative sentences, ATB extraction and RNR would be licensed in the coordinate structure, but not in the subordinate structure, and relational adjectives in the relevant function would take an antecedent in the coordinate structure, but not in the subordinate structure. Conversely, extraction violating the ATB principle would be licensed in the subordinate structure, but not in the coordinate structure, and similarly the relevant cases of pronominal binding.

Thus, a sentence with an extraposed *than* phrase may have two syntactic structures: a coordinate structure and a subordinate structure. In contrast, a nonextraposed *than* clause may only lead to a subordinate structure. Thus, apparently there is nothing that requires a coordinate structure of a comparative sentence.

The proposal that one and the same sentence may have two distinct syntactic structures is not a new one. This is basically the idea that underlie various reanalysis theories (see Goodall 1975 for an extensive discussion and further references). However, what is new in the present proposal is that both structures have to be semantically evaluated to yield part of the meaning of the sentence: the subordinate structure has to be semantically evaluated in particular in order to interpret the comparative operator (which requires two asymmetric arguments); the coordinate structure has to be evaluated in order to interpret relational adjectives in the relevant function.

How should the coordinate structure of clausal comparatives come about? I will assume that the comparative clause introducers *than* and *as* may act as coordinatiors. That is, they are syntactically specified as two distinct categories, first as prepositions and second as coordinators. Thus *than* is specified in the lexicon in the following way:

(70) *than*: coord, P [CP]

Why is the subordinate structure required, but not the coordinate structure? Clearly, the subordinate structure is required because the comparative operator and *than* have to enter a syntctic relation, which is the basis of the interpretation of the comparative construction.

When should the coordinate structure be present simultaneously with the subordinate structure in the derivation of a sentence? This bears on the issue whether the evidence about RNR and ATB extraction is in fact correct. If the evidence from RNR and ATB extraction were not correct, then the only motivation for the coordinate structure would be the antecedent and interpretation of relational adjectives. For this, it would suffice that the coordinate structure be present at LF only. Thus, only at LF could a comparative have two structures. The idea that a sentence with subordination may have a coordinate structure at the level of LF only was already proposed by Haik (1985) for other constructions, namely sentences with parasitic gaps and with 'paycheck'-pronouns and free relatives. Again this view bears on the question whether non-ATB extraction from comparatives and binding into the comparative clause can cooccur. As it should be, the answer seems to be negative. Both (75a) and (75b) seem degraded.

(75) a. ?? At the same time every professor criticized Mary more than his assistant praised

John.

b. ?? Who read more books than Mary read newspapers during the same period of time?

It is not obvious that the evidence about RNR and ATB extraction is correct. The alternative would be that the relevant examples are cases of Heavy NP Shift (HNPS) and parasitic gaps. Since HNPS and parasitic gaps are not restricted to coordination, there would be no syntactic evidence for coordination in comparatives.

HNPS and RNR are generally held to differ with respect to the ability of preposition stranding Preposition stranding is supposed to be possible with RNR, but not with HNPS (cf. Williams 1990). But preposition stranding as in (73) seems to be possible with comparatives.

(73) John wrote more book about than Mary wrote articles about this celebrity from France.

Hence it seems that comparatives in fact allow for RNR.

Let us see whether the evidence for ATB extraction is correct. Parasitic gaps and ATB extraction differ in a number of respects (see in particular Cinque 1989 for the properties of parasitic gaps). For instance, parasitic gaps are restricted to NPs, where PPs may be extracted across-the-board. In this respect, the multiple gaps in comparatives do not seem to pattern with parasitic gaps, but rather with ATB gaps.

(74) To whom will John write earlier than Mary will write?

Thus it appears that comparatives exhibit true instances of RNR and ATB extraction. Given that the evidence about RNR and ATB extraction is correct, how would it be possible that certain syntactic operations are licensed in one structure, but not in the other one? The answer seems to be that both structures are present at S-structure, both structures are present at LF and subject to semantic interpretation, but only one structure is selected in the mapping to PF. Thus, in the case of comparatives with RNR and ATB extraction, this would be the coordinate structure, whereas in the case of binding into the comparative clause and extraction from the main clause only, this would be the subordinate structure. The coordinate structure must be selected just in case a syntactic operation such as ATB wh movement or non ATB wh movement takes place in that structure. Given this view, the simultaneous subordinate and coordinate structure for (a) would be as in (b), and for (a) as in (b).

() a. Who did John see more often that Mary saw?

b. <u>subordinate structure</u>: John saw who more often than Mary saw who

<u>coordinate structure</u>: Who did John see more often than Mary saw?

() a. More people admire than love Mary.

b. <u>subordinate structure</u>: More people admire than love Mary.

coordinate structure: More admire Mary than love Mary.

Apparently the condition that enforces a wh phrase to move to SPEC(CP) need to be satisfied in only one structure. In the case of (a), it need to be satisfied only in the coordinate structure. With non ATB wh movement it would be satisfied only in the subordinate structure.

This account predicts that a sentence cannot overtly exhibit both properties of coordination and of subordination. Thus binding into the comparative clause should be impossible in a sentence with RNR or ATB extraction. This prediction seems to be borne out, as the constrasts between (71a) and (71b) and between (71c) and (71d) show.

(71) a. ?? Every man gave more money than his wife gave flowers to the sick in the hospital.
b. John gave more money than Mary gave flowers to the sick in the hospital.
c. ?? Who did every man meet earlier than his wife met?
d. Who did John meet earlier than Mary met?

Similarly, extraction from the main clause only should be incompatible with RNR, as it in fact appears to be:

(72) ?? Which people wrote a letter earlier than Sue sent a postcard to John?

Thus we can summarize the conclusions about the subordinate and the coordinate structure of comparatives in the following way. Clausal comparatives may have a coordinate structure beside a subordinate structure. This coordinate structure is present at D-structure and S-structure already. If any syntactic operation at any of the two structures than this structure is selected in the mapping of the sentence at PF. The following general conditions holds for the two structures:

() (i) Selectional requirements have to be met in only one (not in every) structure.
(ii) If a syntactic operation O applies to a structure S, then S is slected in the mapping to PF.
(iii) Both structures are evaluated semantically and yield part of the meaning of the sentence.

Let me now turn to the semantic interpretation of a comparative sentence that has both a coordinate and a subordinate structure. Both structures receive partial interpretations, which have to be combined to give the full meaning of the sentence. These partial interpretations again are formulated as relations between events and participants. For (76), these two relations are given in (77a) and (77b).

(76) The same movie impressed more men than women.

(77) a. λexy[men and women(y) & impressed(e, x, y) & Ax'x"(x'Px & x"Px & Ee'e"y'y"(e'Pe & e"Pe & impressed(e', x', y') & impressed(e", x", y") --> x'=x"))]

b. λexy[Ee'e"x'x"y'y"(e=G({e', e"}) & x=G({x', x"}) & y=G({y', y"}) & Ad(many(x', d') & impressed (e', x', y') --> Ed'(many(x", d') & impressed(e", x", y") & er(d', d)))]

The union of the relations in (77a) and (77b) and application of existential clodure to the three variables bound by the lambda-operator then gives the full meaning of (76).

4.2. Phrasal Comparatives

4.2.1. Introduction

This section serves only to provide a number of very general remarks and observations about phrasal comparatives. In the present context, phrasal comparatives raise two interests.

First, in which respect does the syntax and semantics of phrasal share properties with clausal comparatives. In particular, are phrasal comparatives syntactically reducible or irreducible to clausal comparatives. Furthermore, is there evidence that phrasal comparatives involve universal quantification in the same was as clausal comparatives and how do quantifiers and connectives behave in the *than* and*as* phrases of phrasal comparatives.

Second, what is the relation between phrasal comparatives and coordination? Do phrasal comparatives otpionally involve simultaneous coordinate and subordinate structures in the same way as clausal comparatives?

I will first provide somearguments for the irreducibility of at least certain phrasal comparatives. Then I will discuss general aspects of phrasal comparatives. Finally I will come to the question in which way coordination may be involved in phrasal comparatives.
The whole discussion in the following will be rather sketchy. It should only serve to indicate certain issues and generalizations.

4.2.2. Irreducible phrasal comparatives

I will first show that there are irreducible phrasal comparatives, i.e. phrasal comparatives that should be base-generated and not derived from clausal comparatives by deletion.

I think the simplest and most compelling argument that phrasal comparatives are not always derived from clausal comparatives comes from the fact that many languages have comparative constructions that allow for phrasal comparatives, but exclude clausal comparatives. The restriction to phrasal comparatives generally depends only on the particular comparatives operator or comparative clause introducer. Hence it is implausible to derive these phrasal comparatives by subsequent deletion. I will mention only two constructions from German and Spanish.

In German, comparatives with *same* allow only for phrasal comparatives, not clausal comparatives:

(71) a. Hans hat denselben Film gesehen wie Maria.
John has the same film seen as Mary
b. * Hans hat denselben Film gesehen wie Maria gesehen hat.
John has the same film seen as Mary

In Spanish, there are two types of comparative constructions, a relative clause-like construction introduced by a preposition of the type *de lo que* IP and a phrasal comparative construction introduced only by *que*:

(72) a. Maria leyó mas libros que Pedro.
Mary read more books than Peter

b. Maria leyó mas libros de los que leyó Pedro.
Mary read more books than those that Peter read

Crucially, the first construction allows only for phrasal comparatives:

(73) * Maria leyó mas que leyó Pedro.

It is quite implausible to derive these phrasal comparatives from clausal comparatives. Moreover, since coordination does not generally require deletion in the multiplanar approach, it is desirable to dispense with deletion rules in phrasal comparatives as well. However, it is not clear how a coordination analysis of phrasal comparatives would look like and whether it would be sufficient. In the next two sections, I will show that phrasal comparatives, like some clausal comparatives, require both a coordinate and a subordinate structure. Again, there is syntactic evidence for both structures, and both structures have to be semantically evaluated to yield part of the full interpretation of the sentence.

The view phrasal comparatives are base-generated, rather than derived from clausal comparatives by deletion has first been taken by Hankamer (1973) and Napoli (1983), who give further arguments for this view.

4.2.2. A compositional analysis for phrasal comparatives

A compositional semantics for phrasal comparatives is possible without requiring a clausal structure. Thus, there is no principled semantic motivation for deriving phrasal comparatives from clausal comparatives. Heim (1985), though she does not endorse the irreducibility of phrasal comparatives, has proposed a semantics of phrasal comparatives without ellipsis. She suggests the semantic analysis (97b) for the phrasal comparative in (97a):

(97) a. John is taller than Bill
b. er(xd[tall(x, d)], John, Bill)

Crucial in this proposal is that the comparative operator *-er* has a different meaning in (97a) from the one it has in clausal comparatives and in the indexical case. Basically, the lexical meaning of er in (97a) has to encode part of the sentence meaning of a clausal comparative. Thus, given the proposal about the interpretation of clausal comparatives in section 5.1., in (97a) *-er* holds between a two-place predicate P (which expresses a relation between individuals and degrees) and two arguments x and y under the conditions given in (98):

(98) <u>The meaning of the comparative operator in phrasal comparatives</u>
er(P, x, y) iff for all d such that P(x, d), there is d', d'>d such that P(y, d').

The same analysis can be straightforwardly carried over to comparatives with gapping as in (99a), if the meaning of *-er* is extended in the way given in (99c).

(99) a. John loves Mary more than Bill Sue.
b. er(λxyd[loves d-much(x, y)], <John, Mary>, <Bill, Sue>)
c. er(Q, <x, y>, <w, v>) iff for all d such that Q(x, y, d) there is a d', d'>d such that Q(d', w, v).

4.2.3. The semantic behavior of phrasal comparatives

In many ways, phrasal comparatives exhibit similar semantic patterns as clausal comparatives.

First, phrasal comparatives pattern in the same way with respect to NPIs:

(132) a. John is taller than anybody else
b. John is happier than ever.
(133) a. John is as smart as anybody else.
b. John is as happy as ever.
(134) a. John read a different book than anybody else.
b. John wore a different hat than ever before.

Again, comparatives with *same* disallow NPIs:<note>

(135) a. # John read the same book as anybody else.
b. # John wore the same hat as ever before.

The pattern with respect to NPIs should be accounted for in the same way as for clausal comparatives.

An interesting question is how phrasal comparatives behave with respect to the scope possibilities of quantifiers, since the source for a wide scope reading of the quantifier could be a different one; it would simply be due to the fact that *than* here acts as a preposition. The data show that there is in fact a difference. First, as with clausal comparatives, for quantifiers like *everybody, many* and *most* a wide scope reading is available:

(136) John is taller than everybody else / most / many people.

However, also *no* and *few* seem to allow for a wide scope reading:

(137) a. John is taller than few people than no girl.
b. John is as tall as few people / no girl.

This can be correlated with the fact that *no* and*few* can take scope outside of PPs. Thus () receives a reasonable interpretation.

(138) John slept during few / no performances.

Thus the wide scope possibilities with all quantifiers for phrasal comparatives simply followf from the status of *than* as a preposition in phrasal comparatives.

4.2.4. Evidence for coordination with phrasal comparatives

Like clausal comparatives, phrasal comparatives exhibit 'symptoms' of coordination. In this section, I will present evidence that phrasal comparatives involve a coordinate structure. Furthermore, as in the case of clausal comparatives, I will argue that phrasal comparatives may have both a coordinate and a subordinate structure. Again both of these interpretations receive a partial interpretation that provides part of the meaning of the sentence.

There are three sorts of evidence for coordination in phrasal comparatives: first the application of grammatical principles in individual f-planes, second the possibility of gapping in phrasal comparatives, and finally the behavior of relational adjective in sentences with phrasal comparatives.

First, phrasal comparatives with NPs generally require that the NP receive the same case as its antecedent. This is seen in the German example in (75):

(75) Hans hat dem Jungen mehr gegeben als dem Mann.
'John has given the boy (dat) more than the man (dat).'

More generally, phrasal comparatives require that the compared phrase meet all the selectional, categorial and other semantic and syntactic requirements imposed by the predicate of which the correlate is an argument of.

Like clausal comparatives, phrasal comparatives seem to allow for ATB extraction, as in (76), as noted by Napoli (1983).

(76) Mary, I have seen more pictures of t than books about t.

Again as with clausal comparatives, the question raises whether (76) is really a case of ATB movement of whether it is a parasitic gap construction. Let us apply the same tests that we have applied earlier. First, it seems that, unlike in the case of clausal comparatives, PPs can be extracted across-the-board in phrasal comparatives:

(77) a. About which celebrity did John read more books than articles?
b. Of whom who did John see photographs earlier than drawings?
c. Of whom did John more people proud than ashamed?
d. What did more people confirm than deny.

If the PP in (77) is in fact extracted across-the-board, this would show that (77) cannot be analysed as a case of parasitic gap (cf. Cinque 1989). Note though, as was pointed out to me by David Pesetsky, the examples in (77) may not be valid, since the second PP position may stay empty even without wh movement, as in (78). But this does not holds for ().

(78) a. John read more books about Stalin than articles.

b. John saw photographs of Mary earlier than drawings.

c. * More people confirmed that it would be raining than denied.

Thus, there does not seem to be a difference with respect to clausal comparatives in this respect.

Napoli (1983) has argued that only some phrasal comparatives involve coordination, others involve a PP. The phrasal comparatives that involve a coordinate structure are generally those involving categories other than NPs, for instance adverbial phrases and adjective phrases and verbs, as in (79).

(79) a. Mary sings more loudly than beautifully.

b. Mary is more clever than smart.

c. I eat more than drink.

One of the reasons why, according to Napoli, the phrasal comparatives in (79) involve coordination, rather than a PP (that is, why *than* in (79) acts as a coordinator, rather than a preposition) is that prepositions generally do not select adverbs, adjectives or verb phrases.

Let me mention Napoli's, I think, most convincing arguments for the coordinate status of the construction in (79), in contrast to phrasal comparatives with NPs.

First in phrasal comparative constructions as in (79), the first element of the comparison cannot be extracted alone, as seen in (80a), in contrast to phrasal comparatives with NPs, as in (80b).

(80) a. * How does Mary sing more t than beautifully?

b. Who came more often than Mary

Second,only phrasal comparatives with NPs not involving coordination allow fronting:

(81) a. Than John, certainly noone has done more.

b. * Than Mary, I like Bill more.

c. * Than beautifully, certainly Bill sings more loudly.

There is other evidence for the coordinate structure of phrasal comparatives, namely the possibility of gapping with comparatives. Often when a comparative construction in a language is restricted to phrasal comparatives, it still allows for gapping. This is the case, for instance, with comparatives with *derselbe* 'the same' in German as in (77):

(77) a. Hans hat Anna denselben Brief geschrieben wie Franz Maria.
John has Ann the same letter written as Franz Mary
b. Hans hat heute dieselben Leuten gesehen wie Maria gestern.
John has today the same people seen as Mary yesterday

This is also the case with phrasal comparatives with *que* in Spanish:

(78) Maria leyó mas ayer que Juan hace dos anos.
Mary read today more than John two years ago.

Gapping generally is restricted to coordinate constructions. This would support a coordination analysis of phrasal comparatives as in (78). However, not all structures that look like gapping need to involve coordination. In chapter 5, I will discuss a number of constructions that look like gapping, but where it is implausible to assume a coordinate structure. An example of such a construction is given in (79).

(79) Every man danced with every woman, even John with Mary.

In chapter 5, a number of criteria are established that distinguish apparent gapping as in (79) from true gapping. First, unlike true gapping, apparent gapping does not require an intonation break between the remnants. Second apparent gapping is subject to stricter locality conditions that true gapping in that the remnants may not be separated by clause-boundaries. In the following examples, both of these criteria are applied to comparatives with corresponding examples for *and* coordination. We see a clear difference between *and* coordination and phrasal comparatives. Phrasal comparatives do not require focussing of the two remnants, and they seem to subject to the strict clausemate constraint. This is seen in the contrast between (80a) and (80b), where '[-F]' markes the absence of focussing.

(80) a. John read more books than Mary journals.

b. ?* John read books and Mary$_{[-F]}$ journals$_{[-F]}$.

(81)a. . * More women think that the book should be published than men the article.

b. ?? John thinks the book should be published and Mary the record.

Gapping in phrasal comparatives furthermore gives specific support for the three-dimensional approach to coordination, since here gapping is basically treated as a subcase of phrasal coordination. I will come to the formal analysis of gapping in phrasal comparatives later.

The third sort of evidence that phrasal comparatives involve coordination comes from the behavior of relational adjectives, as we have seen in chapter 3:

(82) The same amount of alcohol makes a woman more drunk than a man.

In order for *same* to take an appropriate antecedent and to be evaluated semantically *a man* and *a woman* has to form a phrasal coordination which will be evaluated the same way as a plural NP.

5.2.3. A syntactic and semantic analysis of the coordinate structure of phrasal comparatives

In this section, I will show how the three-dimensional phrase marker theory of coordination can provide a natural account for phrasal comparatives including phrasal comparatives with gapping. I then present a formal semantic analysis of the coordinate structure of phrasal comparatives.

As in the case of clausal comparatives, I assume that *than* has the ability to function as a coordinator in the same way as *and* and *or*. Then a phrasal comparative as in (80a) can be represented as in (80b), by a phrase marker with two planes:

(80) a. John saw more women than men.

b.

```
                          women
John saw x-many  N' -than
                          men
```

c. plane 1: John saw more women

plane 2: John saw men

How can the restriction of certain comparative constructions to phrasal comparatives in some languages be captured in this approach? In German, it must be the comparative operator *derselbe* itself that may select only a nonclausal *wie*-phrase, since *wie* generally can introduce clauses, for instance in equatives as in (80'):

(80') Hans is rannte heute so schnell wie er gestern rannte.
'John ran today as fact as he ran yesterday.'.

In Spanish, comparative *que* is obviously restricted to being dominated only by nodes other than CP. How then can gapping with *que* in Spanish be represented within the planar theory of gapping? In Muadz's account, in gapping sentences the coordinator is dominated by the IP node, rather than by the nodes dominating the remnants and correlates, as in (81)

(81) a. John saw Sue and Bill Mary

b.
```
             John       Sue
   IP -and   NP   saw   NP
             Bill       Mary
```

To get the restriction of *que* to nonclausal coordination right, (78) would have to be represented as in (82):

(82)
```
          Maria              ayer
   IP     NP-que   leyó mas  PP
          Juan               hace dos anos
```

Let us now turn to the semantic interpretation of the coordinate structure of a phrasal comparative clause. Two assumptions are required for the semantic evaluation of phrasal comparatives. First, I will assume that *than* as a coordinator has exactly the same semantic function as the coordinator *and*. In particular, it is evaluated by the operation of group formation in the interpretation of an assignment of small m-planes to the comparative clause. The second assumption is that the comparative morpheme *-er* is not evaluated at all in the evaluation of the coordinate structure, but disregarded in the evaluation of this structure. This actually follows from the general principle that elements that do not enter any syntactic relation in a given structure are not evaluated in that structure at all.

Given these two assumption a phrasal comparative clause such as (82) is basically evaluated as equivalent to (84):

(84)

The same amount of alcohol makes NP-and (a woman / a man) x-much drunk

In (84), *same* takes the phrasal coordination with *a man* and *a woman* as its antecedent and the evaluation of the sentence based on this structure can proceed in the usual way as given in chapter 2.

The coordinate structure of a phrasal comparative sentence is insufficient both as a basis of the semantic evaluation of the sentence and as a representation of its syntactic properties. For the purpose of semantic evaluation, the coordinate structure is insufficient - in particular in the three-dimensional phrase marker approach to coordination -, because coordination is always symmetric, but comparison is asymmetric and requires a syntactic distinction between the two arguments of the comparative operator. Thus, a structure in which the comparative phrase is subordinated rather than coordinated is required in order to evaluate the comparative operator, in particular the comparative morpheme *-er*.

A subordinate structure is required for a number of syntactic reasons. Most important important among those is the observation that phrasal comparatives behave differently from phrasal *and* and *or*- coordination with respect to the 'linearization' of the three-dimensional structure. For instance, unlike *and* and *or* coordination, the *than* phrase often has to be separated from its correlate, as for instance in (86):

(85) John and Mary are tall.

(86) a. John is taller than Mary.

b. * John than Mary is taller.

I will come to the constraints on the 'linearized' or subordinate structure of phrasal comparative in the next section.

5.2.3. Evidence for a subordinate structure of phrasal comparatives

Hankamer (1973) and Napoli (1983) have argued that *than* phrases may be PPs with *than* as the propositional head. They adduce two sorts of evidence. First, extraction from *than* phrases may violate the ATB principle, as in (87):

(87) Who did John come earlier than?

Second, *than* phrases may be topicalized, which is impossible for *and* and *or* coordination (though 88a might be excluded also by the c-command condition discussed below).

(88) a. Than Mary nobody could ever become taller.
 b. *And/Or John Mary saw Sue t.

Furthermore, the *than* phrase may be separated from its correlate and often even has to do so. There are basically two restrictions that govern the position of the *than* phrase in relation to its correlate. These restrictions clearly are not PF restrictions, but rather restrictions that are related to scope relations. Hence the restrictions cannot be considered restrictions on the 'linearization' (which is a one-dimensional structure), but rather have to be considered restrictions on the syntactic structure of phrasal comparatives. But this means that they must be restrictions on a subordinate structure (which is a two-dimensional structure). Furthermore, the restrictions should be considered as conditions on the syntactic relations on which the interpretation of comparatives is based.

First, it appears that the phrase containing the comparative morpheme *-er* has to c-command the *than* phrase.

(89) a. * John than Mary is taller
 b. John is taller than Mary.
(90) a. More men than women came.
 b. A more happy than unhappy boy came.
(91) (??) John wrote more letters than Bill to Sue.

This requirement, obviously, applies before A'-movement, in particular before topicalization as in (88).

C-command, however, is not the only requirement, as seen with the fronted *-er* phrase which does not rescue the structure in (92).

(92) * More often John than Mary came.

Second, there are certain restrictions on phrasal comparatives which seem to be particular to a specific comparative construction. In particular, there is an interesting constraint on *same* comparatives. It appears that the phrase correlating with the *as* phrase has to c-command the NP containing *same*. This holds for English , as in (93), as well as for German, where *same* comparatives only allow the phrasal constructions, as in (93').

(93) a. John has said the same as than Mary.
    b. * The same man saw Mary as John
(93') a. Hans hat dasselbe gesagt wie Maria / etwas anderes gesagt als Maria.
    John has the same said as Mary / something different said than Mary
    b. * Derselbe Mann hat Anna gesehen wie Maria.
    The same man has Ann seen as Mary

The same constraint, though does not seem to hold for gapped comparatives in German:

(94) a. Hans dasselbe dem Mann gesagt hat wie Maria der Frau.
    John has the same the man told as Mary the woman
    b. Hans hat dem Mann dasselbe gesagt wie Maria der Frau.

This restriction on phrasal comparatives with *same* also hold for clausal comparative constructions:

(95) * The same man admired John as loved Mary.

However, the constraint does not hold for *different* comparatives:

(96) a. A different saw Mary as / than John.
    b. A different man admires John than loves Mary.
    c. Ein anderer Mann hat Anna gesehen als Maria.
    A different man has Ann seen than Mary

Furthermore, the constraint does not seem to hold for any other comparatives, for instance with *more*, as seen in (97):

(97) More children love John than love Mary.

Though the constraint seem to be still somewhat active in other *-er* comparatives, as seen in the degraded status of (98):

(99) A more beautiful house belongs to John than to Mary.

The constraint on *same* comparatives can now be stated descriptively as follows:

(100) Syntactic condition on the relation between correlate and comparative operator in *same* comparatives
All correlates in a *same* comparative construction have to c-command the phrase containing *same.*

The constraint in (96) is a general condition on the identification of syntactic relations on which the interpretation of *same* comparatives is based. But why should (96) hold, in particular, why should it hold only for *same* comparatives? I will leave this open for further investigation.

4.2.4. The categorial specification of *than*

We have seen that phrasal comparatives require two syntatic structures for the same reason as clausal comparatives: the coordinate structure is required for the interpretation of relational adjectives and in order to satisfy certain syntactic conditions such as case assignment, whereas the subordinate structure is the structure is chosen for the derivation of the PF of the sentence and required for the semantic interpretation. The problem now is of how to conceive of the subordinate structure.

In phrasal comparatives with NPs, the *than*-phrase behaves as a PP in every respect. Thus, as in Hankamer's original proposal, *than* should receive a categorial specification as a preposition as well as an NP-coordinator.

What about the categorial specification of *than* for phrasal categories other than NP? Here it seems that we have to assume a category intermediate between coordinators and subordinators. The *than* phrase behaves like a coordinator with respect to linearization (adjacency between the *than* phrase and its correlate). There are other expression that have such an intermediate status, for example *with* in many languages. Another possibility to conceive of the category is suggested in Munn (1991), who posits a new category Boolean Phrase, which serves to reinterpret traditional coordinate categories as subordinate categories (see chapter 1).

4.3. Comparative Subdeletion

4.3.1. The problems with comparative subdeletion

Comparative subdeletion presents notorious problems for a wh movement analysis of comparative clauses. These problems have been pointed out by Bresnan, Corver, and recently Ishii...

4.3.2. Comparative subdeletion and coordination

In this section, I will show that comparative subdeletion always involves a coordinate structure and furthermore, that the coordinate structure can account for the type of deletion that comparative subdeletion seems to exhibit. The arguments for coordination are first a restriction of comparative subdeletion to comparative clause in extraposed position and second a parallelism condition on subdeletion.

Pinkham observes that comparative subdeletion is generally impossible from attributive position. It is allowed only in extraposed position:

() a. More men than (*women) came yesterday came today.
   b. More men came today than women came yesterday.

Pinkham proposes the following condition in order to rule out (). However, she does not give any independent motivation for this condition.

George () notes that subdeletion is subject to the same parallelism requirement as ATB extraction:

() a. * More men came than John invited women.
   b. More men came than women were invited.

4.3. 2. Multiple comparative subdeletion

An very interesting phenomenon for the present semantic and syntactic discussion of comparatives are comparatives and related constructions with multiple correlates. These constructions were first noted by Williams (1977) and further discussed by Chomsky (1981) and by Gueron/May (1982). They are illustrated in (38).

(38) a. More students knew more languages than I expected.
   b. Fewer students visited fewer museums than I expected.
   c. (?) More students students visited fewer museums than I hoped.

The phenomenon also occurs with equatives:

(39) a. Maria became as tall as fast as John predicted.
   b. As many students made as many mistakes as John predicted.

Furthermore, the phenomenon occurs with comparative and equative constructions that compare entities, rather than degrees or amounts:

(40) a. The same people made the same mistakes as I expected.
   b. Other people made other mistakes than I expected.

In the following, I restrict my discussion to comparatives of degree; but the descriptive generalizations carry straightforwardly over to equatives and the other comparative construction.

Comparatives with multiple correlates are possible not only with apparent Null Complement Anaphora. There are three other comparative constructions that allow for multiple correlates. First, multiple correlates are possible with 'phrasal comparatives', as in (46).

(46) a. John played more music on more days than Mary.
b. John read more books in fewer years than Mary.
c. John is able to write more on fewer days than Mary.

Comparative clauses are possible also with multiple sites of comparative subdeletion, as in (50).

(50) a. Mary read more books in fewer days than John newpapers in years.
b. More pianists play more concerts than singers perform operas.

The semantics of this construction is interesting in relation to the issue of coordination, because it seems to involve multiple application of the comparative operation to the parallel elements. However, this operation cannot apply in the same way as the *and*-coordinated sentences discussed in the previous chapter. In (50a), the comparative operation cannot simply apply to [*more books*] and [*newspapers*], comparing to the number of books to the number of newspapers in general, and so for [*fewer days*] and [*years*]. Rather what the comparative operation does in (50a) is compare the number of books Mary read on any days to the number of newspapers John read in any years (with the result that the first outnumber the second) and the number of days on which Mary read any books to the number of years in which John read any newspapers (with the result that the second outnumber the first ones) (see von Stechow 1985 for discussion). Thus, the comparative operation applying to multiple comparatives has to take into account the entire propositions of both conjuncts, not only the NP extensions.

Ishii (1991) argues that subdeletion comparatives compare the number of events described by the comparative clause and the matrix clause, rather than the number of individuals satisfying the comparative NP and its correlate. Let me add to Ishii's arguments two further arguments that support this view.

The first argument has to do with a constraints on the gap in the comparative clause. Comparative clauses with multiple antecedents seem to be impossible when the comparative clause contains a verb and a single gap for arguments that are not necessarily groups. This was noted by Chomsky (1981) with examples such as the following:

(47) a. Mary introduced more students to more professors than I met yesterday.
b. (?) More passengers brought more luggage than fit into the bus.

However, multiple correlates of a comparative clause are possible when the gap corresponds to an argument place that is necessarily collective, requiring group arguments.

(48) a. More men met more women at the party than (I thought) knew each other already.
b. More men met more women at the party than I had introduced to each other before.
c. More men divorced more women than could live in different apartment.
d. More men danced with more women at the party than had met before.
e. Mary mixed more wodka with less gin than I had mixed before.

Multiple gaps corresponding to the different correlates are unacceptable for syntactic reasons (cf. Ishii 1991):

(49) a. * Mary sold more pictures to more visitors than John showed e to e.
b. * More pictures disappointed more visitors than e impressed e.

The difference between a single gap with collective predicate and a noncollective predicate can be explained as follows. Assuming that sentences with multiple deletion sites involve a single comparison between events rather than multiple comparisons between participants, only a collective predicate can yields the appropriate number of events for the comparison. Consider (47a). In the intended reading the number of events of introducing a student to a professor should exceed the number of meeting of such a student and a professor. However, the events most likely to be described in the comparison clause are meetings of a single provfessor and meetings of a single student. The number of such meetings will exceed the number of introductions of a student to a professor whenever the number of students and professors involved in the meetings constitute more than half of the students and professors that were introduced to each other. In contrast, when the predicate in the comparative clause is collective, the number of students and professors involved in a single event of the comparative clause correspond to the number of students and professors involved in a single event in the matrix clause.

The second argument comes from the observation that comparatives with multiple antecedents do not require syntactic correspondence between the antecedents and correlating elements in the comparative clause. A correspondence between the overall content of the two clauses is sufficient, as seen in examples such as (51):

(51) a. More people drove more sportscars than flew / jogged in 1990.
b. * More people drove more sportscars than ate / slept in 1990.

(51a) is fine because the verbs in the main and the comparative clause both decribe directed motions, even though the verbs do not correspond in the argument structure and thus *more* sportscar lacks a syntactic correlate in the comparative clause. In contrast, the contents of the main clause and the comparative clause in (51)b. do not form the basis of a reasonable comparison. Thus, two occurrences of *more* in (51)a. seem to be correlated with a single operation of comparing the number of certain events, i.e. of events of someone driving a sportscar, to certain other events, i.e. events of flying or jogging.

Notes

1 One possible argument against the quantificational approach to comparatives is the apparent ability for the comparative clause as a universal quantifier over degrees to take scope outside its clause, an option generally not available for universal quantifiers:

(36) a. If John was taller than he is, ...
b. John believes that he is taller than he is.

However, there is evidence that the ambiguity in (36a) and (36b) is not an ambiguity of scope, but rather an ambiguity that should be be treated in terms of double indexing (see von Stechow 1984, Heim 1985, and Pinkal 1989 for discussion).

See also Groenendijk/Stokhof (1982) who give wh questions and relative clauses a common meaning as lamda abstracts.

2 Note that Haik's does not take into account VP deletion in *before* and *after* clauses. It is less plausible that *before* and *after* clauses should involve an empty operator:

(1) John came before / after Mary did.

3An analysis in which an operator binds different variables at S-structure and LF has also been proposed in a different context, namely by Pesetsky (1982) in an analysis of certain quantifiers in Russian in which QPs bind NP variables after having been forced to move out of the NP position for reasons of categorial mismatch.

3aHaik (1985) suggests that certain free relatives allow for CP deletion. She cites examples with the verbs *like* and *please* as in (1a) from Bresnan/Grimshaw (1978). But the construction is possible also with verbs like *say, hoped* or*expect*, as in (1b):

(1) a. John writes what he likes / pleases.
b. John does what Mary says / hoped / expects.

Still the construction, if adequately classified, is restricted to those verbs and does not generaliz, for example, to free relatives with *who*, as seen in (2).

(2) * John saw whoever Mary said / reportet / claimed / believed.

This suggests that *what* in (1) is in fact an antecedent-contained CP proform, and thus the construction in (1) is of the same type as overt *what* in comparatives.

Furthermore, Haik (1985) claims that the construction in question is possible in French, as in (3).

(3) a. Marie a vu qui tu m'a a dit / qui tu crois.
Mary has seen who you told me / who you believed
b. Jean a rencontré qui tu m'a dit / qui tu crois.
John has met who you told me / who you believe

However, the speakers that I have consulted do not agree with the data or reinterpret as NP deletion, rather than clausal deletion.

3a Some speakers seem to accept en in attributive comparative construction under a condition of strict parallelism of the main and the comparative clause, which requires identical verbs:

(1) Marie a acheté des meilleurs livres que Jean a acheté.

4 The restructuring rule might also be involved in constructions as in (1), where NPs without the specifiers are coordinated together with the verb:

(1) Hans hat alle Buecher gelesen und Filme gesehen.
John has all books read and films seen

5 Hoeksema (1983) claims that there is a fundamental difference between clausal and phrasal comparatives with respect to NPIs. Though his arguments are disputable (see Heim 1985 and others)

6 A question that arises with base-generating an empty NP with internal structure in the comparative deletion site with subsequent pied-piping is, why an overt noun should be impossible, as in (1):

(1) * John read more books than [[O [pro] journals] Mary read t].

However, if (1) is not simply ruled out because pied-piping applies only at LF for comparative constructions, it can be traced to a general constraint on pied piping in that pied-piped phrases may never consist of an empty operator and an overt element:

(2) * John saw the movie [about O] I wrote t.

6' There are certain exceptions to the generalization that comparative subdeletion does not occur in than clauses in attributive position, for instance (1)

(1) More people than Boston has inhabitants participated in the demonstration.

7 Note however, the construction is not possible when the comparative clause specifies directly the entities that provide the basis of comparison:

(1) a. More students failed than only John.
b. * More students should learn more languages than (only) John French and English.
c. More students should learn French than only ten.
d. * More students should learn more languages than only ten two.

But this construction is generally very restricted. For instance, the construction in (1a) seems to occur only with *-er* comparatives, and the construction in (1) is impossible with equatives with extraposition:

(2) a. * As many students passed as Mary, Bill and Sue.
b. As many as ten students passed

7 There are constructions with split antecedents that do not have to occupy parallel positions in a sentence, for instance degree phrases as in (1).

(1) So many tourists bought so many books in so many bookstores that every student had to borrow books from the library.

The question then is, do these constructions allow for the expressions taking a collective split antecedent? There are examples that apparently exhibit such constructions:

(2) a. So many men divorced so many women that the state could not provide for different apartments.
b. Fewer men married fewer women than the state hoped would live in the same apartment.

Chapter 5:

Exception Constructions, Apparent Coordination, and Operations on Quantification Domains

5.1. Introduction

In this chapter, I will discuss some syntactic and semantic aspects of exception constructions and other related constructions. Exception constructions include the sentences in (1). Syntactically related constructions include 'even'-phrases and 'instead'-phrases as in (2). The constructions that I claim are semantically related to exception constructions are 'almost'-phrases, as in (3a), extent clauses, as in (3b), and amount relatives, as in (3c). Potentially related constructions are inclusion and exclusion phrases as seen in (4).

(1) a. Every man came except John.
    b. John did not come everybody else came.
(2) a. Every man came even John.
    b. John came instead of Mary
(3) a. Almost every man came.
    b. Every man came to the extent that / insofar as he was invited came.
    c. John ate everything there was on the table.
(4) Everybody including / excluding John came.

There are three main issues about these constructions. First, what is the general semantics of exception constructions? In particular, what do exception phrases operate on? I will argue that exception phrases operate on a local quantification domain. This also holds for the constructions in (3). Second, exception phrases impose a constraint on the quantifier they associate with. This constraint is also imposed by the constructions in (3), but not by those in (4). As an explanation of this constraint, I will propose a general condition on the 'recoverability' of the relevant semantic operation. This condition also applies to the constructions in (3). Third, the syntax of exception phrases is of interest in the present context as they are similar to phrasal comparatives and bare argument ellipsis and exhibit coordination-like behavior. These properties are shared by the constructions in (2).

In addition, I will show that exception phrases (of all kinds) may apply to polyadic quantifiers. These data are important, in general, for the issue of the occurrence and the status of polyadic quantification in natural language.

I will first discuss the syntax and semantics of simple exception constructions. Then I will show that indexical exception constructions with *else* and *otherwise* share the same properties and can receive the same semantic and syntactic treatment. I will then show that exception constructions have an extended range of application, applying not only to monadic quantifiers, but also to degree phrases, implicit universal quantifiers and, most importantly, polyadic quantifiers. After this, I will deal with the constructions that I argue are related to exception constructions, namely first the constructions in (2) and (3). I will raise the question of why the quantfier constraint holds for exception phrases and the constructions in (3). This will lead to a hypothesis about a general constraint on semantic operations operating on quantification domains. Inclusion and exclusion phrases provide a potential counterexample to this hypthesis. In the final section of this chapter, I will discuss why this might be so.

5.2. Exception constructions

5.2.1. The syntactic structure of simple exception constructions

5.2.1.1. The distinction between free and connected exception phrases

Exception constructions fall into two syntactically and semantically different types. Following Hoeksema (1987, 1989, 1991), I will call these two types **'connected'** and **'free' exception phrases.** These two types differ both in the exception expression, in the syntactic relation to the phrase they associate with and, to some extent, in their semantic properties. Connected exception phrases can be *but* phrases and exception phrases of the form *except* -NP. They can occur ajoined to an NP or extraposed:

(5) a. Everybody [but John] / [except John] came.

b. Everybody came [but John] / [except John].

I will call the NP that an exception phrase relates to (such as *everybody* in (5a)) the **'associate'** of the exception phrase.

Free exception phrases are of the form *except for* NP. At first sight, they seem to have the same distribution as *but* phrases:

(6) a. Everybody except for John came.
b. Everybody came except for John

However, as Reinhart (1990) observes, the constraints on the relation between a potential trace position in the associate and a free exception phrase are weaker than those on overt syntactic movement or extraposition. For example, the associate need not c-command the exception phrase, as in (7a) and (7b).

(7) a. Except for Hegel, John likes the work of every philosopher.
b. The mother of every boy came except for John.

The constraints on S-structure movement and extraposition, however, hold for extraposed *but* phrases (cf. von Fintel 1991, 1992a):

(8) * The mother of every boy came but/except John.

Reinhart also observes that basic properties of the relation between a free exception phrase and its associate are also exhibited by the relation between phrasal comparatives and their correlate, as seen in (8).

(9) The work of more philosophers was published than poets.

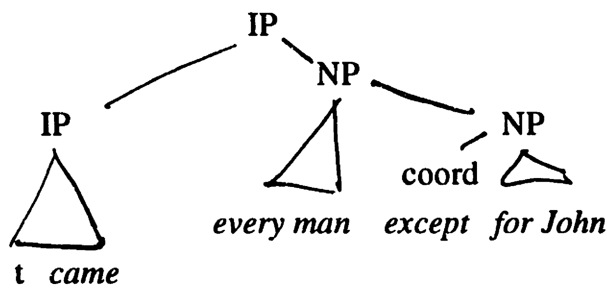
5.2.1.2. Syntactic accounts of free exception phrases: Reinhart (1990)

Only one syntactic theory about the relation between free exception phrases and their associate has appeared in the literature, namely that of Reinhart (1990). I will briefly discuss this proposal and present a number of reasons for not adopting it.

Reinhart (1990) presents a theory in which 'extraposed' exception phrases as in (10a) involve quantifier raising of the associate phrase and coordination of the associate phrase and the exception phrase at LF as in (10b) - in the same way as it occurs in bare argument ellipsis (see chapter 2):

(10) a. Every man came except for John.

b.



There are several questions raised by this account. First, is there independent evidence for coordination of the exception phrase with the associated NP? Second, are sentences with free exception phrases in fact equivalent to sentences in which the exception phrase is adjoined to the associated NP, as this account predicts? With regard to this latter question, throughout the next few sections, we will see evidence that such an equivalence does not hold. There are various phenomena that show that free exception phrases are not equivalent to connected exception phrases. Let me briefly address the first question.

Exception constructions exhibit phenomena that are indicative of the parallelism condition on coordinate structures (see chapter 1). First, a pronoun cannot act as a bound pronoun in an exception sentence, if the exception phrase does not contain a coreferential NP which c-commands the pronoun.

(11) * *Every man* except the brother of *John* met *his* wife.

(11) cannot have a reading in which every man met his own wife and the brother of John did not meet John's wife. That is, *his* has to act as a bound variable pronoun both with respect to *every man* and with respect to *the brother of John.*

Similarly, the parallelism condition holds for the determination of the evaluative antecedent of *each other*:

(12) All the children believe that they hate each other except Mary's children.

If *all the children* is the evaluative antecedent of *each other* in (12), then for the interpretation of the exception phrase, *all the children of Mary* must be the evaluative antecedent as well, rather than *they*. Conversely, if *they* is the evaluative antecedent in the main clause, it must be the evaluative antecedent for the exception phrase as well.

Another apparent indication that exception phrases involve coordination comes from the possibility in some languages, for example English, of what looks like gapping, as in (13).

(13) Every man danced with every woman except John with Mary.

However, later I will show that (13) is not a true case of gapping since it exhibits different syntactic properties.

Other apparent 'symptoms' of coordination in exception constructions can be derived independently, without requiring a coordinate structure. They follow simply from the fact that the same logical predicate has to apply to the exception as applies to the other elements in the quantification domain. In other words, when evaluating the quantifier with the exception phrase, the predicate has to be applied with one and the same meaning: it cannot be taken with a different meaning when verifying the exception as an exception than when evaluating the other elements.

Given that there is no strong evidence for true coordination with exception phrases and that the equivalence between sentences with free exception phrases and those in which the exception phrase is adjoined to its associate does not hold, I will simply make the following assumption. Exception phrases are PPs that are base-generated as either adjoined to the quantified NP (in the case of *but* phrases) or adjoined to the sentence itself. In the latter case, the exception phrase has to enter a special syntactic relation to the associate. This relation presumably is of the same type as the syntactic relation 'extraposed' phrasal comparatives enter to their correlate.

5.3. The semantics of exception phrases

5.3.1. Basic semantic properties of exception phrases

In this section, I will mention three basic semantic properties of exception construction that any semantic analysis has to account for, [1] a constraint on the associate of a the exception phrase, which I call the 'Quantifier Constraint', [2] what I call the 'negative condition' and [3] what I call the 'condition of inclusion'.

5.3.1.1. The Quantifier Constraint: first observations

Exception constructions seem to impose a general condition on the quantifier they associate with. The condition is that the quantifier be either universal or negative universal. That is, the quantifier may be *every, all* or *no*, but not, for instance, *most, few* or a cardinal quantifier. This is seen for connected exception phrases in (14).

(14) Every boy / All boys / No boy / * Most boys / * A lot of boys / * Three boys /
* Few boys but / except John came.

This constraint was discussed in particular by von Fintel (1991, 1992a). I call this the 'Quantifier Constraint'. It is given in (15).

(15) <u>The Quantifier Constraint</u>
The associate of an exception phrase must be a universal or a negative universal quantifier.

Free exception phrases impose the same constraint, except that many speakers allow the quantifiers *most* and *few* as well. This is an issue I will return to later.

(16) Except for John every boy / all boys / no boy / * a lot of boys / * three boys / (?) most boys / (?) few boys came.

But beside universal and negative universal quantifiers, free exception phrases may also associate with *only*. *Only* is an expression that has quantificational force; but when it attaches to an NP, the range of the quantifier it involves is not the denotation of the N' of the NP, but rather the VP denotation. With *only* an exception phrase can in fact associate with the VP, thereby it obligatorily has to be adjoined to the sentence, rather than to the NP with *only*.:

(17) a. Only girls passed the exam except for John.
b. * Only girls except for John passed the exam.

Here the exception phrase modifies a universal quantifier ranging over the VP denotation which is associated with the meaning of *only* as indicated in (18):

(18) Ax[passed the exam(x) except John] [girls(x)]

The Quantifier Constraints as described in this section is thus not correct. What is not correct, basically is that the constraint should not be a constraint on a single quantifier, but rather a constraint on the 'quantificational context' in which the associate occurs. Later we will see how the constraint should be appropriately be recast as a nonlocal constraint on the semantic context of the associate, instead of a local constraint on an associated quantifier.

5.3.1.2. The negative condition

Another general fact about exception constructions is that they carry what I call the **'negative condition'**; that is, simply, the exceptions have to be exceptions. More precisely, applying to the predicate to the exceptions should give the opposite truth value from applying the predicate to nonexceptions. Thus (19a) implies that John did not come and (19b) that John came.

(19) a. Every boy except John came.
b. No boy except John came.

The negative condition is a relatively independent condition on exception constructions and is, in particular, independent from the function of exception phrases as taking away elements from the domain of quantification. This can be seen from the contrast with the expression *other than*. *Other than* shares with exception phrases this latter function, but unlike exception phrases does not carry the negative condition. Thus, since (20) is fine, the second conjunct in (20) obviously does not imply that John does not come.

(20) John came and everybody other than John came.

Note that *other than* does not impose the Quantifier Constraint either.

(21) Somebody / Three people other than John came.

However, we will see later that the property of imposing the Quantifier Constraint and the property of imposing the negative condition are independent of each other.

There are expressions that associate with an NP that are not exception phrases, but still impose the negative condition. Among those are 'but not'-phrases, as in (22).

(22) Some people but not John went to the movie.

5.3.1.3. The condition of inclusion

Exception phrases impose another important condition, namely the condition that the exception elements fall under the restriction of the relevant quantifier. Thus (23) implies that John is a boy.

(23) a. Every boy except John came.
b. Every boy came except for John

I will call this implication the **'condition of inclusion'**. The condition of inclusion is independent of the negative condition. This is seen from the fact that, for instance, *other than* imposes the condition of inclusion, but not the negative condition. Thus (24) implies that John is a boy.

(24) Every boy other than John came.

Conversely, some expressions, for instance 'but not'-phrases impose the negative condition, but not the condition of inclusion. Thus (25) is fine.

(25) Every man but not Mary came.

We have seen that 'but not'-phrases and 'other than'-phrases differ from exception phrases in either the negative condition or the condition of inclusion. Furthermore, 'other than'-

phrases and 'but not'-phrases do not impose the Quantifier Constraint. The semantics of 'but not'-phrases and 'other than'-phrases can be given in the following way. 'Other than'-phrases are N'-modifiers with the content indicated in (26):

(26) [*boy other than John*] = λx[boy(x) & x $\neq$ [*John*]].

Clearly, in order for *other than John* in (24) to be not trivial it must be presupposed that John is a boy, that is, the condition of inclusion should hold. From the meaning as given in (26), of course, the negative condition does not follow.

The analysis of 'but not'-phrases in the relevant cases should look roughly as follows. 'But not'-phrases are coordinated with the NP. 'But not'-phrases lead to 'big' m-planes. Hence their semantics is the negation of the predicate holding of the entity given by the 'but not'-phrase, as in (27):

(27) [*Every boy but not John came*] = [*every boy came and John did not come*]

We have identified three basic properties of exception phrases in a descriptive manner. The question now is, what exactly should the semantic analysis of exception constructions be, such that these properties follow from the account. Clearly, the semantic operation for exception phrases must be different from both the semantic operation for 'other than'- phrases and for 'but not'-phrases.

5.3.2. The formal semantics of exception phrases

5.3.2.1. What do exception phrases operate on?

There are several proposals in the literature about what kind of semantic operations exception phrases are associated with.

In a series of papers (Hoeksema 1987, 1989, 1991), Hoeksema has present a variety of suggestions concerning the semantics of exception phrases. In his earlierst paper on exception phrases, Hoeksema (1987) proposes that exception phrases subtract a set of elements from the universe with respect to which the sentence is evaluated. Thus, the semantics of exception phrases would be as in (28):

(28) $[\textit{Except for } A, S]_E$ is true iff $[S]_{E-[A]}$ is true.

However, there are a number of counterexamples to the view that exception phrases subtract a set from the universe with respect to which the entire sentence is evaluated. Generally, only one NP may be affected by an exception phrase.

(29) a. John's father hates everybody except John.
b. Some people hate everybody except themselves.

In (29a), as noted by Hoeksema in a later paper (Hoeksema (1989), the exception phrase subtracts an element from the domain of a quantifier which is the referent of another NP in the sentence. (29b) could not possibly be true if the values of *themselves* were subtracted from the entire universe, since *themselves* is a variable bound by another quantifier in the same sentence.

Another type of counterexample was also noted by Hoeksema (1991):

(30) a. In a graphic tree, except for the root node, every node is dominated by another node.
b. Except for my youngest sibling everybody in my family has a younger sibling.

In (30a), if the exception phrase would take away the 'root node' from the universe of the entire sentence, it would not make the sentence true, but rather create as many new exceptions as there are nodes in the tree immediately dominated by the root node.

Hoeksema in a later paper (Hoeksema 1989) presents a different proposal. He proposes that exception phrases do not modify the universe, but rather the entire model. Informally, his proposal can be given as in (31).

(31) Q(A) *except* C P is true in a model M iff in every model M' which minimally differs from M in that P(C) has the opposite truth value from the one it has in M, Q(A)P is true in M'.

This proposal accounts for the counterexamples of the type in (29). However, as

Hoeksema (1991) notes, the examples in (30) present serious problems for this view.

A way to account for both types of examples is to let exception phrases subtract a set of elements only from a local quantification domain, which is associated only with a single quantifier. A relativization of quantifiers to a local quantification domain has been proposed by Westerstahl (1984) in order to account for the uniqueness condition of definite NPs. If the function of a definite NP is to refer to the unique entity or set of entities satisfying the description, then in sentences such as (32) different definite NPs have to be associated with different domains:

(32) The men saw the other men.

Westerstahl calls these local quantification domains **'context sets'**. Westerstahl modifies the notion of a generalized (dyadic) quantifier from a relation between two sets to a function from context sets into relations between two sets which satisfy the condition in (33).

(33) $Q^X(A, B)$ iff $Q(X \cap A, B)$

The schema for the semantic interpretation of (both connexted and free) exception phrases can now be given as in (34):

(34) $Q^X(A, B)$ except C iff $Q^{X-[C]}(A, B)$ and $B([C]) \neq [B(a)]$ for any $a \in A \backslash [C]$.

The second conjunct in (34) says that applying the predicate to the exceptions should yield the opposite truth value from applying the predicate to any element in the restriction of the quantifier which is not an exception. This way, positive quantifiers such as *every* and negative ones such a *no* are accounted for simultaneously. The fact that an exception phrase enters a specified syntactic relation to the quantifier it associates with is further evidence that the exception phrase applies to a domain of a specific quantifier, rather than the entire universe.

Besides subtracting an element from the quantification domain, it is part of the meaning of the exception construction that the exception does not satisfy the predicate expressed by the sentence. Thus, so far we have the following two conditions as the semantic effect of an exception phrase:

(35) QA[*but*]C B is true only if Q(A-C)B is true and for every c in C B(c) has the opposite truth value of B(a) for a in B\C.

The restriction on the quantifier should now follow from a semantic condition relating the exception set and the quantifier.

5.3.2.2. The Quantifier Constraint: the proper generalization

The Quantifier Constraint as formulated in (15) is a local condition, which has to be satisfied only by the quantifier which the exception phrase associates with. In this section, I will show that the constraint is rather different in nature. The constraint is, though with certain limits, not a local constraint on a single quantifier, but rather a constraint on the context in which the associate of the exception phrase occurs. There are three types of evidence in favor of the constraint being global in nature and not a matter of whether the associate is a universal or negative universal quantifier.

First, the associate may be a definite NP whose semantic values are dependent, for instance, on a universal quantifier:

(36) a. Mary saw the father of every girl except the father of Sue.
b. The wife of every president came except the wife of George Bush.

Second, exception phrases may associate even with indefinite NPs, namely when they are in the immediate scope of a negation, as in (37). This is particularly clear in a language such as German, where there are no ambiguities between negative polarity *any* and free choice *any* in the scope of negation. Examples are given in (38). Another condition is that the negation has to belong semantically to the same clause as the exception phrase, as seen in (39) (although this condition seems to be somewhat subject to dialect variation).

(37) John didn't buy anything except for a few rings.
(38) a. weil Hans hier noch nie jemanden getroffen hat ausser Mary.
because John here never anybody met has except Mary
b. weil Hans noch nie jemandem etwas geschenkt hat, ausser Maria eine Blume
because John never anybody something given has except Mary a flower

c. Hans weigerte sich, jemandem zu helfen ausser seiner Schwester
'John refused to help anybody except his sister.'

d. Hans leugnete, dass jemand krank war ausser seiner Schwester
'John denied that anybody was sick except his sister.'

e. Kein Mädchen wollte mit einem Jungen tanzen ausser mit Hans.
'No girl wanted to dance with a boy except with John.'

(39) * Hans hat nicht behauptet, dass jemand krank war ausser seiner Schwester.
'John did not claim that anybody was sick except his sister.'

This shows that the condition on the quantificational force of the NP that is associated with an exception phrase cannot be a local condition, i.e. a condition satisfied only by an NP denoting a generalized quantifier. Rather, it might have to take into account the entire semantic structure of the clause.

The generalization that the indefinite NP be in the immediate scope of the negation is not quite correct. Generally, other indefinite NPs may intervene, as in (40):

(40) a. Never did any student read any book except this novel

b. Today no guide showed any visitor any painting except the Mona Lisa.

The third type of evidence that the constraint in question is global in nature comes from the fact that universal quantifier do not always license exception phrases. There two contexts in which a universal quantifier does not license an exception phrase. First, universal quantifiers in the scope of negation: This holds for free exception phrases as in (41) and the same way for connected exception phrases as in (42).

(41) a. * Except for John, not everybody was there.

b. * Except for you I did not meet everybody.

(42) a. Not everybody except for John was there.

b. I did not meet everybody except for you.

Furthermore, in certain positions, free exception phrases cannot associate with universal quantifiers when they are in the semantic scope of an indefinite. This was noted by Hoeksema (1991) with the examples in (43).

(43) a. * Except for this cadillac, someone damaged every car.

b. Except for John, every professor introduced some applicant to every student.

In (43b) the exception phrase can associate only with the first universal quantifier. (43b) is possible only when John is the exceptional professor, not the exceptional student.

However, the restriction against free exception phrase associating with a universal quantifier in the scope of an indefinite does not hold for all positions in which the exception phrase may occur. Furthermore, it does not hold for connected exception phrases. This is seen in the following examples which are all acceptable with the relevant interpretation.

(44) a. Somebody damaged every car except for this cadillac.
b. Every professor introduced some applicant to every student except for John.

(45) a. Somebody damaged every car but / except this cadillac.
b. Every professor introduced some applicant to every student but John / except John.

Without going into further details, the data given in this section justify the following conclusions. First, the constraint underlying the Quantifier Constraint is not generally a local condition that has to be met just by the quantifier associated with the exception phrase. Rather it is a constraint that may have to be satisfied by the context in which the associate of the exception phrase occurs. Second, this context, depending on whether the exception phrase is free or connected and on its position in the sentence, may be the entire sentence or it may be only part of it. I will call this context the **'domain of the exception phrase'**. In (43a) this domain is the entire sentence; in (43b) it is only the NP. The Quantifier Constraint given in (15) should now be reformulated as a constraint on the domain of the exception phrase.

Hoeksema (1991) proposes a formulation on the constraint underlying the Quantifier Constraint which takes into account its global nature. This formulation says that a sentence with an exception phrase should be closed under subdomains (or submodels) and under unions of domains (or union of models). However, his formulation still involves the universe of the entire sentence, not a local quantification domain. Furthermore, Hoeksema incorrectly assumed that what I call the domain of the exception phrase is always the entire sentence. I will reformulate his condition as the Revised Quantifier Constraint in (46), taking into account both the variability of the domain of the exception phrase and the fact that the exception phrase involves context sets of quantifiers, rather than the entire universe.

(46) The Revised Quantifier Constraint

If S is the domain of an exception phrase associated with a quantifier Q with the context set X, then the conditions (i) and (ii) have to hold.

(i) Closure under subdomains with respect to Q

If $X' \subseteq X$ and $[S]_X$, then $[S]_{X'}$.

(ii) Closure under unions of domain with respect to Q

If $[S]_X$ and $[S]_{X'}$, then $[S]_{X \cup X'}$.

Let us see how these conditions apply to the relevant cases.

In the case of indefinite NPs in the scope of negation, it is obvious that closure under union of domains and under subdomains holds.

In the case of universal quantifiers associated with an exception phrase in the scope of an indefinite, the two conditions are not satisfied if the domain of the exception phrase includes the indefinite NP. The condition under union of models might not be satisfied because only distinct entities could satisfy the indefinite NP in the two models. The condition of closure under subdomains is not satisfied if the entities that would satisfy the indefinite NP are taken away from the domain.

The application of the two conditions to the case of definite NPs dependent on universal quantifiers is more problematic. Let us say that in the relevant cases, the domain is the entire sentence. Then, provided that the union of two domains preserves the uniqueness condition, the condition of closure under subdomains is satisfied. If a subdomain still contains, for every value of the universal quantifier, an entity satisfying the definite NP, then closure under subdomains is also satisfied. Thus the two conditions can be satisfied only under additional assumptions concerning the domains.

5.3.3. Explaining the Quantifier Constraint

5.3.3.1. Prior syntactic and semantic explanations of the Quantifier Constraint

I will first discuss and subsequently reject two approaches to an explanation of the Revised Quantifier Constraint and then present my own explanation in the next section.

First, one might try to exclude the unacceptable examples syntactically. For instance, as was suggested to me by David Pesetsky, one might argue that NPs allow for only one specification regarding the cardinality or constitution of the domain associated with the NP. This restriction would be a uniqueness condition regarding a certain syntactic function in an NP. Since exception phrases provide information about the constitution of a quantification domain, they would fullfill this function. Thus cardinality attributes such as *many* and *three* cannot cooccur with an exception phrase in an NP. An account in the same spirit was proposed by Carlson (1981) for restrictions on a related constructions, namely extent clauses, which as we will see in section impose exactly the same constraint.

However, this account seems to make the wrong predictions in certain cases. For example in (47) a universal quantifier cooccurs with a cardinality attribute and still allows for an exception phrase:

(47) all three hundred / those many students except John

This approach also fails for a number of principled reasons. First, as we will see in the next section, exception phrases may operate on a semantic or pragmatic level that is relatively independent of a particular expression in a sentence and thus cannot be subject to a syntactic cooccurrence restriction. Second, it appears that the condition is insufficient; even quantifiers without cardinality specification may disallow exception phrases, as in (48):

(48) * not all / ?? almost all students except John

Thus, it appears that the condition should be purely semantic in nature. This is supported by the fact that it occurs in a variety of different exception constructions, not only with exception phrases associating with NPs, as we will see.

A semantic attempt of deriving the Quantifier Constraint was made by von Fintel (1991, 1992a). I will first present his proposal and its main motivation and then show that it is untenable for a number of reasons.

Von Fintel (1991) has noted that there is a uniqueness condition associated with an exception phrase. For a quantifier in a sentence there can be only one exception set and this exception set must be specified by the exception phrase. This **uniqueness condition** is stated in (49).

(49) Exception phrases specify a unique set as the the exception set.

Von Fintel claims that the set is unique by being the smallest set among the potential exception sets. He provides two sorts of evidence for the uniqueness condition. First, an inference from (50b) to (50a) is impossible. The reason is that the set of exceptions should be the smallest set, hence if it consists of only John in (50a), there cannot be a greater exception set such as the one containing John and Bill in (50b).

(50) a. Every student but John passed the exam.
 b. Every student but John and Bill passed the exam.

Second, an iteration of exception phrases is generally impossible:

(51) a. *every student but John and but Bill
 b. *every student but John but Bill

This, again follows from the requirement that there be unique exception set. The evidence from the lack of iteration, hoever, seems rather weak. With *except*, coordinated exception phrases are fine; noncoordinated exception phrases seem to be excluded for syntactic, rather than semantic reasons, in the same way as other PP adjuncts, as in (52)c.

(52) a. Every boy except John and except Bill came.
 b. * Every boy except John except Bill came.
 c. the book about this princess and about India
 d. * the book abour this princess about India

Thus the evidence for the uniqueness condition is not uncontroversal.

Von Fintel proposed the following condition on sentences with exception phrases. A sentence with an exception phrase is acceptable only when the exception phrase refers to the smallest set of entities such that if this set is subtracted from the quantification domain of the relevant quantifier, the sentence comes out true. This is called the '**Minimality Condition**', which is more formally given in (53).

(53) The Minimality Condition on Exception Phrases

The set of exceptions to a quantified sentence Q(A, B) is the smallest set C such that Q(A-C, B) is true.

I will now show how the Minimality Condition applies to the various cases.

Exception phrases with quantifiers such as *many, three* and *few* are ruled out since with these the exception phrase generally does not denote a unique set, satisfying the condition in (53). There is generally more than one set which, when subtracted from the quantification domain, would make the sentence true.

Von Fintel's condition rules out certain quantifiers with exception phrases, for instance *most* as in (54), where more students than only John, let us say Joe and Bill, did not pass the exam.

(54) # Most students except John passed the exam

Applying (53) to (54), it is clear that there are more than one exception set that when taken from the set of students would make the sentence true, for instance {Joe, Bill, John}.

Furthermore, von Fintel's condition makes the right predictions with respect to NPs with numerals. In a universe of exactly eleven students, (55) is unacceptable:

(55) # Ten students except John passed the exam.

Von Fintel's condition rules out (55) in the following way. Given all students other than John passed the exam, then taking John away from the set of the students, the singleton set consisting of John is not smallest set such that 'exactly ten students' passed the exam is true. The empty set would be a smaller set such that when it was taken away from the set of students would makes the sentence true - since the sentence without the exception phrase is already true.

(55) also comes out as unacceptable when the universe contains ten students, where nine of them passed the exam and where only John did not pass the exam. Since taking away the empty set from the set of students, does not make the sentence true and since there is no other student than John who failed the exam. the singleton set containing John is the smallest set, which, when subtracted from the set of students, would make the sentence true.

The Minimality Condition works quite well for most cases. However, there are both serious conceptual and empirical problems with von Fintel's proposal.

First, von Fintel's proposal is conceptually problematic. The Minimality Condition as stated in (53) confuses truth conditions with acceptability conditions. An exception sentence not meeting (53) is not false, as von Fintel would predict, but rather unacceptable. For instance, a sentence such as *some men except John came* is simply unacceptable, not false.

Second there are examples which show that von Fintel's condition is empirically inadequate. First, consider a model in which John and Mary are the only students and John passed the exam, but not Mary. In this model (56) is unacceptable - as it is for any model.

(56) # More than half of the students except Mary passed the exam.

However, von Fintel's proposal would predict that (56) is true in this case. The set consisting of John and Mary makes up all the students and hence more than half the students. The sentence *more than half of the students passed the exam* is false and the set containing only Mary is the smallest set such that when subtracted from the quantification domain, the sentence becomes true.

Another counterexample to von Fintel's proposal are the examples by Hoeksema where the indefinite NP takes scope over a universal quantifier which is associated with the exception phrase. Consider (43a) repeated here as (57).

(57) # Except for this cadillac, somebody damaged every car.

The Minimality Condition may accidentally be satisfied by (57) with respect to a given model in which there is exactly one person having damaged every car. This also holds for (43b) repeated here as (58), namely for a model in which exactly one applicant was involved in the introductions to the students by professors.

(58) Except for John every professor introduced some applicant to every student.

These two violations of von Fintel's condition show a very general point about the nature of the constraint on the associate of the exception phrase. The constraint on the associate of the exception phrase must take into account the meaning of the quantifier, that is, other models with respect to which the exception sentence is evaluated. It cannot just make reference to the intended model. That is, the constraint cannot be a constraint that can be accidentally satisfied for a given model, with the Minimality Condition proposed by von Fintel. The relevant condition on exception phrases must involve models other than the intended one.

This shift from a condition on exception phrases relative to a given model to a condition involving other models can be compared to the distinction between local and global constraints on quantifier denotations in the theory of generalized quantifiers (see in particular van Benthem 1987, Westerstahl 1989). A local constraint is a constraint relative to a given universe, a global constraint a constraint across universes.

Another problem with von Fintel's analysis is that the Minimality Condition is not applicable at all in certain cases; namely, when there is no specific or a potentially empty exception set, as in (59).

(59) a. all students except at most three
b. all students except perhaps John

Two final remarks about von Fintel's proposal are in order. First, von Fintel's condition was intended only for connected exception phrases. But we have seen that free exception phrases are also subject to the relevant constraint, although not in the same strict way. Second, von Fintel does not account for the cases in which the constraint is not satisfied locally, but globally, that is, not just by the associated quantfier. However, the

Minimality Condition can in principle be modified in such a way that it may be satisfied by a domain larger than the associated quantifier.

In the next section, I will propose a different condition as the constraint underlying the (local or global) restrictions on the associate of an exception phrase. This condition takes different quantification domains into acount. Furthermore, the condition will instantiate a more a more general condition on semantic operations on quantification, a condition which requires that semantic operations on quantification domains be 'recoverable'. This condition, instantiated in appropriate ways, will explain why constructions other than exception constructions exhibit the same restriction to universal and negative universal quantifiers, namely *almost*, extent clauses and amount relatives.

5.3.3.2. An explanation in terms of the recoverability of the exception set

The condition on the associate of an exception phrase that I will propose is based on the idea that the exception set should be recoverable from any context set with respect to which the quantifier is evaluated. I will formulate the constraint for the cases in which the quantifier alone, regardless of its context, satisfies the constraint. Then I will indicate how the constraint can be satisfied by the context in which the associate of the exception phrase occurs.

The basic idea of the condition is as follows. Given a sentence S and an occurrence of a quantifier Q in S with the restrction A, there has to be a function f that gives for any S, A, Q, **any context set** X and a set of verifiers for Q with respect to X, A and B, the exception set for Q. A set of verifiers of a quantifier in a sentence is defined as follows, where a generalized quantifier now is conceived as function from set to sets of sets.

(60) Y is a **set of verifiers** for Q, X, A and B iff $Y \subseteq X \cap A \cap B$, $Y \in Q^X(A)$.

In the following, I will denote an arbitrary set of verifiers for a quantifier with respect to an argument A by '**D(Q, X, A, B)**'.

A set of verifiers for *some* in *some man came* is any set of men that came. A set of verifiers for *a lot* in *a lot of men came* is any set of men that came and that exceeds a given expected cardinality.

The point now is that such a function f as given above can exist only when there is a unique set of verifiers for any context set of the quantifier Q. There are only two quantifiers for which this is the case, universal and negative universal quantifiers. A set of verifiers for a universal quantifier in a sentence is always the intersection of the context set with the restriction. A set of verifiers for a negative universal quantifier is always the empty set. In contrast, given an appropriate context set and a model, an existential quantifier may have several sets of verifiers. Thus if two men x and y in the context set for *some* in *some man came* came, then *some* has three sets of verifiers {x}, {y} and {x, y}. Similarly *a lot* may have several sets of verifiers given an appropriate context set.

The condition that the exception set be recoverable means the following. There has to be a function f which yields for any (dyadic) quantifier, its restriction and its second argument and any context set, the exception set of that quantifier with respect to the context set and its two arguments. The exception set clearly is the complement of the set of verifiers in the intersection of the context set with the restriction. Such a function can exist only if there is a unique set of verifiers for any context set for the quantifier relative to an argument.

More formally, the condition on the associated quantifier for an exception phrase is as in (61):

(61) The Recoverability Condition on the Exception Set

Let Q be a quantifier occurrence in S with the restriction A and the scope B. Then for any context set X for Q, there is a function f as defined below, where D(Q, X, A, B) is a set of verifiers for Q relative to X.

$f(Q, X, A, B) = X \cap A \cap B\text{-}D(Q, X, A)$.

The recoverability condition as stated in (61) rules out all quantifiers as the associate of an exception phrase except universal and negative universal quantifiers. Thus, it also rules out the first counterexample to von Fintel's proposal.

The general idea of this condition intuitively accounts for the other problematic cases, as well. The problem only is how to formulate the condition in a sufficiently general manner so that it applies not only locally (i.e. to a particular quantifier), but also to a larger domain of the exception phrase.

I will not give the full generalization of the recoverability condition for arbitrary domains, but will restrict myself to domains which consist of at most one negation or quantifier taking scope over the quantifier in question.

(62) $-(Q(A, B)) = (-Q)(A, B)$

(63) Let S be of the form $Q_1(A, \{y|Q_2(A', B[y])\})$. Then there is a function f from the set of verifiers of Q_1, X, A, and $\{y|Q_2(A', B[y])\})$ for any context set X and the set of verifiers of Q_2, Y, A' and B[y] to the exception set for any context set V such that the following holds:

$f(D(Q_1, X, A, \{y|Q_2(A', B[y])\}), \{Y|\ y \in D(Q_1, X, A, \{y|Q_2(A', B[y])\quad Y = D(Q_2,$ V,

$A', B[y]), A', B[y])$

$= \{W| \exists y\ y \in D(Q_1, X, A, \{y|Q_2(A', B[y])\}) \ \&\ W = X \cap A \cap B[y]-D(Q_2, X, A)\}.$

If Q in (62) is an existential quantifier, then clearly (-Q) is a negative universal quantifier and hence the quantifier constraint is satisfied. (63z) requires that there be function mapping the set of verifiers of the first quantifier and the set of sets of verifiers of the second quantifier, which is dependent on the first quantifier to the set of exception sets to the second quantifier relative to a verifier of the first quantifier. If there is such a function f, then the set of verifiers of Q1 must also be unique. hence Q1 in (63) must be a universal or negative universal quantifier.

Why should (61) hold? Should it simply be part of the lexical meaning of *except, but* and other exception expressions or can it be derived from something else? The most appealing way to think of it is to consider it a universal constraint imposed on semantic operations of a certain kind. Such a constraint would have a similar status as universal semantic constraints on quantifier denotations in the theory of generalized quantifiers (see in particular Barwise/Cooper 1979). One may think of the constraint in (61) as an instance of a more general condition that certain semantic operations have to be recoverable. (In the present case, the semantic operation of subtracting elements from the context set of a quantifier). This would suggest the following correlation between the semantic operation of domain subtraction and the constraint in (62):

(62) All and only expressions whose semantic effect is domain subtraction are subject to the constraint (61).

Assuming that the recoverability condition follows independently from general conditions of certain types of semantic operations, the meaning of an exception construction will just consist of domain subtraction and a negative condition concerning the elements in the exception set, as was given in (35).

5.3.4. Further issues concerning the semantics of simple exception phrases

Let me mentioned a small puzzle with the semantics of *but*-phrases. This puzzle arises when *but* takes coordinated NPs as arguments, as in (63).

(63) everyone but John and Bill.

The problem with this example is that the semantic function of *and* here should be the same as for *and* which is interpreted by group formation (as in the semantics of plural NPs and in *John and Bill met.*) However, the associated quantified NP is not plural and contains only 'atomic' elements in its domain that are referents of singular nouns. Note also that *but* phrases are possible with plural NPs when associating with singular quantified NPs, as in (64).

(64) (?) every student except the mathematics students.

Let us now turn to a problem remaining with the second exception construction, namely free exception phrases of the form *except for* NP. Why is the quantifier constraint less strict for free exception phrases (cf. von Fintel 1991a, 1992). The quantifier in this case may be 'almost' universal or 'almost' negative universal, as in (65).

(65) a. Except for Mary, almost every student / most students failed the exam.
b. Except for Mary, almost no student / few students failed the exam.

That 'almost universal' is a requirement is seen in (66):

(66) * Except for Mary, half of the students / three students / many students failed the exam.

(65a) means taking away Mary from the set of students, which then includes almost every student, every one in this set failed the exam. This reading can be termed the appositive reading (cf. von Fintel 1991, 1992a), because the members in the exception phrase constitutes exactly the missing part that 'almost' makes reference to.

How can the appositive reading be accounted for? I suggest a treatment in which the standard application of the semantic operation for exception phrases is maintained. Generally, the appositive reading occurs with proportional quantifiers such as *most* or *few*. Proportional quantifiers involve two sets: first the set denoted by the N' and second a smaller subset of it, as specified by the quantifier. Thus, *most students* involves the maximal set X of students and a subset X' of it. Now in the appositive use of *except John,* John is subtracted not from the set X', but rather from the set X. Therefore, in the appositive use, the second sentence in (65a) can adequately be paraphrased as in (67):

(67) Most of the students other than John

The appositive use also occurs with quantifier specifiers such as *almost*, as in (68):

(68) almost every student except John

Here the semantic operation associated with *except John* can apply to the quantifier phrase *almost every student.*

Thus, if this account of the appositive use of exception phrases is correct, the distinction between the appositive use and the standard use consists of which set the exception phrase relates to. Why can domain extraction with *but* exception phrases not apply to the second set of a proportional quantifier? Since *but* phrases involve a different syntactic relation than free exception phrases, it appears that this syntactic relation determines that the *but* phrase can only apply to the first set, the set the quantifier actually ranges over. This then leads to an unacceptable result since the constraint (46) would not be satisfied.

Clearly, if this treatment is correct, the term 'appositive' is rather misleading, since it suggests a different semantic operation associated with the exception phrase than the standard one. But in this account presented, the semantic operation is the same, only the target of application is different.

5.3.5. The range of association of free exception phrases

In this section, I will show that (free) exception phrases may associate with more than simple NPs. But what is important is that in all these constructions, exception phrases impose the Quantifier Constraint in an appropriately generalized way. This shows that the Quantifier Constraint is universal semantic constraint on exception constructions and independent of the form or nature of the particular associate of the exception phrase.

A free exception phrase need not associate with an NP quantifier. It may also relate to an adverb of quantification (in the nontemporal use) as in (69):

(69) Except for Bill the students generally / for the most part understood the question.

Furthermore, an exception phrase may in this construction also relate to an adjectival or adverbial degree phrase:

(70) a. Except for the first two questions, John did extremely well during the exam.
b. Except for the occasional bad wheather, John was very happy during his vacation.

The exception phrase may also relate to an adverb of completion:

(71) Except for the last chapter, John completely read the book.

In this construction, the exception phrase need not even relate to an explicit degree or quantifying phrase, but rather to some kind of implicit universal quantification as in (72).

(72) a. Except for the dessert, John enjoyed the meal.
b. Except for the first chapter, John liked the book.

(72a) may involve an implicit *completely* or alternatively this aspect may be part of the verb meaning.

There are also clausal exception constructions, for instance *except* followed by a *that* clause as in (73):

(73) a. Nothing happened, except that John fell from the tree.
b. Not much was going on, except that John was playing piano.

In this case, the exception phrase cannot associate with *nothing* or *not much,* since *happen* and *go on* do not admit *that* clauses:

(74) a. This event / ??That John fell from the tree happened yesterday.
b. This process / ?? That John was playing piano was going on.
(75) ?? What was going on was that John was playing piano.

Thus, it appears that in (73a) and (73b) the *that* clause denotes a fact that is an exception to what the main clauses expresses as a whole, rather than a fact that is subtracted from the quantification domain of *nothing*. Here then the exception phrase associates with the main clause itself, rather than with a quantifier.

There are other exception constructions of this type. One example is *besides the fact that* or *abgesehen davon* in German. This construction does not require any syntactic correlation, but still requires that the sentence modified have in some sense universal or negative universal force. For many speakers the following judgments hold for the German a-examples and their English translations as the b.-examples.

(76) a. ??Abgesehen davon, dass es regnet ist heute ein Feiertag.
b. ?? Besides the fact that it is raining, today is a holyday.
(77) a. Abgesehen davon, dass es regnet, ist Hans sehr gluecklich.
b. Besides the fact that it is raining, John is very happy.

What happens with these is that the exception phrase subtracts a fact from some set of facts expressed by the main clause as a whole, or even some set of facts that the main clause as a whole implies. The latter is presumably what happens in (77b). Here, a set of facts may be inferred from the main clause. This set consists of the facts that John is happy about x, that John is happy about y, that John is happy about z etc. A condition corresponding to the one on the associated quantifier in the case of phrasal coordination must hold here with respect to this set. This set must include all or almost all facts of a certain sort. For example in (77b) it must include almost all facts of the form 'John is happy about x', where 'x' stands about relevant aspects about which John might be happy or unhappy.

Another type of clausal exception construction are *unless*-sentences, i.e. conditional exception constructions, as in (78) (see von Fintel 1992b):

(78) a. If the weather is good, John will go to the beach, unless it is too hot.
b. John will go to the beach unless he has to work.

Unless sentences seem to have a similar range of association as other exception constructions. First, they can be associated with an explicit conditional clause of the relevant type (which can be considered a type of universal quantifier, see von Fintel 1992b). An example is given in (78a). Second, if the sentence is not overtly conditional, they can associate with the implicit set of all possible conditions, as in (78b).

The range of association that free exception phrases may have raises the following questions. First, how is the domain to which a free exception phrase applies construed? Does it correspond to the domain associated with the meaning of a particular subexpression of the sentence or is it generally construed on the basis of the overall meaning of the sentence? Second, should there be a syntactic relation between the exception phrase and the constituent which provides the domain? Alternatively, is a syntactic relation to the entire sentence sufficient? Third, what are the constraints on deriving a domain from the meaning of constituents or the meaning of the sentence itself?

Concerning the first question, it is quite obvious that the propositions representing the meaning of a sentence may vary in more than one respect; and hence there is no single potential domain of application for an exception phrase corresponding to the overall meaning of a sentence. Consider (79):

(79) John was always very happy except for his back pain.

(79) has two readings, depending on what the exception phrase relates to. Either it relates to *always*, namely when John's suffering in the back was only temporary, or it relates to *very happy*, namely when his suffering in the back was constant. That is, the exception phrase in (79) may relate either to the set in (80a) or to the set on (80b):

(80) a. {John was at t very happy| t is a relevant time}

b. {John was always happy to the degree d|d is a positive degree of happiness}

The availability of two distingishable readings shows that free exception phrases can make reference to a specific domain corresponding to a specific expression, rather than making general reference to the sentence as a whole.

Turning now to the question about the syntactic relation, it seems clear that in certain cases, free exception phrases of the form *for* NP must stand in a syntactic relation to an associate. Such cases were discussed earlier in relation to Reinhart's proposal. An example illustrating this is given in (81) (cf. von Fintel (1991)):

(81) * The paper that everybody submitted was good except for Lucie.

However, other exception constructions do not seem to be subject to a syntactic constraint - the only constraints seem to be semantic in nature.

5.3.6. Indexical exception constructions

Let me now discuss indexical exception constructions, which have not yet been discussed as such in the literature. These exception constructions are indexical in the sense that the subtracted element is given contextually. I will show that indexical exception constructions pattern in exactly the same way as exception phrases with *but* and *except* with respect to the restriction on the associated element and the range of association. Furthermore, indexical exception phrases may also apply to polyadic quantifiers.

There are exception phrases which are indexical in the sense that the exception element must have been mentioned previously in the discourse. One example is *else,* which is a **connected indexical exception phrase.** *Else* is restricted to occuring a position following a pronominal NP.

(82) * Mary laughed and no girl else laughed.

(83) a. Mary laughed and nobody else laughed.

b. * Mary laughed. Else nobody laughed.

c. * Mary laughed. Nobody laughed else.

(84) Mary didn't laugh, but everybody else laughed.

At first sight, *else* exception constructions do not seem to be subject to the same constraints as the constructions with *but* and *except*..

(85) somebody else / not everybody else / almost nobody else

Is there a principled distinction between *else* which is associated with a universal quantifier and acting as an exception phrase and *else* which is associated with an indefinite? One respect in which they differ is that *else* as an exception expression with a universal quantifier does not allow *than* complements. However, this is possible in some dialects of English for *else* with indefinite pronouns:

(86) a. ? someody else than Bill
 b. * everybody else than Bill

If *else*, associated with a universal quantifier, acts as a true exception phrase, then it should be incompatible with other exception phrases associated with the same NP. This prediction seems to be borne out:

(87) ? Mary laughed. Nobody else except Sue laughed.

What is the syntactic and semantic status of *else.*? *Else* is a negative anaphor, specifying that a referent is distinct from a certain entity or that a quantification domain does not include a certain object. *Else* may act both as a pronominal in Chomsky's (1982) sense and as a bound variable anaphor. Curiously, *else* cannot act as an anaphor taking a referential antecedent, as in (88a). It can act as an anaphor only when it also has the function of a bound variable, as in (88b).

(88) a. *John* admires somebody *else*.
 b. *Everybody* admires somebody *else*.

English has another indexical exception expression, which is restricted to the position of a sentence adverbial and thus is a **free indexical exception phrase**. This is *otherwise*.

(89) a. John came. Otherwise nobody came

b. John did not come. Otherwise everybody came.

Unlike *else, otherwise* can only act as an exception expression, imposing the familiar constraints on the associate:

(90) a. John did not come. Otherwise everybody / * three people / ?? many / ?? most people came.
b. John came. Otherwise nobody / ?? few people came.

Thus, *otherwise* in (90) is equivalent roughly to *except for him*.[4]

The various possible functions of indexical exception phrases are most clearly exhibited in German by one and the same expression, namely by *sonst*. *Sonst* can occur both adjoined to a pronominal quantifier and as a sentence adverbial.

(91) a. Hans kam. Niemand sonst kam.
'John came. Nobody else came.'
b. Hans kam. Sonst kam niemand.
'John came. Otherwise nobody came.'

Unlike *else* in English, *sonst* can associate only with universal quantifiers. That is, it can function only as an exception expression:

(92) Hans kam. * Jemand sonst / * Nicht jeder sonst / ?? Fast niemand sonst kam.
'John came. Somebody else / Not everybody else / Almost nobody else came.'

Still, it is compatible with a nonindexical exception phrase:

(93) Hans kam. Sonst kam niemand ausser Maria.
'John came Otherwise nobody came except Mary.'

To sum up this section, we have seen that there are exception expressions which differ from *except* and *but* phrases with respect to the indexical status of the exception entity. As for nonindexical exception phrases, there are two types of indexical exception phrases in English, connected and free indexical exception phrases. These two types of indexical exception phrases uniformly exhibit the Quantifier Constraint on the associate, at least as long as they truly function as exception phrases.

5.3.7. Exception constructions and polyadic quantification

In this section, I will show that exception phrases may have another target of application beside simple quantifiers and the range of other explicit and implicit quantifiers discussed in section 5.2.3. Exception phrases can apply to polyadic quantifiers, that is, quantifiers ranging over pairs or, more generally, n-tuples of entities. As we will see, this holds for all types of exception phrases that have been discussed. First, it holds both for connected indexical expressions in what I will call the multiple *else* construction. Second, it holds for free indexical exception constructions, i.e. *otherwise*. Third, it holds for nonindexical exception constructions, namely *except* phrases in a construction similar to gapping. Again, as with the other targets of application of exception phrases, polyadic quantifiers are subject to the Quantifier Constraint.

Beside introducing another type of associate of exception phrases, this section will draw a number of conclusions about the status of polyadic quantifiers in natural language in general.

5.3.7.1.The multiple *else* construction and polyadic quantification

Keenan (1991) has noted that two or more occurrences of *else* in a sentence may involve the quantification domain of a polyadic quantifier. Relevant examples are given in (94):[1]

(94) a. John praised Mary. Nobody else praised anybody else.
 b. John did not praise Mary. Everybody else praised everybody else.
 c. John gave Mary the book in the library, and nobody else gave anybody else anything else anywhere else.

The second sentence of (94a) has two readings. In the first reading, it can be understood as 'nobody other than John praised anybody other than Mary'. In this reading, it might describe a situation in which everybody other than John praised Mary, and John was the only one who praised somebody other than Mary. However, this is not the most plausible reading of the second sentence of (94a), given the sentence that precedes it. In the second, and more natural reading, the second sentence of (94a) means that no pair other than the pair consisting of John and Mary stands in the praising relation. Thus, what the *else-else* construction in (94a) does is subtracting the pair consisting of John and Mary from the quantification domain of a **dyadic quantifier** (NOBODY, ANYBODY), whose quantification domain consists of all pairs of the relevant people. In (94b) the same pair is subtracted from the dyadic quantifier (EVERBODY, EVERYBODY). Similarly in (94a), the four occurrences of *else* in the relevant reading have the joint effect of subtracting the quadruple (John, Mary, the book, the library) from the quantification domain of (NOBODY, ANYBODY, ANYTHING, ANYWHERE), whose quantification domain is a four-place relation. The multiple*else* construction can involve the quantification domain of a polyadic quantifier.

Polyadic quantifiers have been the subject of extensive investigation from a logical point of view in the theory of generalized quantifiers (see van Benthem 1987, 1991, Keenan 1987, 1991a, 1991). It is another question whether natural languages have true instances of polyadic quantification. Among the constructions that have been regarded as cases of polyadic quantification are, for instances, multiple wh questions (see Higginbotham/May1982), *same* and *different* in certain constructions (see Keenan 1987, 1991) and correlative constructions in Hindi (see Srivastav 1991). The multiple *else* construction and, as we will see, other exception constructions constitute another instance in natural language of polyadic quantification.

Let me introduce the relevant notions in the theory of polyadic quantification. In the theory of generalized quantifiers, a quantifier such as *every* (in one of two possible views) can be considered a relation between two sets X and Y. Such a quantifier is of the type <1, 1>, a monadic quantifier. A quantifier of type <2, 2>, a dyadic quantifier, is a relation between two binary relations. Similarly, a quantifier of type <3, 3> is a triadic quantifier, a relation between two three-place relations, and so on.

As a general fact, any sequence of unary quantifiers can be considered a single polyadic quantifier. For instance, the sequence of *every* and *some* in (95) with wide scope of *every* can be defined as the dyadic quantifier in (96). This quantifier is equivalent to the 'sequence' of monadic quantifiers in (97a).

(95) Every man loves some woman.
(96) (EVERY, SOME)(X x Y, R) iff $\mathrm{dom}(R \cap (X \times Y)) = X$

(97) a. EVERY([*man*], {a|SOME([*woman*], [*loves*]$_a$)}) = (EVERY, SOME)([*man*] x [*woman*], [*loves*])

b. $R_a = \{x \mid R(a, x)\}$

Polyadic Quantifiers which can be defined in terms of monadic quantifiers are called **'reducible polyadic quantifiers'.**

Conceiving of a sequence of monadic quantifiers in a sentence as a polyadic quantifier does not alter the truth conditions of the sentence at all, but it will alter the quantification domain of the quantifier: it is now a single quantification domain, containing n-tuples of entities. The quantification domain of a monadic quantifier is a set, whereas the quantification domain of a polyadic quantifier is the Cartesian product of two or more sets. Thus in (95), it is the set [*man*]x[*woman*].

The multiple *else* construction marks explicitly which of the monadic quantifiers in the sentence participate in forming a polyadic quantifier to whose domain the operation of domain subtraction applies to. In a later section, I will discuss in detail the syntactic and semantic conditions for polyadic quantifiers. In this section, I will only sketch the treatment of polyadic quantification that is required for the multiple *else* construction.

I will assume that the multiple *else* construction involves a relation between several quantifiers in the sentence which forms the basis for the operation that maps a sequence of quantifiers into a n-adic quantifier. For the second sentence of (94a) this relation is simply indicated in (98) by lower subscripts with the scope ordering relation indicated by natural numbers.

(98) [Nobody$_{(k,\ 1)}$ else loves anybody$_{(k,\ 2)}$ else]$_k$.

The formal semantic analysis of the *else* construction will look roughly as follows. Let us assume that *else* has the same lexical meaning as a pronoun, but a different structural meaning:

(99) [*else*] = [*he/she/it*]

We now formulate a rule which evaluates the two occurrences of *else* as a single occurrence of *else* relating to a dyadic quantifier:

(100) $[Q1\ \mathit{else}_1\ Q1\ \mathit{else}_2] = [F(\langle Q1, Q2\rangle\ \mathrm{except}(\langle[\mathit{else}_1], [\mathit{else}_2]\rangle))]$

Two questions arise concerning the relation between the syntax and the semantics of the multiple *else* construction. First, are there syntactic constraints restricting the relation between the quantifiers with *else,* and if so, are they restrictions on the relation between the occurrences of *else* or are they restrictions on when monadic quantifier may together form a polyadic quantifier? Second, is there independent evidence for a semantic operation such as the one in (100) which evaluates the two occurrences of *else* as a single exception phrase?

Concerning the first question, the multiple *else* construction in fact exhibits certain syntactic constraints. First of all, the *else* construction exhibits island constraints. It is impossible across wh islands and complex NPs in the polyaidc quantification reading. This is seen in (101a)and (101b). (101a) hardly allow for reading of the second conjunct as 'everybody knows what to give to everybody except that John does not know what to give to Mary'. It only allows for the reading as 'everybody except John knows what to give to everybody except Mary'. Similarly for (101b).

(101) a. ?? John does not know what to give to Mary, but everybody else knows what to give to everybody else.

b. ?? John did not see Mary's picture of Sue, but everybody else saw Mary's pictures of everybody else.

But, the multiple *else* construction also seems to be degraded simply across finite clause-boundary. Thus also (102) lacks the relevant reading.

(102) ?? John did not think that Mary was guilty, but everybody else thought that everybody else was guilty.

Interestingly, in the case of nonfinite clauses, the *else* construction is possible provided that the subject is a quantifier with *else*: Thus (103a) lacks the polyadic quantification reading according to which the second conjunct would mean 'nobody expects Mary to marry anybody except that John expects Mary to marry Bill'. But such a reading is available in (103b) and in (103c).

(103) a. ?? John expects Mary to marry Bill, and nobody else expects Mary to marry anybody else.

b. John expects Bill to come and nobody else expects anybody else to come.

c. John expects Mary to marry Bill, and nobody else expects anybody else to marry anybody else.

Why should such constraints hold? There are four possibilities for what exactly these constraints might restrict.

The first possibility is that it is a general constraint on quantifier absorption in the sense of Higginbotham/May (1982). Quantifier absorption applies to wh phrases in multiple questions after the application of QR to form a quantifier ranging over n-tuples. But clearly, instances of wh in situ involving absorption as in (104) are subject to constraints very different in nature. In particular, wh phrases in situ undergoing absorption are not subject to island constraints, as the possibility of an absorption reading in (104) shows.

(104) Which man wonders whether John likes which woman?

Second, the restrictions might be restrictions corresponding to general constraints on QR or quantifier scope. This certainly holds for the first two restrictions: the scope of a quantifier generally is subject to island constraints, and moreover, cannot even extend over finite clause boundaries with many quantifiers. I will come back to the question later of whether the formation of polyadic quantifiers is syntactically restricted in the same way as the scope of individual monadic quantifiers. Clearly, constraints on the formation of polyadic quantifiers need not be the only restrictions on the multiple *else* construction.

A third possibility for what constraints the multiple *else* construction is that the occurrences of *else* have to enter a syntactic relation to each other similar to anaphoric relations. This relation then would be subject to the relevant constraint. If this relation were the source for the restrictions, then the restrictions would not appear in constructions involving an operation on polyadic quantification domains, but not multiple occurrences of *else* or a similar expression. We will see, however, that the restrictions can also be found ir constructions not involving multiple occurrences of an expression. In particular, similar constraints can be found with the indexical exception expression *otherwise.*

Let me briefly address the second question concerning the status of the multiple occurrences of *else*. A few speculative remarks should serve as a tentative answer. It is suggestive that the multiple *else* construction classifies together with the 'resumptive use' of quantifiers in English. This use of quantifiers was noted by May (1985, 1987) for examples such as in (105).

(105) a. Nobody loves nobody.
  b. Few men admire few women.
  c. Many students asked many questions. (where each student might have asked less than many questions.

The general rule for the resumptive use of quantifiers can be given as in (106):

(106) $F(Q_1x, Q_2y)(R(x, y)) = Q_1x\ y(R(x, y))$, where Q_1 is of the same quantifier type as Q_2.

This corresponds to the rule on multiple *else* given in (100).

The parallel to the 'resumptive' use of quantifiers is not unproblematic. Most importantly, the resumptive use of quantifiers seems to be rather marginal and for many quantifiers not available at all, whereas the multiple *else* construction is fully grammatical. For instance, for (105c) many speakers do not get the relevant reading, namely where the two occurrences of *many* count the number of student-answer pairs. *Nobody* seems to be the only quantifier that readily allows for such a reading. Another construction that might involve the operation of quantifier resumption are multiple comparative subdeletion constructions, as discussed in chapter 4, section 5.3.

5.3.7.2. *Otherwise* and polyadic quantification

The possibility that exception phrases apply to the quantification domain of a polyadic quantifier is not restricted to the multiple *else* construction. Even the free indexical exception phrase *otherwise* may apply to the quantification domain of a polyadic quantifier - without occurring more than once in the sentence.

As we have seen earlier, *otherwise* essentially has the same meaning as *else*. The difference consists basically in that *otherwise* behaves like the free exception phrase *except for* NP, whereas *else* behaves like a *but* phrase or a phrase of the form *except* NP. Crucially, like *else*, *otherwise* can relate to several quantifiers and then involve the quantification domain of a polyadic quantifier. Consider (107).

(107) John talked Mary. Otherwise, nobody talked anybody.

In one reading, the second sentence of (107) is not equivalent to (108)

(108) Nobody else / other than John talked about anybody.

In order to see the difference between the second sentence of (107) and (108), consider a situation in which John talked about Mary and John talked about Sue, but in which there are no other pairs <x, y> such that x talked about y. In this situation, the second sentence of (107) can be considered false (namely if *otherwise* is understood as associating with both quantifiers); but (108) is certainly true. This difference in truth conditions means that *otherwise* in (one reading of) the second sentence of (107) subtracts the pair consisting of John and Mary from the quantification domain of the dyadic quantifier (NOBODY, ANYBODY), whereas the exception phrase in (108) subtracts the individual John from the quantification domain of *nobody* leaving the quantification domain of *anybody* as it is.

The possibility that a free exception phrase can involve a polyadic quantifier demonstrates a general point. It shows that the possibility of forming a polyadic quantifier is not based on a particular construction which picks out the quantifiers in question syntactically, such as the multiple *else* construction. Rather the formation of polyadic quantifiers from a sequence of unary quantifiers seems to be available independently.

It is an important question whether the reading of *otherwise* in which it associates with several quantifiers and involves an n-adic quantification domain is subject to syntactic constraints. In fact, this seems to be the case. In particular, the quantifiers may not be separated by a finite clause boundary. (109) has only a reading in which *otherwise* associates only with the first quantifier.

(109) John thinks that Mary is guilty. Otherwise nobody believes that anybody is guilty.

There is no reading of the second sentence of (109) which excludes a situation in which John believes also that Sue is guilty. However, such a reading is available if the second quantifier is the subject of an ECM clause:

(110) John believes Mary to be guilty. Otherwise nobody believes anybody to be guilty.

Thus, it appears that the quantifiers that provide a polyadic quantification domain are subject to similar constraints as the quantifiers modified by *else* in the multiple *else* construction. If this is correct, it shows that the restrictions on the multiple *else* construction are due not to a syntactic relation between the two occurrences of *else*, nor to a constraint on the resumption of quantifiers or exception phrases. Rather they are to a condition on the formation of a polyadic quantifier.

Is there evidence that the application of *otherwise* to a polyadic quantifier involves a syntactic relation? Relevant in this respect is the fact that the position of *otherwise* influences the availability of readings involving polyadic quantification. Consider (111):

(111) a. Nobody otherwise has written to anybody.
b. Otherwise, nobody has written to anybody.

Only (111b) is appropriate in a reading involving polyadic quantification. *otherwise* in (111a) seems to be able to only associate with the first quantifier *nobody*. This might suggests that if *otherwise* applies to a polyadic quantifier based on a sequence of monadic quantifier $Q_1 \ldots Q_n$, then *otherwise* must either c-command all of $Q_1 \ldots Q_n$ or not c-command any of them.

We can thus conclude that the constitution of a polyadic quantifier requires that the monadic quantifiers stand in a certain syntactic relation to each other and that furthermore *otherwise* has to stand in a syntactic relation to all of those quantifiers.

In the last two sections, I have left out a number of questions that polyadic quantifiers raise as the target of exception phrases. In particular, I have left out the question of how the Quantifier Constraint is satisfied by the quantifiers that constitute the polyadic quantifier and the question of whether the Quantifier Constraint can also be satisfied by a larger context in which the polyadic quantifier occurs, rather than locally by the polyadic quantifier itself. For reasons of exposition, I will postpone an answer to these questions to the next section. In the next section, another construction will be discussed that bears on these questions. In this construction, nonindexical exception phrases apply to polyadic quantifiers.

5.3.7.3. Polyadic quantification with nonindexical exception phrases

In this section, I show that even nonindexical exception phrases may apply to the quantification domain of a polyadic quantifier. In many languages, for instance German and, in a more restricted way, English, exception phrases may occur with what seems to be gapping.[2] This construction is both syntactically and semantically interesting. Syntactically, it is interesting because it exhibits properties of gapping and is also distinct from gapping in important respects. This construction is semantically important because it again involves polyadic quantification. In this construction, the quantifiers associated with the remnants in the gapped exception phrase form a polyadic quantifier ranging over n-tuples.

Let us consider the following examples from German.[3]

(112) a. Jeder Mann hat mit jeder Frau getanzt, ausser Hans mit Maria.
every man has with every woman danced except John with Mary
b. Kein Junge hat mit einem Maedchen gesprochen, ausser Hans mit Maria.
no boy has talked to any girl except John with Mary
c. Niemand las ein Buch, ausser Hans die Bibel.
nobody read a book except John the bible
d. weil niemand diesen Professor an einer Universitaet gesehen hat, ausser Hans am
MIT
because nobody this professor at a university seen has except John at MIT
e. weil hier niemand jemals Zeitung liest, ausser Hans am Sonntag
because here nobody ever newspaper reads except John sundays

What is crucial about gapped exception phrases as in (112) is that they are not always equivalent to clauses with multiple exception phrases with single arguments, as seen in the contrast between the a.-examples and the b.-examples in (113) - (115).

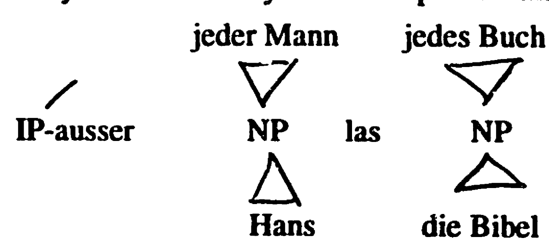
(113) a. Kein Mann hat mit einer Frau getanzt, ausser Hans mit Maria.
'No man has danced with any woman except John with Mary.'
b. * Kein Mann ausser Hans hat mit einer Frau ausser Maria getanzt.
'No man except John has danced with any woman except Mary.'

(114) a. Jeder Mann hat mit jeder Frau getanzt ausser Hans mit Maria.
'Every man has danced with every woman except John with Mary.'
b. Jeder Mann ausser Hans hat mit jeder Frau ausser Maria getanzt.
'Every man except John has danced with every woman except Mary.'

(115) a. Jeder Mann wollte mit keiner Frau tanzen, ausser Hans mit Maria.
'Every man wanted to dance with no woman except John with Mary.'
b. Jeder Mann ausser Hans wollte mit keiner Frau ausser Maria tanzen.
'Every man except John wanted to dance with no woman except Mary.'

(113a) is not equivalent to (113b), which, unlie (113a) is ungrammatical. (114b) is not equivalent to (114b), since, for instance, only (114a), but not (114b) implies that John did not dance with Mary. Finally, (115a) is not equivalent to (115b), since, for instance, (115b) implies that every man except John wanted to dance with Mary, whereas (115a) implies that only John wanted to dance with Mary.

The nonequivalence of the examples of the a.-examples and b.-examples in (113) - (115) also shows that gapped exception clauses cannot be interpreted on the basis of a representation of gapping in terms of phrasal coordination as given in chapter 1, that is, like *and* coordinate clauses with gapping. To see this, consider the three-dimensional representation of (116a) as in (116b).

(116) a. Jeder Mann las jedes Buch, ausser Hans die Bibel.
every man read every book except John the bible
b.


Let us assume that the semantic operation associated with exception phrases is domain subtraction. Then on the basis of the syntactic representation in (116b), domian subtraction would apply to all pairs consisting of a remnant and a correlate (in the evaluation of 'small m-planes', see chapter 1 and 2). In (116a), domain subtraction would take away John from the quantification domain of *every man* as well as the bible from the quantification domain of *every book*. But this interpretation would make (116a) equivalent to (117).

(117) Jeder Mann ausser Hans las jedes Buch ausser der Bibel.
every man except John read every book except the bible

But, as we have seen, this is not correct. (116a) has a different meaning from (117).

The meaning of (116a) can adequately be construed only when gapped exception constructions are not assigned multiple operations on unary quantifiers, but rather a single operation on an n-adic quantifier. That is, in (116a) the semantic operation associated with *ausser* does not subtract John and the bible from the quantification domains individually, but rather subtracts the pair <John, the bible> from the quantification domain of the dyadic quantifier (EVFRY MAN, EVERY BOOK), a universal quantifier ranging over all pairs consisting of a man and a book. Gapped exception phrases thus constitute another exception construction that genuinely involves polyadic quantification.

We have seen that a syntactic representation as for gapping with *and* or *or* coordination does not provide an adequate syntactic basis for the semantic interpretation of 'gapped' exception constructions. There is also syntactic evidence that what looks like gapping in the exception constructions in question is in fact not gapping. Thus in the case of exception constructions, one should rather speak of **'pseudogapping'**. (Here the term 'pseudogapping' is used in a somewhat different way than traditionally, where structures such as *John hit Bill and Mary did Sue* are called 'pseudogapping'). Let us now in greater detail compare gapping with *and* and *or* coordination with pseudogapping in exception phrases.

Exception constructions with pseudogapping as in (112) exhibit certain characteristic properties of gapping; in other respects they differ from gapping (see chapter 1 for a discussion of gapping).

Among the characteristics of gapping are the following two properties. First, the finite verb obligatorily has to be omitted. Note that nonfinite verb forms can remain in German, as in (118c).

(118) a. * Jeder Mann hat mit jeder Frau getanzt, ausser Hans hat mit Maria getanzt.
every man has with every woman danced except John has with Mary danced
b. * Kein Mann hat mit einer Frau etwas gemacht, ausser Hans hat mit Maria getanzt.
no man has with a woman anything done except John has with Mary danced
c. Kein Mann hat mit einer Frau etwas gemacht ausser Hans mit Maria getanzt.
no man has with a woman anything done except John with Mary danced

Second, the constituents associated with the exception phrase have to be major constituents, i.e. daughters of IP or VP. That is, pseudogapping obeys the Major Constituent Constraint (see chapter 1).

(119) a. weil jeder Student an jeder Universität studiert hat, ausser Hans *(am) MIT.
because every student at every university studied has except John (at) MIT
b. weil jeder das Geheimnis von jedem kennt, ausser Hans *(das Geheimnis) von Maria
because everybody the secret of everybody knows except John (the secret) of Mary'

Besides these two similarities with gapping, there is further apparent evidence that exception phrases with psudogapping involve coordination.

In the exception constructions with pseudogapping, 'extraposition' of the exception phrase is obligatory. In these respects, too, gapped exception phrases pattern together with bare argument ellipsis and gapped clauses with *and*. Recall that this was also the case with 'full' clausal comparatives that involve coordination.

(120) a. * Jeder Mann ausser Hans mit Maria hat mit jeder Frau getanzt.
every man except John with Mary has with every woman danced
b. * Jeder Mann hat mit jeder Frau, ausser Hans mit Maria getanzt.
every man has with every woman except John with Mary danced

One can show, however, that the parallelism between pseudogapping in exception constructions and true cases of gapping is only apparent. Pseudogapping differs from gapping in crucial respects.

First of all, unlike true gapping, the constituents associated with the exception expression need not be separated by an intonation break. This can be seen best in French, where liason is impossible between the remnants of true gapping, but permitted between the constituents in a exception pseudogapping construction. (Note that the difference is also marked orthographically.)

(121) a. Chaque homme a vu chaque femme, sauf Louis Inès. (liaison possible)
every man has seen every woman except Louis Ines
b. Jean a vu Marie et Louis, Inès. (liaison impossible)
Jean has seen Marie and Louis Ines

Second, unlike true gapping, pseudogapping in exception phrases does not require focussing of the 'correlates' and the 'remnants'.

Finally, apparent gapping with exception phrases is subject to stricter locality conditions than true gapping. In the latter case, the remnants may be separated by a finite clause boundary with only a mild degradation in acceptability - and with an intervening coreferential subject, there is no degradation at all (see chapter 1). But this is not possible with pseudogapping, which strictly prohibits the correlates from being separated by a finite clause boundary:

(122) a. * Jeder Mann sagte, dass jede Frau schön sei, ausser Hans Maria.
Every man said that every woman was beautiful except John Mary.
b. * Every man said that he danced with every woman except John with Mary.
c. ? John said that Sue was beautiful and Joe Mary.
d. John said that he loves Mary and Bill Sue.

I will therefore propose a syntactic analysis of gapped exception phrases that does not involve coordination. Rather, I will assume that what follows *except* in a pseudogapped exception phrase is a small clause, though not with an interpretation as a proposition, but rather an interpretation as an n-tuple. The syntactic structure is illustrated in (123).

(123) Every man danced with every woman [$_{P}$except [$_{SC}$John [with Mary]]].

I will assume that small clauses as the object of *except* are interpreted as denoting an n-tuple of entities. For example, *John with Mary* in (123) will denote the pair consisting of John and Mary. I will come back to the problems of a compositional analysis of gapped exception constructions below.

Let us now turn to the question of how the Quantifier Constraint is satisfied with gapped exception phrases. Let us first consider exception constructions with pseudogapping with only two associated quantifiers. Apparently, the first associated quantifier of a gapped exception phrase has to be universal or negative. This is shown in (125):

(125) a. * Wenige Maenner / Drei Maenner haben mit jeder / keiner Frau getanzt ausser Hans mit Maria.
'Few men / Three men have danced with every woman except John with Mary.'
b. ?? weil die meisten Studenten kein Buch gelesen haben ausser Hans die Bibel.
'because most students have read no book read except John the bible'

However, the associated quantifiers following the first associated quantifier of the exception phrase need not be universal or negative. In fact, it has to be indefinite if the first associated quantifier is negative:

(126) a. * No man has danced with most women / every woman / few women except John with Mary.
b. No man has danced with three women / a lot of women except John with Mary, Sue and Joan.

But, if the first associate is universal, the following quantifier has to be universal as well, as in (127a) or, alternatively, it may be negative universal, as in (127b). A nonuniversal second quantifier as in (127c) is excluded.

(127) a. Every man danced with every / some woman except John with Mary.
b. (?) Every man wanted to dance with none of the women except John with Mary.

c. ?? Every man wanted to dance with most women except John with Mary.

The generalization to draw from these data is that only the following sequences of quantifiers are allowed in pseudogapped exceptive constructions:

(128) a. AA
b. A(A-)
c. (A-)E

A similar generalization holds for gapped exception phrases with more than two associates. Here any two adjacent quantifiers either have to match one of the sequences in (128) or have to be of the same type, where a universal quantifier must precede a negative universal one and no more than one negative quantifier may occur in the quantifier sequence (perhaps as a result of a condition against semantic complexity).

(129) a. Jeder Mann zeigte jeder Frau jedes Buch, ausser Hans Maria die Bibel.
every man showed every woman every book except John Mary the bible
b. Jeder Mann wollte keiner Frau ein Buch zeigen, ausser Hans Maria die Bibel.
every man wanted no woman any book show except John Mary the bible
c. Kein Mann wollte einer Frau ein Buch zeigen, ausser Hans Maria die Bibel.
no man wanted any woman any book show except John Mary the bible
d. Jeder Mann hat jeder Frau kein Buch gezeigt, ausser Hans Maria die Bibel.
every man showed every woman no book except John Mary the bible
e. # Kein Mann zeigte einer Frau kein Buch ausser Hans Maria die Bibel.
no man showed any woman no book except John Mary the bible
f. # Jeder Mann zeigte einer Frau kein Buch, ausser Hans Maria die Bibel.
every man showed any woman no book except John Mary the bible
g. #?Kein Mann zeigte jeder Frau kein Buch, ausser Hans Maria die Bibel.
no man showed no woman no book except John Mary the bible

Disregarding multiple negative quantifiers, the admissable quantifier sequences are exactly those that yield universal or negative universal polyadic quantifiers. This can be shown formally, though this will not be undertaken here.

In the discussion of polyadic quantification with exception constructions, I have only considered cases in which the Quantifier Constraint was satisfied by the polyadic quantifier only, not by the context in which the polyadic quantifier occurred. As expected from the other exception constructions, the relevant constraint, i.e. the recoverability condition, can be satisfied also by the larger context containing the quantifier. This is seen for the various exception constructions in (130):

(130) a. (?) John never wrote any postcard to anybody except one to Mary.
b. John sent a postcard to Mary. But he never sent anything else to anybody else.
c. John sent a postcard to Mary. Otherwise he never sent anything to anybody.

In (130a), (ANY POSTCARD, ANYBODY) forms a dyadic existential quantifier, which by itself does not satisfy the Quantifier Constraint; but in (130a) the recoverability condition is fulfilled because the quantifier is in the scope of the negative quantifier *never*. The same holds for (130b) and (130c).

The same question arises regarding polyadic quantification in pseudogapped exception phrases that came up in relation to indexical exception phrases. How is it possible that two or more quantifiers form a polyadic quantifier? That is, does this require a syntactic relation between the quantifiers involved or can all quantifiers in a sentence constitute polyadic quantifiers? Gapped exception phrases with a polyadic quantifier as their associate give further evidence that polyadic quantification must be based on a particular syntactic relation among the quantifiers. This relation is not identical to the relation representing quantifier scope and is independent of pseudogapping.

An important phenomenon about pseudogapped exception phrases is that they allow for what one may call 'pied-piping' (cf. Hoeksema 1989). That is, the exception phrase may contain a phrase that does not itself denote the exception element, but rather contains the term referring to that element. Thus, the exception phrase in (131) should denote Mary, but it is a PP only containing the term referring to Mary.

(131) John danced with everybody except with Mary.

Pied-piping obligatorily occurs with PPs in gapped exception phrases, because of the Major Constituent Constraint:

(132) Every man danced with every woman except John *(with) Mary.

Examples like the following suggest that the quantifiers forming a polyadic quantifier must be clausemates in gapped exception constructions:

(133) a. # Any man woud say that he would dance with any woman except John with Mary.
b. Any man would dance with any woman except John with Mary.

However, (133a) can be ruled out simply by the Major Constituent Constraint. *With Mary* is not a major constituent, only *that he would dance with Mary* would be. However, pied-piping then should be possible:

(134) # Any man would say that he would dance with any woman except John that he would dance with Mary.

But (134) is still bad. The reason can only be that *any woman*, for reasons independent of pseudogapping, cannot be contained in the embedded clause in order to form a polyadic quantifier with *any man* in the main clause. This condition is independent of the constraints on quantifier scope. NPs with free choice *any* in an embedded clause can have scope over the entire clause, as in (135).

(135) Any man would say that he would dance with any woman.

Thus, *any man* and *any woman* in (134) could both have maximally wide scope. But still *any man* and *any woman* in (134) cannot form a dyadic quantifier. This shows that quantifiers have to stand in a special syntactic relation to each other, distinct from scope, in order to form a polyadic quantifier. As an approximate condition on this relation, we can state the following generalization:

(136) <u>Condition on the Formation of Polyadic Quantifiers</u>
Monadic quantifiers have to be clausemates in order to form a polyadic quantifier.

The fact that the formation of polyadic quantifiers from monadic ones requires a special syntactic relation goes against certain proposals in the literatures about how polyadic quantification arises in natural language.

There are two proposals about the formation of a polyadic quantifier out of a sequence of monadic quantifiers, namely Higginbotham/May (1982) and second May (1987).

In the account of Higginbotham/May (1982), polyadic quantification is the semantic correlate of a syntactic operation of quantifier absorption at LF. This operation applies optionally to a sequence of two or more quantifiers that have undergone Quantifier Raising to a position in which they are adjacent to each other. This operation is given in (137).

(137) $[Q_1x: N'(x)][Q_2y: N''(y)] \dashrightarrow [Q_1x, Q_2y: N'(x) \;\&\; N''(y)]$

In such an approach, the LF representation of (138a) would most plausibly be as in (138b).

(138) a. Every man danced with every woman except John with Mary.

b. [every x, every y: man(x) & woman(y)] [except John with Mary] x danced with y.

However, in this account, quantifier absorption is possible whenever the quantifers have been raised to adjacent positions at LF. That is, the possibility of forming a polyadic quantifier coincides with the possibility of the individual monadic quantifier to take the same scope. Hence this approach is in a principled way to unrestricted to account adequately for the syntactic basis for the formation of polyadic quantifiers.

May (1987) proposes a similar account for the formation of polyadic quantifiers. He also assumes that quantifiers raise at LF and adjoin to IP (or VP). The class of quantifiers adjoined to the same node constitutes what May calls a ' -sequence'. This class serves as the syntactic basis for a number polyadic quantifier interpretations, for as many polyadic quantifiers as there are different possible scope orderings among the monadic quantifiers yielding different truth conditions. Thus, in May's account, polyadic quantifiers are formed obligatorily in the interpretation of sequences of quantifiers adjoined to the same category.

Again, this account is problematic because of the correlation of quantifier scope and polyadic quantification. Furthermore, the account is problematic in another respect. In this account, all quantifier that are adjoined to the same category obligatorily participate in the formation of the same polyadic quantifiers. But this is inadequate for exception constructions with polyadic quantifiers as their associate. Exception phrases need not relate to a polyadic quantifier based on the maximal sequence of quantifiers that would be adjoined to the same node. Exception phrases may relate to a polyadic quantifier formed on the basis of any set of quantifiers in the sentence (meeting the relevant syntactic conditions), provided the recoverability condition is met.

(139) a. John gave a flower to Mary. Nobody else gave a flower to anybody else.
b. John did not talk about the bible to any girl. Otherwise, every boy talked about every book to some girl.
c. John showed every picture to Mary and Sue. Otherwise no boy showed every picture to two girls .

The possibility that exception phrases can take a polyadic quantifier as their associate raises further interesting empirical issues. In particular, if pseudogapped exception phrases may involve n-ary quantification, one might expect pseudogapped exception phrases to be possible also with unselective binding. Unselective binding as in (140) generally is assumed to also involve quantification over n-tuples (cf. Lewis 1972, Heim 1982).

(140) If a farmer owns a donkey he always beats it.

Under this assumption,*always* in (140) acts as a unselective quantifier binding both the variable representing *a farmer* and the variable representing *a donkey*. That is, it acts as a dyadic quantifier ranging over pairs consisting of a famer and a donkey, as in (141):

(141) [ALWAYSx, y: farmer(x) & donkey(y)] (owns(x, y) -->beat(x, y))

However, contrary to expectation, the quantificational constructions that have taken to involve unselective binding hardly allows for exception phrases. Gapped exception phrases seem to be completely impossible, as in (142), and even simple ones are often unacceptable, as in (143).

(142) a. # Wenn ein Bauer einen Esel hat schlägt er ihn, ausser Hans Pedro.
when a farmer a donkey owns beats he it except John Pedro
b. # Jeder Bauer, der einen Esel hat, schlägt ihn, ausser Hans Pedro.
every farmer who a donkey owns beats it except John Pedro

(143) a. ?? A student always can solve this problem except John.
b. ?? A house always has a door except Mary's.

The only general possibility for constructions involving unselective binding to associate with an exception phrase is the association with an exception phrase consisting of a conditional exception clause, as in (144) and (145). But here clearly the exception clause associates with the entire antecedent of the conditional clause, not with an unselective quantifier.

(144) a. Wenn ein Bauer einen Esel hat schlägt er ihn, ausser wenn es sich um Hans und Pedro handelt.
'If a farmer owns a donkey he beats it, unless it is about John and Pedro.'
b. Jeder Bauer, der einen Esel hat schlägt ihn, ausser wenn es sich um Hans und Pedro handelt.
'Every farmer who owns a donkey beats it, unless it is about John and Pedro.'
(145) a. A student can always solve this problem except when it is John.
b. A house has always a door except when it is Mary's.

This can be taken as evidence that constructions that seem to involve unselective binding do in fact not involve polyadic quantification, as in the traditional approach (Lewis 1972, Heim 1982), but rather quantification over 'cases' in the sense of situations or events, entities that *when* clauses refer to (cf. Berman 1987, Heim 1990).

5.4. Syntactically related constructions with *even, not even, instead, but not*

Pseudogapping with exception constructions is not an isolated syntactic phenomenon. There are a number of similar constructions that seem to involve gapping, but have a semantics, and also syntactic properties, quite different from gapping with *and* and *or* coordination. I will only briefly mention some of those constructions, namely 'even'-phrases, 'instead'-phrases and 'but not'-phrases, without going into a detailed semantic or syntactic analysis.

5.4.1. *Even* phrases

Focussensitive operators such as *even* may induce structures parallel to 'except'-phrases. *Even* may attach to a phrase of any category and be adjoined either to a phrase of the same category or to the sentence. This is illustrated in (146) and (147).

(146) a. Every child, even Mary, laughed.
   b. Every child laughed, even Mary.
(147) a. Mary is everything, even intelligent.
   b. John looked everywhere, even in the box.

Extraposed 'even'-phrases exhibit the same constraints on the relation between exception phrases and their associates:

(148) a. * John gave a book about everything to Mary even Sports.
   b. *The book that everybody read was interesting even Mary.

'Even'-phrases exhibit similar restrictions on quantifiers as exception phrases. 'Even'-phrases allow universal quantifiers as their associates. But they disallow all other quantifiers, except, perhaps, for *most*.

(149) Everybody / (?) Most children / * Three children / # Some children / # The children laughed, even Mary.

'Even'-phrases have a negated counterpart, namely not even phrases, as in (150).

(150) Nobody came, not even Mary.

The occurrence of *not*. does not seem to be special, since *not* can also occur before ordinary 'even'-phrases, as in *not even Mary came*.

'Not even'-phrases also exhibit the constraints on the associate, but in a slightly different way. 'Not even'-phrases allow for negative universal quantifiers, and disallow all other quantifiers as associates except, perhaps, for *few*:

(151) No child / ? Few children / # Three children / # Some children / # The children laughed, not even Mary.

Again, the constraints may be satisfied or not satisfied also by the larger context containing the associate as in (152).

(152) a. # John did not see everybody, even Mary.
b. # John has never seen anybody here, not even Mary.

How can the restriction to universal and negative universal quantifiers be derived for *even* and *not even* phrases? Superficially, the semantic operation associated with *even* and *not even* does not consist in domain subtraction. Therefore, it not clear why the Quantifier Constraint should apply. However, *even* and *not even* have presuppositions whose content involves domain subtraction in some sense. The presupposition of *even* consists roughly in the following. *Even Mary laughed* presupposes that it was expected that Mary did not laugh or, stronger, that Mary occupies the end of a scale of relevant entities that are ordered with respect to the probability that they laughed. Thus, assuming that the determination of the quantification domain is in part influenced by such a scale, it is plausible to assume that implicitly an operation of domain subtraction takes place which subtracts Mary as the extreme end of the scale from the quantification domain of *every child* in (146a).

Thus, one can say that in the *even* construction in question domain subtraction takes place at the level of conversational implicature, rather than at the level of the propositional content of the clause. *Even* phrases do not only have a presuppositional meaning, but also an assertive meaning. This meaning simply consists in the proposition that the entity denoted by the phrase following *even* satisfies the property expressed by the main clause (see Karttunen/Peters 1979 on presuppositional and assertive meanings).

Unlike exception phrases, *even* phrases are impossible with negative universal quantifiers as in (153).

(153) # No child has laughed, even Mary.

This follows from the assertive part of the meaning of *even*. The assertive part of *even Mary* in (153) consists in the proposition that Mary laughed. This proposition is in contradiction to the assertion of main clause.

Formally, one can conceive of the semantics of adjoined *even* phrases in the following way. In the assertive part of the sentence meaning, *even* simply means *and*. Thus we have (154), where '$[]_{ass}$' denotes the semantic evaluation function for the assertive meaning of the sentence (see Karttunen/Peters 1979 for a formal treatment within Monague Grammar of bipartite meanings of sentences with presuppositional and assertive parts):

(154) [Q A *even* XP]$_{ass}$ = [Q A *and* XP]

However, the semantic effect of an 'even'-phrase at the propositional level is something like (155). Here '$[]_{pres}$' denotes the semantic evaluation function for the presuppositional meaning of the sentence.

(155) [[Q A *even* XP] P]$_{pres}$ = it is not expected that P([XP])

'Not even'-phrases can be treated in a parallel way. 'Not even'-phrases are restricted to negative universal quantifiers and excluded with universal quantifiers:

(156) * Every child laughed, not even Mary.

I take it that 'not even'-phrases have exactly the same presuppositional meaning as *even* phrases. This conforms with the general fact that presuppositions are inherited under negation. But 'not even'-phrases differ from *even* phrases in the assertive meaning. In the assertive meaning, 'not even'-phrases are equivalent to 'and not'-phrases and 'but not'-phrases. Thus we have (157).

(157) [Q A *not even* XP]$_{ass}$ = [Q A *and not* XP].

The fact that *not even* phrases are excluded with positive universal quantifiers follows from the assertional part of the meaning. In (157), the assertional content of *not even Mary* is in contradiction with the proposition expressed by the main clause.

The analysis does not yet explain why *even* phrases marginally accept *most* and *few*. Presumably, this is the same phenomenon discussed earlier as with free exception phrases, which also accept *most* and *few*.

'Even'-phrases pattern together with phrasal comparative and exception phrases in other respects. In particular, 'even'-phrases exhibit what looks like gapping. Again, as with exception phrases, this is particularly clear in German. The following examples exhibit gapping structures. They again display the same restrictions on quantifier sequences as exception phrases, with the additional two restrictions holding for *even* and *not even* phrases.

(158) a. Jeder Mann hat mit jeder Frau / * einer Frau getanzt, sogar Hans mit Maria.
every man has with every woman danced even John with Mary
b. Kein Mann hat mit einer Frau / * jeder Frau getanzt nicht einmal Hans mit Maria.
no man has with any woman / every woman danced, not even John with Mary
c. Jeder Mann wollte keiner Frau / * einer Frau ein Buch / * jedes Buch geben, nicht einmal Hans Maria die Bibel.
every man wanted no woman / a woman a book / every book give not even John Mary the bible

(159) Niemals hat ein Besucher eines der Gemaelde gesehen, nicht einmal den Picasso.
never has a visitor one of these paintings seen not even the Picasso

As with exception phrases, generally clauses with gapped 'sogar'-phrases or 'nicht einmal'- phrases are not equivalent to clauses with multiple 'sogar'-phrases or 'nicht einmal'-phrases. This is shown by the following correlates of the first clauses in (160a) and (160b), both of which are unacceptable for semantic reasons.

(160) a. ?? Jeder Mann, sogar Hans, hat mit jeder Frau, sogar Maria, getanzt.
every man even John has with every woman even Mary danced
b. ?? Kein Mann, nicht einmal Hans, hat mit einer Frau, nicht einmal Maria, getanzt.
no man, not even John has with a woman not even Mary danced

The construction with *even* exhibits exactly the same properties as pseudogapping in exception constructions in German. 'Even'-phrases with pseudogapping require that the finite verb be omitted and are subject to the Major Constituent Constraint. They also differ from true gapping in that the constituents they contain are not separated by an intonation break. This is seen in the possibility of liaison in French - for the speakers for whom the construction is acceptable:

(161) Chaque homme a parlé avec chaque femme, même Louis avec Ines. (liaison possible)

'Every man has talked to every woman, even Louis with Ines.'

How are pseudogapped *even* phrases interpreted? Apparently, for the assertive level, we can assume the same semantics as for gapping. Thus, at this level, the first sentence of (158a) would be equivalent to (162) (based on the construal of 'big' m-planes).

(162) Every man danced with every women and John danced with Mary

However, at the presuppositional level, *even John with Mary* situates the pair consisting of John and Mary at the end of a scale of pairs ordered according to the probability that the pair danced together. Thus, as in the case of pseudogapped exception phrases, the semantic operation associated with gapped *even* phrases has as its target a domain of ordered n-tuples rather than a set of elements. As a result of a conversational implicature, domain subtraction then applies to this domain, yielding the relevant restrictions.

5.4.2. 'Replacement phrases'

Another construction type which patterns syntactically like 'except'-phrases and 'even'-phrases are 'instead'-phrases and 'but not'-phrases. Because of their semantic function (according to which they seem to indicate parts of a prior utterance or otherwise entertained proposition that the sentence in question will 'replace') they can be called 'replacement phrases' (see also Hudson 1976).

(163) a. John praised Mary instead of Sue.

b. John praised Mary, but not Sue.

'Instead'-phrases may occur with what looks like gapping in languages other than English, for instance in German (note that even the English translation seems marginally acceptable).

(164) a. Hans lobte Maria, statt Max Anna.

John praised Mary instead of Max Ann

b. Hans hat mit Maria getanzt, statt Max mit Anna.

John has with Mary danced instead of Max with Ann

c. Alle Frauen haben alle Männer geküsst, statt alle Männer alle Frauen.
all women have all men kissed, instead of all men all women

Again, one can easily see that 'instead'-phrase involve pseudogapping, rather than true gapping. Thus 'instead'-phrases with pseudogapping do not require focussing the remnants and correlates and are subject to stricter locality conditions than true gapping.

In English, '(but) not'-phrases can occur with single arguments and apparent gapping, but not with full clauses:

(165) a. John saw Mary, but not Sue.
b. John saw Mary, but not Max Ann.
c. * John saw Mary, but not Bill met Sue.

Special in this construction is the occurrence of *not*. *Not* in (165) is not the *not* that may modify NPs, as in (166).

(166) Not many children / not all children came.

Not in this function is restricted to quantified NPs; it does not apply to names, as it seems to do in (167).

(167) Not John came.

Not in (167) is acceptable only in a metalinguistic use, correcting a previous utterance by another interlocutor. This corresponds to a similar structure in (168), where *not* is followed by a full clause (The contrast in acceptability between (165a) and (168) was noted by Lasnik 1972).

(168) John came; not Mary left.

Not in (168) is acceptable only as a *not* of correction (of a previous utterance). This does not hold for the *not* in (165). *Not* in (165) does not make reference to a previous utterance.

5.5. Related Constructions 2: *almost*

There is another expression that associates with quantifiers and imposes the quantifier Constraint and furthermore has a semantic function similar to those of exception phrases, namely *almost*, as in (169).

(169) Almost every man came.

Almost basically has the semantic function of an exception phrase. However, *almost* does not specify what the exception is and moreover, it does not even imply that there is an exception; it only specifies that if there are exceptions, they constitute a minority among the elements in the relevant restriction of the quantifier. *Amost every man* basically means 'every man except perhaps a minority of men'.

Almost applies both to quantifiers and to degree specifiers. In both cases, *almost* imposes something like the Quantifier Constraint. When it applies to a quantifier, *almost* requires a quantifier with 'extreme', maximal or minimal set of verifiers, as in (170a). When it applies to a degree phrase, *almost* requires that the degree specifier indicate an extreme degree, as in (170b). In addition, *almost* applies to adverbs of completion, again requiring universal or negative universal quantifiers over parts of the event that is to be completed. This is seen in (170c).

(170) a. Almost every student / all students / * most students / * some students / * several
students
b. John is almost very tall / extremely tall / # tall / # not very tall
c. The wax melted almost not at all / completely /# partially.

(170a) shows that *almost* modifying a quantifier imposes the same restrictions on the determiner as exception phrases. (170b) shows that *almost* applied to adjectival specifiers imposes parallel constraints: it is acceptable only with adjectival specifiers that express an extreme degree. In (170c), *almost* measures the degree of completion of an event.

There are contexts in which *almost* does not apply to a universal quantifier or degree modifier, for instance in *almost tall* and *almost not very tall*. But in these contexts, *almost* arguably has a metalinguistic meaning, relating to the scale of applicability of the adjective and its specifier.

Unlike exception phrases, *almost* is also acceptable with specifiers that express a clear limit or cardinality, provided it occupies a sufficiently high place in the scale. This is seen in (171):

(171) a. almost one hundred students / # two students
b. John is almost exactly as tall as Mary / too tall to pass through the door / # taller
than Mary

However, this does not seem to be counterevidence to the parallelism between *almost* and exception phrases. The difference, it appears, has to do with the fact that *almost* may apply both to a scale of degrees and to a set and in each case requires a boundary: a natural boundary of a scale is either an extreme degree or a specified degree, a natural boundary of a set is either the universe or a specified subset.

The restrictions imposed by *almost* can be accounted for in the same way as for exception phrases, namely by the recoverability condition. Notice that unlike von Fintel's account, the present account of the restrictions imposed by exception phrases does not require that there be a specific nonempty exception set in order for the relevant condition to apply. I will formulate the recoverability condition only for the case in which *almost* associates with a quantifier. The condition then is in fact the same as for exception phrases and is given again in (172).

(172) There is a function such that for any context set X,
$$f(Q, X, A, B) = X \cap A \cap B - D(Q, X, A, B)$$

Note that there will still be a function f if the exception set is empty for a given context set. Thus, the Recoverability Condition applies regardless of whether there are actual exceptions or not.

5.6. Semantically related constructions 2: extent clauses

5.6.1. The characterization of extent clauses

Another example of a construction that is semantically related to exception constructions, though in a less obvious way than *almost,* are what I call 'extent clauses'. Extent clauses are semantically similar to exception phrases in two respects. First, they impose the Quantifier Constraint on the NP they assocaite with. Second, they take the same broad range of association as free exception phrases. As for exception phrases, I will argue that extent clauses express a condition on quantification domains, rather than modifying the N'.

Consider the extent clause given in (173).

(173) Every man as long as as he is an American citizen may pass the border.

In (173), the 'insofar as'-clause associates with the quantifier *every man*. When associating with a quantified NP, the semantic function of an extent clause superficially seems to be the same as that of restrictive relative clauses. As with exception constructions, the domain may not only be the quantification domain of a quantified NP, but may also be the domain of an adverbial quantifier, degree specifier or a domain corresponding to some set of propositions expressed or implied by the clause as a whole. The clauses are of the form of equative clause. Intuitively, they express a comparison between the quantification domain of the quantifier they associate with and the set of entities satisfying the clause.

Extent clauses are instantiated in English by a variety of different types of (usually equative) clauses, differing in their complementizer and in the variety of domains they can associate with. Extent clauses are introduced by *as far as, as long as, to the extent that* or *insofar as*. All types of clauses are of the form of equative clauses, except for 'to the extent that'-clauses and 'insofar as'-clauses. This is illustrated in (174).

(174) a. John bought everything to the extent that / as long as / insofar as he could afford it.

b. The books as long as / insofar as they are written in English belong to John.

c. Insofar as his work is concerned, John is very happy.

d. As far as I know, John resigned.

The *as far as* clause in (174c-d) modifies a proposition as a whole. In contrast, the clauses in (174a-b) all associate with a (definite or quantified) NP, namely *everything* in (174a) and *the books* in (174b). Moreover, they form a constituent with this NP. This is seen in the fact that the clause may be topicalized or wh moved together with the associate NP, as seen in (175):

(175) a. The books to the extent that / as long as / insofar as they were written in English I

think John will certainly read.

b. (?) Whose books to the extent that / as long as / insofar as they are written in English will John read?

There are a number of differences between 'as far as'-clauses, 'as long as'-clauses, 'to the extent that'-clauses and 'insofar as'-clauses, though speakers vary greatly with respect to how these clauses differ from each other. I will list a number of these differences, since they reflect the general ways in which extent may divide into subtypes.

As far as clauses may only delimit the epistemic basis for the assertion of the sentence, as in (176a) or the 'domain of relevance' of a proposition, as in (176b). They may never modify a quantification domain of an NP, the scale of completion of an event or the scale of degrees associated with an adjectival specifier, as in (177).

(176) a. As far as I can tell / see / was told, it is raining.

b. As far as I am concerned, It does not matter where we go.

(177) a. * As far as he is American, every man may pass the border.

b. * As far as it was related to his work, John completely finished the book.

c. * John sold everything as far as it belongs to Bill.

To the extent that'-clauses are (for at least a number of speakers) possible only with singular quantified or definite NPs. In the latter case, they involve the part-whole relation (In this interpretation, they also allow for definite plural NPs with a distributive reading.)

(178) a. Every book to the extent that it is written in French will be sold.

b. This book to the extent that it deals with psychology is very interesting.

c. These books to the extent that they deal with psychology are very interesting.

(179) a. ?? To the extent that I can tell / see / was told, it is raining.

b. ?? To the extent that I am concerned, It does matter where we are going.

(180) a. # To the extent that his work is concerned, John is very happy.

b. # To the extent that it is related to his work, John completely finished the book.

5.6.2. The range of association of extent clauses

Extent clauses have a number of interesting properties. One of the most important findings is that some of these properties are the same as were found in exception constructions.

Extent clauses pattern with exception constructions in the range of association. Extent clauses need not necessarily associate with an NP, but may modify the proposition (or the set of propositions) expressed by the clause as a whole, as we have seen above.

When associated with the sentence as a whole, extent clauses may have the effect of restricting the maximal degree specified with adjectives or may involve the part-whole relation with objects, as in (181):

(181) a. To the extent / As long as / Insofar as it concerns his work, John is very happy.

b. To the extent / As long as / Insofar as it was danced by Mary the ballet performance as excellent.

5.6.3. The restriction on the associate of extent clauses

An important property of extent clauses is the following. Like exception phrases,extent clauses may associate only with universal or negative universal NPs, not with any other quantified NPs:5

(182) a. # John read some / many / most / two / few books as far as they were written in English.

b. No / Every / Any / Each book as far as / as long as / insofar as it is not written in French will be published by this publisher.

However, extent clauses may, unlike exception phrases without *for*, also associate with definite (nonspecific) plural NPs:[6]

(183) a. The books as long as / insofar as they are concerned with art are very interesting.

b. ?? The book as long as / insofar as it is concerned with art is very interesting.

(184) ?? These books as long as / as far as they are concerned with art are very interesting.

5.6.4. The syntactic and semantic analysis of extent clauses

When they associate with an NP, extent clauses need not contain a pronoun coreferring with the head NP, but are already licenced if they simply satisfy the aboutness condition. This is seen in (185)-(186). The aboutness condition is also sufficient for *such that* relative clauses, as in (187).

(185) a. Every book to the extent that the first chapter is sufficiently interesting will be published.

b. (?) John ordered everything as far as he had money in the restaurant.

c. (?) John ordered everything as far as it did not contain meat in the restaurant

(186) Whose books as far as he has time will John read?

(187) John was looking for an apartment such that he could walk to work.

I will assume that the ability of a clause satisfying the aboutness condition to restrict a domain is made possible by a function ABOUT, which maps the proposition expressed by the clause to the set of those entities that the proposition is about. Thus we have (188).

(188) ABOUT(P) = $\{x | P \text{ is about } x\}$

Because of the effects of the Quantifier Constraint that extent clauses display, I will assume that extent clauses do not operate on the restriction of the quantifier they modify, but rather on the context set of the quantifier. Thus, the schema for the interpretation of extent clause is as in (189).

(189) [Q^X(A, B) *to the extent that* P] = true iff Q([X ABOUT(P)])(A, B).

The explanation of the quantifier constraint can now be given in a way parallel to the one for exception constructions. Thus there has to be a function f which yields, for any context set X, the set of entities in the context set that the extent clause is 'about'. This is given in (190):

(190) For any quantifier Q with arguments A and B, there is a function f such that for any

context set X of Q:

f(Q, A, B, X) = D(Q, X, A, B) if Q is positive

= X (D(Q, X, A, B) if Q is negative

Clearly, such a function f can exist only if there is exactly one verifier set for the quantifier Q for any given context set. Again, this is the case only when Q is universal or negative universal.

5.7. Semantically related constructions 3: amount relatives

There is another clausal construction which behaves quite similar to extent clauses, namely amount relatives (ARs), a type of relative clause construction discussed first by Carlson (1977). An AR is illustrated in (191).

(191) Every tree that there was in the garden

The following characteristics of ARs distinguish them from ordinary (restrictive and nonrestrictive) relative clauses. First, ARs allow the variable in the relative clause to occur in a context subject to the indefiniteness effect. This is the case in the *there* insertion context in (191), and it holds more generally for all contexts imposing the indefinitenes effect. Moreover, ARs allow for quantified head NPs in the case in which the material in the matrix clause imposes the indefiniteness effect. The two case are seen in (192) - (195) with a variety of contexts imposing the indefiniteness effect.

(192) a. The movie lasts two hours / * every hour.

b. every / * some hour the movie lasts

(193) a. Max weighs two pounds / every pound.

b. every / some pound Max weighs

(194) a. John saw a lot / little / * everything / * all / * most of Mary.

b. John saw everything / all of Mary he wanted to see.

(195) a. John exhibits little / a lot of / * all / *the courage in a bad situation.

b. John will exhibit all courage that is required

Second, ARs require an empty relative clause operator and disallow overt relative wh pronouns:7

(196) a. * every tree which there was in the garden

b. * every hour which the movie lasts

c. * John saw all of Mary which he wanted to see.

ARs are important in the present context for two reasons. First, they impose the same restriction on the NP they modify as extent clauses and, basically, exception phrases. Second, ARs have a semantic function similar to extent clauses, differing in this respect from ordinary restrictive relative clauses.

The restrictions on the determiner NP modified by an AR were noted by Carlson (1977). They are illustrated in (197).8

(197) every / each / any / no / * some / * many a man that there was in the garden

Carlson gives a purely syntactic explanation for this restriction. He observes that the quantifiers that are allowed with amount relatives coincide roughly with the quantifiers that may precede a cardinality attribute such as *five*. Carlson assumes that ARs have exactly the same function as cardinality attributes, namely being amount specifiers - and he assumes that in fact ARs initially occupy the same syntactic position as cardinality attributes. Therefore, as with cardinality attributes, the position preceding an AR is restricted to universal quantifiers.

However, there are a number of arguments that Carlson's explanation does not work. First, as Carlson notes himself, some determiners may precede a cardinality attribute, but disallow an amount relative, namely demonstratives as in *these two children*. Furthermore, certain universal quantifiers have completely different semantic effects when preceding a cardinality attribute and when associated with an amount relative. For instance, *no* preceding a cardinality attribute has the effect of quantifying over groups with that cardinality, not of quantifying over the members of such a group, as with *all*:.

(198) No / All five children are able to lift the piano.

Furthermore, *every* preceding a cardinality attribute has the effect of quantifying over certain members of a sequence whose distance in that sequence is specified by the cardinality attribute:

(199) every two weeks

Furthermore, cardinality attributes do not always exclude amount relatives, in particular, when they specify a sufficiently great cardinality:

(200) a. All these many mistakes that there were in the report.

b. ? All these three mistakes that there were in the report.

We can derive the restriction to universal and negative universal quantifier with ARs in the same way as for extent clauses if we assume that ARs modify semantically not the restriction of the quantifier, but rather its context set. The formal semantic schema for an amount relative would then be as in (201):

(201) If R is an amount relative, then

$[Q^X(A, B)R] = \text{true iff } Q^{X \cap R}(A, B)$

Since (201) involves an operation on quantification domains, the recoverability condition applies. Clearly it applies in exactly the same way as for extent clauses. Hence the quantifier must be universal or negative universal

As with extent clauses, the recoverability condition has to be satisfied with ARs strictly locally, that is, by the associated quantifier itself, not by the larger context in which the quantifier occurs. Thus, for instance an indefinite in the scope of a negation does not license an AR, not does a negation taking scope over a universal quantifier exclude an AR.[9]

(202) a. # John did not eat any meat that there was in the kitchen.

b. # John did not talk to two women that there were at the party.

(203) a. Not everybody there was at the party was invited.

b. John did not eat every apple there was on the table.

5.8. Inclusion and exclusion phrases and the source of the recoverability condition

We have seen that the recoverability condition holds for four different constructions, exception phrases, *almost*, extent clauses and amount relatives. The semantic analyses of these constructions given all share the property that they involve an operation on a quantification domain - more precisely the context set of the associated phrase. This raises the question: does some version of the recoverability condition hold for all expressions involving an operation on quantification domain? If this were so, then we would in fact have a semantic universal of the form given in (204):

(204) Hypothesis about Operations on Quantification Domains and Recoverability

If an expression x is evaluated by an operation O on a quantification domain, then the

evaluation of x is subject to the recoverability condition with respect to O.

Unforunately, there are constructions which seem to involve an operation on quantification domains, but which apparently are not subject to a recoverability condition. These are inclusion and exclusion phrases. *Including John* in (205) seems to be associated with the semantic condition that says that the context should include John:[10]

(205) Every student / No student including John came.

However, inclusion phrases can associate with quantifiers other than universal and negative universal quantifiers:

(206) a. Several students / A lot of students including John came.

b. Ten students including John came.

Similarly, with an appropriate inclusion set, inclusion phrases may also associate with *most*:

(207) a. Most students including the French ones came.
b. Few students including the French ones came.

A way to explain the different behavior of inclusion phrases would be to say that inclusion phrase need not operate on the context set, but may also operate on the set of verifiers. This seems to be true for (206). (206b), for instance, means that ten students among whom is John came. It cannot mean 'ten of the students which include John came'. In the latter case, the inclusion phrase would have operated on the context set, violating recoverability.

However, with proportional quantifiers, both readings seem to be available, the one in which the inclusion operates on the 'verifying proportion' and the one where it operates on the context set. Thus (207a) has two readings. In one reading, the students that came include all the French ones. In this case, the inclusion phrase 'means' that the verifier set includes all the French students. In the second reading, the set of students that came includes more than half than half (most) of the students which include the French ones. In this case, in fact not all French students need not have come. The second reading would constitute a counterexample against the hypothesis in (204). If we know which students came and that they constitute most students of a given context set, we still cannot tell which sets of students the inclusion phrase might have included.

The observations can be made for exclusion phrases such as (208):

(208) No student excluding John came.

Exclusion phrases are particularly interesting because they seem to have the same meaning as exception phrases. However, again, exclusion phrases can associate with quantifiers other than universal and negative universal quantifiers; furthermore, they yield two readings for proportional quantifiers, one of which should not arise:

(209) a. Several students / A lot of students excluding John came.
b. The students excluding John came.
(210) a. Most students excluding the French ones came.
b. Few students excluding the French ones came.

But still there is in principle a way to account for inclusion and exclusion phrases without violating the condition stated in (204). It may be that inclusion and exclusion phrases may operate on different sets than context sets. They may either operate on sets of verifiers or they may operate on the restriction - not the context set - of the quantifier. Operations on restrictions then would not be subject to the recoverability condition. But still independent evidence is required for why exclusion and inclusion phrases operate on restrictions, rather than contexts.

Notes

1 Note that the correspondent of *else* in German *sonst* does not allow for a multiple *else* construction:

(1) * Niemand sonst hat mit jemandem sonst getanzt.
'Nobody else danced with anybody else.'

2 Pseudogapping in exception phrases in English is for most speakers possible only with NP-PP configurations, not with two or more adjacent NPs:

(1) Every man danced with every woman except John with Mary.
b. Every man saw every woman except John Mary.

In German, this restriction, for whatever reason, does not hold. Therefore, I will generally use German, rather than English, data.

3 Note that not all exception phrases in German allow for pseudogapping. For instance, the complex preposition *bis auf* allows only single arguments:

(1) a. Jeder bis auf Hans lachte.
b. Jeder lachte bis auf Hans.
'Everybody laughed except John.'
c. * Jeder Mann saw jede Frau bis auf Hans Maria.
'Every man saw every woman except John Mary.'

The difference between *ausser* and *bis auf* seems to be that *bis auf* is a true preposition subcategorized only for NPs. Unlike *ausser, bis auf* assigns case. The case of the NPs with *ausser* generally have the case of the parallel NPs in the full clause - as in the case of ordinary coordination.

(2) a. Hans lobte jeden ausser den Jungen.
'John praised everybody except the boy (acc)'

b. Maria gab stellte jeden Kuenstler jedem Besucher vor, ausser diesen Maler jenem Experten.
'Mary introduced every artist to every visitor except this painter (acc) this expert (dat.).'

In certain cases, though, dative is assigned even when the associated NP has a different case, in particular in fronted *ausser* phrases:

(3) Ausser diesem Jungen / diesen Jungen habe ich niemanden gesehen.
'Except this boy (dat.) / this boy (acc.) have I seen nobody (acc.).'

It appears then that *ausser* may also function as a preposition, assigning case of its own. It then correctly predicted that gapped exception phrases are impossible with *ausser* assigning dative case as a preposition:

(4) * Kein Mann hat eine Frau gesehen ausser diesem Professor diese Studentin.
'No man has seen a woman except this professor (dat) this student (dat.).'

Notice also that *bis auf* cannot associate with indefinite NPs in the scope of negation:

(5) Kein Maedchen wollte mit einem Jungen tanzen ausser / * bis auf Hans.
'No girl wanted to dance with a boy except John.'

4 Though for some speakers, with *otherwise* the entity it subtracts from the relevant domain need not be an exception, but may also just be an entity that has already been mentioned

(1) John came. Otherwise, nobody / # three people / ?? few people / # the girls / Joe and Bill came.

Furthermore, in this use, it is not incompatible with an other indexical exception phrases in the sentence, in particular *else* :

(2) John did not come. Otherwise everybody else came.

Otherwise in (2) seems to be redundant, or rather it appears that *otherwise* in (2) has the function of removing John from the set of relevant objects in the discourse, whereas *else* removes John from the quantification domain of *everybody.* Thus, *otherwise* for the relevant speakers also seems to have the function of 'other than'-phrases in some contexts.

5 Comparing extent clauses with exception clauses, it is an interesting question whether extent clauses may also modify the quantification domain of a polyadic quantifier (that arises from absorption of monadic quantifiers):

(1) a. Every man recognized every woman as far as / as long as / insofar as they had met

only recently.
b. No man recognized any woman as far as / as long as / insofar as they had not met very recently.

However, the analogue of multiply headed relative clauses is available only with 'as long as'-clauses:

(2) Every man and every woman insofar as they liked each other danced together.

Split definite antecedents are sometimes possible, namely with 'as long as'-clauses:

(3) The teachers recognized the students as long as they had studied together.

6 A peculiarity of extent clauses is that they seem to allow for a group reading as well as an individual reading. This is seen in the ambiguity of (1):

(1) John took everything as far as / as long as / insofar as it fit into his car.

(1) can either mean the totality of things John took fit into the car (the group reading) or each chair John took fit into the car (the individual reading).

7 As another characteristic of ARs, Carlson mentions the possibility of antecedent-contained deletion in ARs, which is absent in restrictive relatives. His examples which should support the generalization are given in (1):

(1) a. * John put some / many / four / most things he could in his pocket.
b. *John put everything / the things (*which) he could in his pocket.

However, there are also restrictive relative clauses in which antecedent-contained deletion is possible, for instance (2).

(2) John saw the man Mary did.

See Fiengo/May (1991) for an extensive discussion of antecedent-contained deletion and a criticism of Carlson's generalization.

8 Note that unlike exception phrases and like extent clauses, ARs allow for definite plural or mass NPs, as seen in (1). This was noted by Carlson (1977).

(1) a. The trees that there are in the garden.
b. The bread there is on the table.

9 ARs share other properties with extent clauses. Like extent clauses (see footnote 7), ARs express a predicate that holds either of individual members of the domain or of the group corresponding to the domain as a whole. Thus (1) has two readings, one in which

John bought the maximal set of individual chairs x such that x fit into the car and one in which John bought a maximal set X of chairs such that the group of chairs corresponding to the set X fit into the car.

(1) John bought every chair that fit into the car.

10 Inclusion and exclusion phrases have other interesting properties. Inclusion phrases must specify the lower limit of the included set; in contrast, exclusion phrases must specify the upper limit:

(1) a. All students including at least three / * at most three philosophy students.
    b. All students excluding at most three / * at least three philosophy students.

BIBLIOGRAPHY

Abbott, B. (1976): 'Right Node Raising as a Test for Constituenthood'. Linguistic Inquiry 7.4.

Abney, S. (1987): The English Noun Phrase in its sentential Aspects. Ph D dissertation, MIT, Cambridge (Mass.).

Anderson, C. (1983): 'Generating coordinate structures with asymmetric gaps'. Chicago Linguistic Society (CLS) 9.

Baker, J. C. (1970): 'Notes on the Description of English Questions'. Foundation of Language 6.

Barwise, J./R. Cooper (1981): 'Generalized Quantifiers and Natural Language'. Linguistics and Philosophy 4.

van Benthem, J. (1987): 'Polyadic Quantification'. Linguistics and Philosophy.

Berman, S. (1987): 'Situation-based semantics for adverbs of quantification'. In J. Blevins et al. (eds.): Poceedings of WCCFL.

Bresnan, J. (1973): 'Syntax of Comparative Constructions in English'. Linguistic Inquiry 4.

--------- (1975): 'Comparative Deletion and Constraints on Transformations'. Linguistic Analysis 1.1.

--------- (1976): 'On the Form and Functioning of Transformations'. Linguistic Inquiry 7.1.

--------- (1976): Evidence for a Theory of Unbounded Transformations'. Linguistic Analysis 2.4.

--------- and J. Grimshaw (1978): 'The Syntax and Free Relatives in English'. Linguistic Inquiry 9.3.

Carlson, G. (1987): '*Same* and *Different*: Some Consequences for Syntax and Semantics'. Linguistics and Philosophy 10.

Chomsky, N. (1977): 'On wh Movement'. In P. Culicover et al.: Formal Syntax. Academic Press, New York.

----------- (1981): Lectures on Government and Binding. Foris Publications, Dordrecht.

----------- (1986): Knowledge of Language. Praeger, New York.

----------- (1986): Barriers. MIT Press, Cambridge (Mass.).

Cresswell, M. (1976): 'The Semantics of Degree'. In B. Partee (ed.): Montague Grammar. Academic Press, New York.

von Fintel (1989): 'Exceptive Constructions'.

--------- (1991): 'Exceptive conditionals: the meaning of *unless*'. Proceedings of NELS 22.

--------- (1992): 'Exceptive constructions'. To appear in Natural Language Semantics.

Gazdar, G. (1981): 'Unbounded Depenencies and Coordinate Structure'. Linguistic Inquiry 12.

---------, G. K. Pullum, I. A. Sag and T. Wasow (1982): 'Coordination and Transformational Grammar'. Linguistic Inquiry 13.

Goodall, G. (1987): Parallel Structures in Syntax. Cambridge. UP, Cambridge.

Groenendijk, J. / M. Stokhof: 'Dynamic Predicate Logic'. Linguistics and Philosophy 14.

Haik, I. (1985): The Syntax of Operators. Ph D dissertation, MIT, Cambridge (Mass.).

------ (1987): Bound VPs that need to be'. Linguistics and Philosophy 10.

Hankamer, J. (1973a): 'Unacceptable Ambiguity'. Linguistic Inquiry 4.

----------- (1973b): 'Why are two *tahns* in English?'. Proceedings of CLS 9.

Heim, I. (1982): The Semantics of Definite and Indefinite Noun Phrases. Ph D dissertation, University of Massachusetts, Amherst.

------- (1985): 'Notes on Comparatives and Related Matters'. Ms. University of Texas, Austin.

------- (1990): 'E-type pronouns and donkey anaphora'. Linguistics and Philosophy 13.

Higginbotham, J. (1985): 'On Semantics'. Linguistic Inquiry 16.

-------------- (1984): 'A note on phrase markers'.

Hoeksema, J. (1983): 'Negative Polarity and the Comparative'. Natural Language and Linguistic Theory.

------------ (1986): 'An account of relative clauses with split antecedents'. Proceedings of WCCFL 5. Stanford Linguistic Students Association.

------------ (1987):

------------ (1989):

------------ (1991):

Horn, L. (1969): 'A presuppositional analysis of *only* and *even*'. CLS 5.

Jackendoff, R. (1977): Semantic Interpretation in Generative Grammar. MIT Press, Cambridge (Mass.).

Karttunen, L./S. Peters (1979): 'Conventional Implicature'. Syntax and Semantics, Vol

11. Academic Press, New York.

Keenan, E. (1987):

--------- (1992): 'Beyond the Frege-Boundary'. Linguistics and Philosophy

Klein, E. (1980): 'A semantics for Positive and Comparative Adjectives'. Linguistics and Philosophy 4.

Larson, R. (1988): 'Scope and Comparatives'. Linguistics and Philosophy 11.

Lewis, D. (1975): 'Adverbs of Quantification'. In E.L. Keenan (ed.): Formal Semantics of Natural Language. Cambridge UP, Cambridge.

Lieb, H. (1983): Integrational Linguistics. New York, Benjamins.

Link, G. (1983): 'The Logical Analysis of Plurals and Mass Terms: A Lattice-Theorietical Approach'. In R. Bäuerle et al. (eds.): Meaning Use and the Interpretation of Language. de Gruyter, Berlin.

------- (1984): 'Hydras. On the Logic of Relative Clause Constructions with Multiple Heads'. In F. Landman et al. (ed.): Varieties of Formal Semantics. Reidel, Dordrecht.

May, R. (1977): The Grammar of Quantification. Ph D dissertation, MIT, Cambridge (Mass.).

------- (1985): Logical Form. Its Structure and Derivation. MIT Press, Cambridge (Mass.).

------- and R. Fiengo (1986): 'Anaphora and Ellipsis. Ms. University of Irvine, Irvine, and CUNY.

Moltmann, F. (1991): 'The Syntax and Semantics of Binary Distributive Quantifiers'. Proceedings of NELS.

------------ (1992): Reciprocals and *Same/Different*. Towards a Semantic Analysis. Linguistics and Philosophy 16.

Muadz, H. (1991): Coordinate Structures: A Planar Representation. Ph D dissertation, Univerisity of Arizona, Tucson.

Munn, A. (to appear): 'A Null Operator Analysis of ATB Gaps'. The Linguistic Review.

Neijt, A. (1979): Gapping. A Contribution to Sentence Grammar. Foris Publications, Dordrecht.

Perlmutter, D. / J. Ross (1970): 'Relative Clauses with Split Antecedents'. Linguistic Inquiry 1.

Pesetsky, D. (1982): Paths and Categories. Ph D dissertation, MIT, Cambridge (Mass.).

Pinkal, M. (1989): 'Die Semantic von Satzkomparativen.' Zeitschrift fuer Sprachwissenschaft 8.2.

Pinkham, J. E. (1982): The Formation of Comparative Clauses in French and English. Ph D dissertation, Harvard University.

Reinhart, T. (1991): 'Elliptical conjunctions - nonquantificational LF'. In A. Kasher (ed.): The Chomskyan Turn, Basil Blackwell, New York.

van Riemsdijk, H. / E. Williams (1981): 'NP structure'. The Linguistic Review 1.

Rooth, M./B. Partee (1982): 'Conjunction, Type Ambiguity and wide scope *or*'. Proceedings of WCCFL, Staford Linguistic Students Association, Stanford.

Ross, H. (1967): Conditions on Variables. Reprinted in 1986 as Infinite Syntax, Ablex Publ. Corp, New Jersey.

Sag, I. (1976): Deletion and Logical Form. Ph D dissertation, MIT.

Safir, K. / T. Stowell: 'Binominal *Each*'. In J. Blevins et al. (eds.); Proceedings of NELS 18. Graduate Linguistic Student Association, University of Massachusetts, Amherst..

Schubert, L. / F. J. Pelletier: 'Generically Speaking or Using Discourse Interpretation Theory to Interpret Generics'. In G. Chierchia et al. (eds.): Properties, Types and Meanings. Reidel, Dordrecht.

Srivastav, V. (1991):

von Stechow, A.: 'Comparing Semantic Theories of Comparison'. Journal of Semantics 3.

Westerstahl, D. (1984): 'Context Sets'.

-------------- (1989):

Williams, E. (1977): 'Deletion and Logical Form'. Linguistic Inquiry 8.

---------- (1978): 'Across-the-board rule application'. Linguistic Inquiry 9.

---------- (1986): 'A Reassignment of the Functions of LF.' Linguistics Inquiry 17.

---------- (1988): 'A Reply to May

---------- (1990): 'The ATB theory of parasitic gaps'. The Linguistic Review 6.