

V Interface with Interpretation

19 The Syntax of Scope

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0 Introduction

This chapter reviews some representative examples of scopal dependency and focusses on the issue of how the scope of quantifiers is determined. In particular, we will ask to what extent independently motivated syntactic considerations decide, delimit, or interact with scope interpretation. Many of the theories to be reviewed postulate a level of representation called Logical Form (LF). Originally, this level was invented for the purpose of determining quantifier scope. In current Minimalist theory, all output conditions (the theta-criterion, the case filter, Subjacency, binding theory, etc.) are checked at LF. Thus, the study of LF is enormously broader than the study of the syntax of scope. The present chapter will not attempt to cover this broader topic.

1 Scope Relations and Determining Scope

1.1 *Scope relations*

We are going to take the following definition as a point of departure:

- (1) The scope of an operator is the domain within which it has the ability to affect the interpretation of other expressions.

Some uncontroversial examples of an operator having scope over an expression and affecting some aspect of its interpretation are as follows:

- quantifier–quantifier,
- quantifier–pronoun,
- quantifier–negative polarity item (NPI).

Examples (2a, b) each have a reading on which *every boy* affects the interpretation of a *planet* by inducing referential variation: the planets can vary with the boys. In (2c), the teachers cannot vary with the boys:

- (2) a. Every boy named a planet.
 “for every boy, there is a possibly different planet that he named”
 b. I showed every boy a planet.
 “for every boy, there is a possibly different planet that I showed him”
 c. That every boy left upset a teacher.
 *“for every boy, there is a possibly different teacher who was upset by the fact that the boy left”

Note the following convention: when an example is annotated with one interpretation as in (2), we are only claiming that this interpretation is available (or, if it is starred, unavailable), and we are not making any claim as to whether other interpretations are possible.

Similar variation is induced in (3a, b), with the mediation of *his* being interpreted as a variable bound by *every boy*. No bound variable interpretation is available in (3c), and *his* must refer to a contextually specified person:

- (3) a. Every boy_i read his_i book.
 b. I showed every boy_i his_i book.
 c. *That every boy_i left upset his_i teacher.

Notice that the quantifier–bound pronoun relation is syntactically more constrained than the name–coreferential pronoun relation: *That John_i left upset his_i teacher* is fine.

In (4a, b), the negative polarity item *any* [*of the books*] is licensed (becomes interpretable) in view of being in the scope of the downward entailing operator *few boys*; in (4c) it is not licensed:

- (4) a. Few boys read any of the books.
 b. I showed few boys any of the books.
 c. *That few boys came upset any of the teachers.

The notion of scope in (1) is quite similar to its counterpart in logical syntax. The scope of a logical operator is that segment of the formula, demarcated by parentheses (possibly suppressed when notational conventions make them recoverable), over which the operator can have a semantic effect. In (5a), only the x in fx is bound by the universal quantifier; in (5b), only the conjunction $fa \wedge ga$ is affected by negation:

- (5) a. $\forall x[fx \wedge ga] \wedge hx$
 b. $\neg(fa \wedge ga) \vee \exists x[hx]$

Definition (1) is syntactic in that it identifies the scope of an operator as the domain within which it has the potential to affect another expression's interpretation. Just as in logic, it does not require that the expressions within this domain be actually affected in any tangible way. Notice that in (5a), *ga* is within the universal quantifier's scope but is not affected by it, because it contains no free occurrence of the variable *x*. Now compare (6) with (7) and (2a) with (8):

- (6) I was not reading a book (when you came in).
 "no book is such that I was reading it"
 (7) A boy/Most boys did not laugh.
 "there is a boy/a majority of the boys who did not laugh"

When negation has an indefinite in its scope, as in (6), it clearly affects its interpretation in that the existence of a relevant entity can no longer be inferred. When negation is within what normally counts as the subject quantifier's scope, as in (7), negation is in no way affected by that quantifier, simply because no aspect of the interpretation of negation can ever be affected:

- (2a) Every boy named a planet.
 (8) Every boy named every planet/Mercury and Venus.

Likewise, while planets may vary with the boys in (2a), this is not possible in (8). Whoever named every planet or Mercury and Venus must have named the same planets; this simply follows from the meanings of these direct objects.

Thus, we are making a distinction between (2c) and (8), for instance:

- (2c) That every boy left upset a teacher.
 (8) Every boy named every planet.

In neither case does *every boy* make the direct object referentially dependent. In (2c), this is so because *a teacher* is not within the scope of *every boy*. In (8), this is so because, although *every planet* is within the scope of *every boy*, its semantics precludes referential variation.¹

1.2 How is the scope of an operator determined?

Scope understood as a domain is a syntactic notion; but to what extent does independently motivated syntactic structure delimit scopal options in natural language? Reinhart (1978) subsumed scope relations under the general principle (9) and proposed a very restrictive implementation, as in (10)–(11):

- (9) If a rule assigns node A some kind of prominence over node B, B must be within the domain of A.

(10) **“First branching node” c-command:**

The domain of a node A consists of all and only the nodes dominated by the (non-unary) branching node α which most immediately dominates A.

- (11) A logical structure in which a quantifier binding a variable x has wide scope over a quantifier binding a (distinct) variable y is a possible interpretation for a given sentence S just in case in the surface structure of S the quantified expression (QE) corresponding to y is in the domain of the QE corresponding to x .

According to (11), the surface structure of S directly determines what scope interactions are possible. If QE/1 is in the domain of QE/2 but not vice versa, QE/1 must take narrow scope. If both are in the domain of the other, the structure is potentially ambiguous. If neither QE is in the domain of the other, they must be interpreted independently. (11) is intended as a necessary but not a sufficient condition: the properties of the participating QEs may eliminate some of the predicted possibilities, as observed by Ioup (1975).

These assumptions immediately explain the starred data in (2c), (3c), and (4c): the direct object of the main clause is not within the domain of the embedded subject.

Reinhart’s proposal is very attractive, because it is parsimonious (Minimalist, one might say) and establishes an extremely tight link between syntax proper and interpretive possibilities. However, as it stands it fails to account for the full range of the data, or it accounts for them using certain controversial analytical assumptions. We single out two problems.

First, the subject clearly has the direct object within its domain, but not vice versa. This predicts that both (12) and (13) have only subject wide scope readings. While these may indeed be the preferred interpretations, the so-called inverse – object wide scope – readings are also possible:

- (12) Each student speaks two languages.

direct, predicted:

“for each student, there is a potentially different pair of languages . . .”

inverse, not predicted:

“there are two languages that each student speaks”

- (13) Two students speak each language.

direct, predicted:

“there are two students who speak each language”

inverse, not predicted:

“for each language, there is a potentially different pair of students . . .”

Reinhart essentially denies that grammar needs to account for the unpredicted readings. As regards the type of (12), which has an indefinite in object position, she observes that the unpredicted object wide scope reading entails the

predicted subject wide scope reading. It is thus difficult to tell whether there is a separate reading that requires that the pair of languages be held constant, or we are simply dealing with a special case in which the predicted reading is true. As regards the type of (13), which has a universal in object position, she points out examples that do not easily allow for inverse scope and takes these latter to be paradigmatic:

- (14) Some tourists visited all the museums.
 ?? “for each of the museums, there are potentially different tourists . . .”

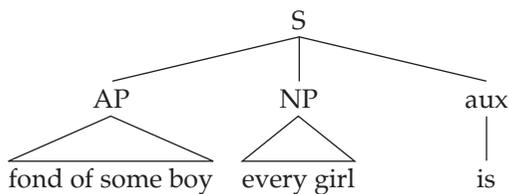
Second, there are cases where the correct predictions are made but at the cost of controversial analytical assumptions involving preposing. In (15)–(16), the subject QE takes wide scope over the QE within the preposed XP:

- (15) Fond of some boy every girl is.
 “for every girl, there is some boy she is fond of”
- (16) (. . . and) break all the plates someone finally did.
 “there was someone who broke all the plates”

These data fall under the same generalization as the binding judgments in (17)–(18):

- (17) *For Ben_i's car, he_i is asking two grand.
 (18) For his_i car, Ben_i is asking two grand.

To achieve these effects, Reinhart sister-adjoins the preposed XPs to S. For example:



In this chapter, we are focussing on the issues related to (12)–(14); those related to (15)–(18) are taken up in Barss (this volume).

The problems we encountered raise at least the following questions:

- (19) a. Are there solid inverse scopal readings that cannot be explained away as special cases of weaker direct readings?
 b. Can scope options be read off of independently motivated syntactic structure, or is it necessary to create additional structure specifically for the purposes of scope interpretation?

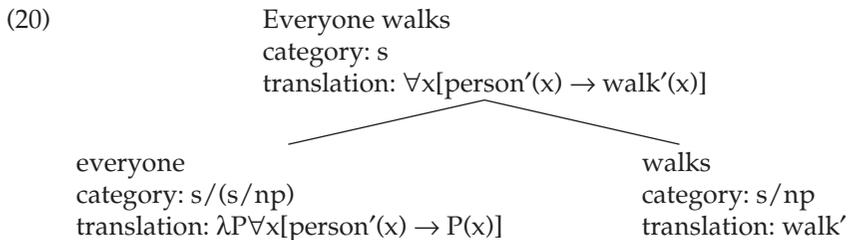
- c. If additional structure is needed, is it constrained by similar principles to those that constrain “syntax proper”?
- d. What shall we make of the apparently diverse scope behavior of scope-bearing noun phrases?

Ever since Reinhart’s pioneering proposal, the literature (some of Reinhart’s own work included) has been grappling with these questions. Not surprisingly, each stage of theorizing attempts to answer them in its own characteristic spirit. The survey below will bear this out.

2 Quantification in Abstract Syntax

2.1 Rules of quantification: the 1970s

Montague’s classic paper, “The proper treatment of quantification in ordinary English” (1974), presents a grammar for a small fragment of English which, however, contains the logicosyntactic and semantic devices to handle practically any scope phenomenon. The core of his grammar is a categorial syntax with just functional application: these days one may think of it as a Minimalist syntax with nothing but Merge. Quantifier phrases, just like proper names, may enter the sentence in a functional application (Merge) step. The derivation in (20) is slightly simplified, and Montague’s categories *t* and *e* are relabeled as *s* and *np*, respectively:

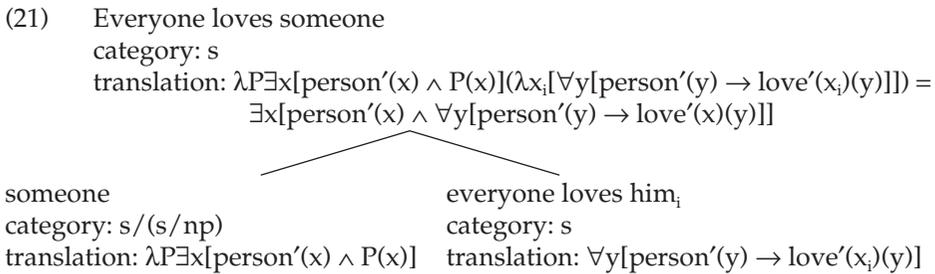


Syntax and interpretation proceed hand in hand. All noun phrases belong to the category of functions *s/(s/np)* that take a predicate *s/np* as an argument and yield a sentence *s* as a value; semantically, *everyone* is interpreted as the set of properties that everyone has. Applied to the property *walk'*, this yields the statement that everyone has the property of walking, that is, everyone walks. A similar analysis, involving just functional application (Merge), is available for noun phrases in non-subject position; the details, which involve some complications, are not relevant here. It is important to dispel the myth that there is an inherent semantic necessity to impose an operator–variable structure on the syntax of English whenever we introduce a quantifier. Once quantifiers are assigned an appropriate interpretation (and devising such an interpretation in

terms of sets of properties is one of Montague's major achievements), merging them is perfectly well formed.

The introduction of a quantificational phrase by way of merging assigns it strictly direct scope: it will not scope over any operator (quantifier, negation, modal, etc.) that is merged later.² This portion of Montague's grammar makes essentially the same predictions as Reinhart's (1978) does without preposing.

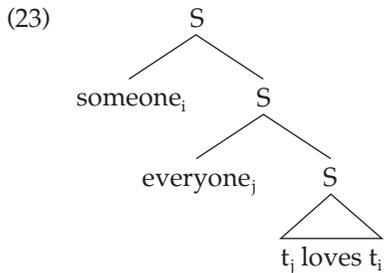
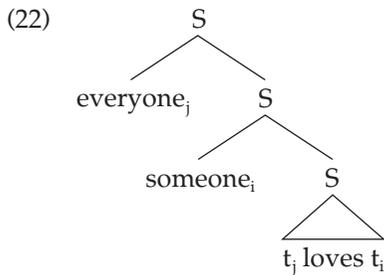
Montague's grammar, however, also contains devices that create arbitrary inverse scopes. These are the rules of quantification (quantifying into nominals, verb phrases, and sentences). For illustration, we derive the inverse (object wide scope) reading of *Everyone loves someone*. Structures continue to be built bottom-up. First an open sentence, *everyone loves him_i*, is built with a placeholder pronoun in the object position. This placeholder is interpreted as a variable x_i . The subsequent quantification step has the following ingredients. (i) Using the quantifier phrase *someone* and the open sentence as input, a sentence is created by replacing the placeholder with the quantifier. (ii) The interpretation of the resulting sentence is built by applying the quantifier to a property that is obtained from the open sentence by abstraction. Abstraction is performed by the lambda operator; the property it forms in this case is that of being loved by everyone: $\lambda x_i[\forall y[\text{person}'(y) \rightarrow \text{love}'(x_i)(y)]]$. The result boils down to there being a person whom every person loves:



The narrow scope quantifier *everyone* may have been introduced either by plain Merge (as in *Everyone walks* above) or by quantifying into *he_j loves him_i*. In this case the choice makes no semantic difference, because there is no scope interaction in the relevant portion of the sentence.

Notice that although in (21) Montague ends up with a string that corresponds to a surface English sentence, the quantification step in the derivation is a piece of abstract syntax. A structure is created that has no independent syntactic motivation and serves no other end than assigning wide scope to *everyone*.

There is a significant affinity between these ideas and May's (1977). May proposes that syntax does not end with producing the surface string. Instead, movement operations somewhat reminiscent of *wh*-movement continue to operate at an abstract level called Logical Form (LF) and append each phrase containing a quantifier to its domain. This rule is called Quantifier Raising (QR). For example, the two readings of *Everyone loves someone* have the following LF structures:



It is interesting to observe the precise match between (21) and (23). Both theories hold that on its object wide scope reading, *Everyone loves someone* is crucially associated with an abstract structure consisting of an operator comprising the material in the object noun phrase and of a sentence with a variable in the position of the direct object (a placeholder in one theory, a trace in the other). We might say that one difference between Montague's and May's syntaxes is that in Montague's, the steps straightforwardly building the surface string are interspersed with steps pertaining to its LF, while May first builds the surface structure and then rearranges it into a LF representation. Another difference is that May applies QR to all quantifier phrases without exception. An important further difference is that Montague provides an explicit compositional semantics for his syntax; we will conveniently assume that compatible syntactic proposals by others are interpreted along the same lines.

2.2 Syntactic aspects: the 1980s

Reinhart's approach and the Montague/May approach represent two extremes. On the former, independently motivated phrase structure imposes an absolute limitation on scope options; on the latter, there is no such absolute limitation, because structure may be built solely for the purposes of scope assignment. Nevertheless, syntactic considerations bear on scope on the latter approach as well.

First, syntactic constraints on structure building can be accommodated. For example, Rodman (1972) observed that a quantifier inside a relative clause cannot make an expression outside that relative clause referentially dependent, and modified Montague's fragment to prevent quantifying into a relative clause:

- (24) Guinevere has a bone that is in every corner of the house.
 *"for every corner of the house, Guinevere has a (different) bone in that corner"

In fact, an even tighter constraint seems to be correct: a universal quantifier generally cannot affect the interpretation of expressions outside its clause.³ Accordingly, May stipulated that QR is a clause bounded adjunction rule:

- (25) A critic thinks that every book is readable.
 *"for every book, a possibly different critic thinks that it is readable"

The existence of "scope island" constraints points to the syntactic nature of the abstract structure created for the purposes of disambiguating scope. It is to be noted, however, that clause boundedness somewhat idiosyncratically constrains Quantifier Raising. The most likeminded overt operation, *wh*-movement, is not so constrained:

- (26) What books does a critic think are readable?
 "what books are such that possibly different critics think they are readable"

Second, QR interacts with pronouns, VP-ellipsis, and other phenomena in the manner of overt *wh*-movement. For example, it gives rise to crossover effects. Crossover is thought to be sensitive to either linear order or c-command, both of which are clearly syntactic in nature:

- (27) a. Who does he admire?
 *"for what person x , x admires x "
 b. Who does his mother admire?
 ??"for what person x , x 's mother admires x "
- (28) a. He admires every man.
 *"for every man x , x admires x "
 b. His mother admires every man.
 ??"for every man x , x 's mother admires x "

Third, even though Reinhart's original assumption that no quantifier phrase takes inverse scope over another may have been too strong, an interesting subject-object asymmetry is observed in May (1985) in connection with the interaction of *wh*- and quantifier phrases:

- (29) Which planet _{t_i} did every boy name t_i ?
 i. "which planet is such that every boy named it"
 ii. "for every boy, which planet did he name"
- (30) Which boy _{t_i} named every planet?
 i. "which boy is such that he named every planet"
 ii. *"for every planet, which boy named it"

It is convenient to think of the contrast between the (i) readings and the (ii) readings in terms of scope. Reading (i), where the *wh*-phrase has wider scope than the universal quantifier, is called the individual reading and it is generally available. Reading (ii), where the universal has wider scope than the *wh*-phrase, is called the family of questions or pair-list question reading. It is available only when the quantifier phrase c-commands the trace of *wh*-movement.

This contrast plays a central role in motivating the revisions proposed in May (1985), a work which develops a theory of scope by addressing most of the issues that were of prime concern to syntacticians in the mid-1980s.

In May (1977), QR both determines and disambiguates quantifier scope: the quantifier's c-command domain is determined by QR and the wide scope quantifier always asymmetrically c-commands the narrow scope one. In May (1985), QR determines quantifier scope, but it does not disambiguate it. In addition to assigning an absolute scope to each quantifier, the theory includes the Scope Principle that regulates their interaction:

(31) **The Scope Principle:**

If two operators govern each other, they can be interpreted in either scopal order.

This is a feature that the new theory shares with Reinhart's.

Let us see the motivation and how the proposal works. A glance at (22) and (23) reveals that the subject wide scope reading involves a crossing dependency, while the object wide scope reading involves a nesting one. To recap:

(22) [_S everyone_j [_S someone_i [_S t_j admires t_i]]]

(23) [_S someone_i [_S everyone_j [_S t_j admires t_i]]]

Crossing dependencies cause ungrammaticality with two *wh*-phrases:

(32) *What does who admire?
[_{S'} who_j what_i [_S t_j admires t_i]]

(33) Who admires what?
[_{S'} what_i who_j [_S t_j admires t_i]]

The Empty Category Principle (ECP) (specifically, on Pesetsky's 1982 formulation, the Path Containment Condition) rules out (32). But then the same principle should rule out (22) as well.

If so, we have no legitimate representation for the subject wide scope reading in May's (1977) terms. May (1985) proposes that, in fact, (23) represents both readings simultaneously. This is achieved by the Scope Principle as above, in conjunction with a modified set of relevant definitions:

(34) α dominates $\beta =_{df}$ all the member nodes of α are above β .

- (35) α c-commands $\beta =_{df}$ every maximal projection dominating α dominates β , and α does not dominate β . Maximal projections are NP, VP, and S' (but not S).
- (36) α governs $\beta =_{df}$ α c-commands β , and there are no maximal projection boundaries between them.

These notions will sound familiar as they were adopted almost wholesale in *Barriers* (Chomsky 1986b). Recall that QR is Chomsky-adjunction. Under the above definitions, two phrases Chomsky-adjoined to the same projection γ will c-command each other because, in fact, the c-command domains of both extend to the next maximal projection up (they are not dominated by γ , only member nodes of it). Furthermore, since they are not separated by a maximal projection boundary, the Scope Principle says that they can be interpreted in either order. Thus, (23) with two S-adjoined quantifiers is ambiguous.

The assumption that Chomsky-adjunction extends the scope of a quantifier upwards is beneficial in connection with inverse linking. The relevant fact is that in (37), *every city* must scope over *someone* to bind it:

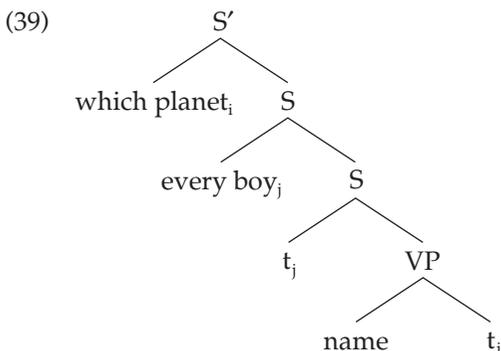
- (37) Someone from every city hates it.
 "for every city x , there is someone from x who hates x "

In May (1977), sentential scope could be assigned to *every city* only by S-adjunction. The assumption that *every city* extracts from the subject NP conflicts with the ungrammaticality of the corresponding *wh*-extraction (irrespective of pronoun binding):

- (38) *Which city_i does [someone from t_i] hate New York?

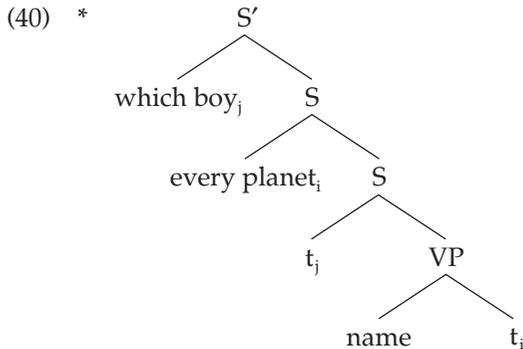
In May (1985), *every city* only needs to adjoin to NP to have scope over the whole of S.

Let us now come back to the issue of how the theory works for *wh*-/quantifier interaction. The ambiguous sentence in (29) has the following LF representation:

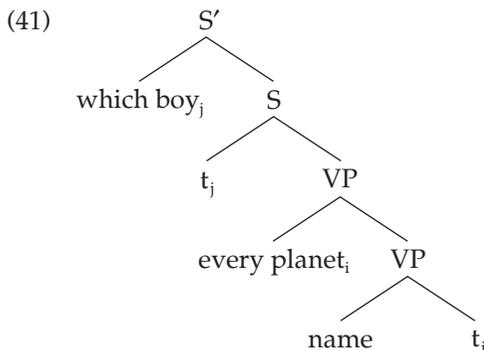


This structure contains a nested dependency and is thus approved by the ECP. Furthermore, it is ambiguous. The c-command domain of S-adjoined *every boy* extends to S' , and there is no maximal projection boundary separating it from *which planet* (S does not count as a maximal projection).

On the other hand, reversing the subject and the object in this structure gives rise to a crossing dependency and thus an ECP violation:



But (30), *Which boy named every planet?*, is merely unambiguous, not ungrammatical. We still need a legitimate representation for it on the correct “which boy is such that he named every planet” reading. The definitions above allow for the following, with *every planet* adjoined to VP:



This structure does not incur an ECP-violation. On the other hand, it is not ambiguous: although VP-adjoined *every planet* c-commands *which boy*, they do not govern each other, because they are separated by a VP-boundary.

The following example shows that it is useful to distinguish mutual c-command from mutual government:

(42) [Which pilot that shot at it_i]_j hit [every Mig that chased him_j]_i?

(42) contains two bound variable pronouns. The fact that they are legitimate indicates that *which pilot that shot at it* c-commands *him* (has *him* in its absolute

scope) and *every Mig that chased him* c-commands *it* (has *it* in its absolute scope). Nevertheless, the sentence has no family of questions interpretation because, as in (40), the *wh*-subject and the universal object do not govern each other.

VP-adjunction of a quantifier is independently motivated by coordinations like (43b):

- (43) a. Some professor admires every student.
 i. “there is a professor who admires every student”
 ii. “for every student, there is a professor who admires him or her”
 b. Some professor admires every student and hates the dean.
 i. “there is a professor who both admires every student and hates the dean”
 ii. *“for every student, there is a professor who both admires him or her and hates the dean”

While (43a) is ambiguous, (43b) strongly prefers the reading with a particular professor. This indicates that QR is subject to the Coordinate Structure Constraint: *every student* cannot adjoin to S by moving out of a conjunct. But then the subject wide scope reading of (43b) cannot be represented in the manner of (23). VP-adjunction of *every student* serves as a way out:

- (44) [_S some professor_j [_{VP} every student_i [_{VP} t_j admires t_i]]]

This last observation has somewhat more general significance. If subject wide scope readings can in general be represented by an unambiguous structure where the direct object adjoins to VP, then the possibility of subject wide scope does not provide much evidence for the need of ambiguous representations and the Scope Principle, contrary to what the discussion of (22) *vis-à-vis* (32) suggested. The burden of motivating the Scope Principle falls solely on the asymmetry observed in connection with *wh*-/quantifier interactions.

The Scope Principle in general and the ECP-based account of the asymmetries in *wh*-/quantifier interaction in particular have been criticized from various angles. The first extensive discussion can be found in Williams (1986, 1988), where Williams proposes to eliminate LF as a separate level of representation and to reassign its functions to other components. For further important arguments, see Liu (1990: ch. 5), Chierchia (1993), Aoun and Li (1993c), Hornstein (1995), and Beghelli (1997). As a consequence, May's specific solutions have eventually been abandoned.

3 Minimalism: The 1990s

In the early 1990s, Minimalism changed the general perspective on syntax and, accordingly, the approach to scope as laid out above became a misfit,

over and beyond the specific empirical problems it might have had. A powerful summary of the discrepancies is offered in Hornstein (1995: ch. 8). QR is an adjunction rule; no other core grammatical process involves adjunction. QR does not target a specific position; other movement rules have specific targets. QR applies in order to assign scope; other movements are feature driven.

There are two basic ways to remedy this situation. One is to eliminate QR and obtain the desired scope results as by-products of entirely independent grammatical processes. Another is to recast QR and show that it fits the Minimalist picture. The first strategy is followed by Hornstein (1995); the second is followed in some aspects of Beghelli (1993) and Beghelli and Stowell (1997).

3.1 Scope read off of A-chains

Hornstein proposes that relative scope is largely a property of A-chains. That is, the structures that determine scope are created for independent reasons and, specifically, those reasons are primarily related to case, not operatorhood. Noun phrases originate in VP-internal positions and raise to the specifiers of agreement phrases (AgrSP and AgrOP) to check case. In doing so, they leave behind copies in each link of the chain. But crucially, only one link can survive till the Conceptual–Intentional interface; all others must be deleted. Unlike in A'-chains, however, there is no preference principle forcing the deletion of a specific link in the chain: we are free to choose. Scope is now determined by the asymmetric c-command relations of the surviving copies.⁴

To illustrate, (46) is the LF phrase marker for (45):

(45) Someone attended every seminar.

(46) [_{AgrS} Someone [_{TP} Tns [_{AgrO} every seminar [_{VP} someone [_{VP} attended every seminar]]]]]]

In both chains, one or the other member must delete. This predicts four possibilities. Two of them are excluded by a version of Diesing's (1992) Mapping Hypothesis that requires that quantifiers like *every seminar* land outside VP; in the present framework, this entails that their surviving copies are always in the specifier of some AgrP.⁵ The remaining structures are as follows. Parentheses indicate deletion. (47) reflects the subject wide scope and (48) the object wide scope reading. (We come back to the ambiguity of *Everyone attended some seminar* later.)

(47) [_{AgrS} Someone [_{TP} Tns [_{AgrO} every seminar [_{VP} (someone) [_{VP} attended (every seminar)]]]]]]

(48) [_{AgrS} (Someone) [_{TP} Tns [_{AgrO} every seminar [_{VP} someone [_{VP} attended (every seminar)]]]]]]

The idea that scope ambiguities are due to the possibility of taking alternative chain links into account (put another way, to the possibility for quantifiers to reconstruct into trace positions) originates with Aoun and Li (1993c), although the chains they created and considered were A'-chains. The account extends naturally to the restrictions pronoun binding, VP-ellipsis, etc. impose on the range of possible scope interpretations.⁶

This approach has various benefits, beyond its appealing Minimalist spirit. Quantifier scope is largely clause bounded (recall (26)), a property that A-movement but not A'-movement classically has. Now this follows immediately from the fact that scope lives off of A-chains. Also, QR does not license parasitic gaps:

- (49) a. Which paper_i did you file t_i without reading pg_i?
 b. *You filed every paper without reading.
 [S every paper_i [S you filed t_i without reading pg_i]]

This can be explained, without explicit reference to parasitic gaps being licensed at S-structure, if the analysis of (49b) never involves A'-chains comparable to those in (49a).

3.2 Different quantifiers, different scopes

In at least one respect, there is a fundamental similarity between all the theories reviewed above, Hornstein's included. They hardly address the anecdotally well-known fact that different quantifier types have different scope-taking abilities. To begin with, they ignore all quantifier phrases other than those containing *every* or *some*, although those may exhibit markedly different scope behavior, and they do not even address the systematic differences between the chosen two. It turns out that scopal diversity is not only an issue for descriptive adequacy but bears on how the syntax of scope should be set up.

Reinhart (1995, 1997b), Beghelli (1993), and Beghelli and Stowell (1997) address fundamental facets of the diversity issue. Reinhart focusses on the contrast between "indefinites" and "quantifiers" with respect to islands, Beghelli and Stowell focus on the clause internal differences exhibited by a greater variety of noun phrase types.

3.2.1 The island-free scope of indefinites

As regards Minimalist concerns, Reinhart (1995, 1997b) assumes that QR, a covert movement operation specifically dedicated to scope assignment, is acceptable if it obeys standard constraints on movement and is forced by interface conditions, specifically the need to associate sentences with their correct truth conditions.⁷ Let us assume without further argument that the behavior of universals like *every man* can indeed be accounted for along these lines. The big problem is that the scope of indefinites does not appear to obey any island constraints at all. Consider scoping out of coordinate structures, adjuncts, and relative clauses:

- (50) Everyone reported that [Max and *some lady*] disappeared.
 “there is a lady such that everyone reported that Max and this lady disappeared”
- (51) Most guests will be offended [if we don’t invite *some philosopher*].
 “there is a philosopher such that most guests will be offended if we don’t invite him or her”
- (52) All students believe anything [that *many teachers* say].
 “there are many teachers such that all students believe anything they say”

All these sentences are ambiguous. The claim that they indeed have the island-escaping readings specified above is corroborated by the fact that *wh*-in situ and sluicing, which Reinhart argues should be treated in a manner analogous to indefinites, exhibit the same effects. Those cases boil down to plain matters of grammaticality. For example:

- (53) Who reported that Max and *which lady* disappeared?
- (54) Who will be offended if we don’t invite *which philosopher*?
- (55) Who believes anything that *who* says?

It turns out that the indefinite facts cannot be explained away in the manner Reinhart (1978) had attempted to: the reading on which the indefinite takes wide scope does not always entail the other reading. Fodor and Sag (1982) and Ruys (1992) note the existence of examples where neither reading entails the other. Crucially, to show that in (56), the inverse reading does not entail the direct reading, imagine a situation with three boys. Two of them kiss Jane, and the third kisses Jean. In this situation it is true that some girl, i.e., Jane, is kissed by exactly two boys, but it is not true that exactly two boys kissed some girl or other: three boys did. (To show that the direct reading does not entail the inverse reading, imagine a situation where one boy kisses Jane, one kisses Jean, and the third kisses no one. In this situation it is true that exactly two boys kissed some girl or other, but not a single girl was kissed by exactly two boys.)

- (56) Exactly two boys kissed *some girl*.

But then, the island-free scope of the indefinite in (57) cannot be a matter of entailment:

- (57) Mary dates exactly two of the men [who know *a producer I like*].
 “there is a producer I like such that Mary dates exactly two men who know him”

Nor can the wide scope reading be attributed to a separate, referential interpretation of the indefinite, as Fodor and Sag (1982) proposed. As they pointed out, this account predicts that indefinites cannot escape an island and take intermediate scope at the same time; Farkas (1981) showed that such readings are possible. In (58), conditions can vary with students, and triplets of arguments with conditions:

- (58) Every student has to come up with three arguments [that show that *some condition proposed by Chomsky* is wrong].
 “for every student, there should be a condition proposed by Chomsky such that the student comes up with three arguments that show that the condition is wrong”

In sum, the varying scope of indefinites is neither an illusion nor a semantic epiphenomenon: it needs to be “assigned” in some way. Suppose it is assigned by QR, and LF movement is generally immune to subjacency (as suggested in Huang 1982), while the scope of universals is confined to their clause for some other particular reason. But whether or not this solution might have worked in earlier theories, the assumption that movement before and after S-structure obeys different constraints cannot even be stated in the Minimalist theory, which does not have S-structure as a level of representation.

Given this difficulty, the varying scope of indefinites might be attributed to unselective binding. Following Lewis (1975), indefinites may be interpreted as variables, rather than existentially quantified expressions. Their existential force is then due to the fact that they are captured by an independently introduced existential quantifier. Such an existential may occur at the text level or appended to the nuclear scopes of all true quantifiers, as in Heim (1982), or appended to VP, as in Diesing (1992). In any case, the fact that unselective binding involves no movement will immediately explain why the scope of indefinites is island-free.

But there is a problem. Heim (1982) combined unselective binding with QR in the treatment of indefinites, with a good reason. Suppose an indefinite occurs inside the antecedent of a conditional and is intended to take scope over the whole conditional:

- (59) If we invite some philosopher, Max will be offended.

The interpretation that plain unselective binding produces is (60):

- (60) for some x[(if x is a philosopher and we invite x), Max will be offended]

A conditional is true if either the if-clause is false or the consequent is true. The if-clause in (60) will be false if the value of x either is not a philosopher or we do not invite it. Thus, the existence of any non-philosopher or non-invitee suffices to make (60) true. The problem stems from the fact that in (60), only

the existential quantifier occurs outside the implication; the restriction *x is a philosopher* stays in its antecedent. An operation like QR, which has always been assumed to move the whole noun phrase, would not separate the existential quantifier from its restriction. Thus, syntactically ill-behaved as it might be, it appears we need QR to carry the restriction up.⁸

As a final blow, Reinhart shows that in another respect, QR would not assign the correct truth conditions. The relevant observation, made by Farkas (1981), Ruys (1992), and Kratzer (1995), pertains to the distributive interpretation of plural indefinites. Compare:

- (61) Three relatives of mine inherited a house.
- i. "there are three relatives of mine who together inherited a house"
 - ii. "there are three relatives of mine who each inherited a house"
- (62) If three relatives of mine die, I will inherit a house.
- i. "there are three relatives of mine such that if they all die, I will inherit a house"
 - ii. "there are three relatives of mine the death of each of whom will leave me with a house"

Plural indefinites can scope out of an island, but cannot distributively scope out: they cannot make another expression outside the island referentially dependent. What this indicates is that existential scope and distributivity are two separate matters: they can diverge. The traditional notion of quantifiers has distributivity built in, so to say, hence it will not make the distinction. If QR is an operation that raises quantifiers so understood, we get only the (ii) readings, which amounts to both undergeneration and overgeneration.

Thus, we need a non-QR solution to the problem of the separated restriction. There are several logically possible solutions. Reinhart chooses a variant of unselective binding, with existential quantification over choice function variables, as opposed to individual variables, as proposed in Egli and von Stechow (1995). A choice function applies to a set and chooses an element of the set. Each choice function *f* may choose a different element. For example, it may be that $f_1(\text{philosopher}) = \text{Russell}$ and $f_2(\text{philosopher}) = \text{Strawson}$. (59) will now be interpreted as follows. The restriction is not syntactically carried up and yet it contributes to interpretation as if it was:

- (63) $\exists f[\text{f is a choice function and (we invite f(philosopher) } \rightarrow \text{Max will be offended)]$
 "there is some choice function such that if we invite the philosopher it picks, Max will be offended" = "there is some philosopher such that if we invite him or her, Max will be offended"

If the indefinite is plural, the choice function will pick appropriate collectives from the NP-denotation; for example, *three relatives* will be interpreted as $f(\text{three$

relatives), which picks a collective made up of three relatives. The distributive readings of plurals are obtained with the aid of a separate distributive operator; a conclusion that is standard in the literature.

The syntactic upshot of the discussion is this. It had been assumed that QR, an operation that either is clause bounded or at least obeys Subjacency, affects phrases like *every man*, *some man*, *three men*, etc. alike. This assumption runs foul of the robust fact that the existential scope of indefinites is island-free, and the situation cannot even be remedied by making QR by default island-free. Indefinites acquire their existential scope in a manner that does not involve movement and is essentially syntactically unconstrained. The distributive interpretation of plural indefinites is due to a separate operator.

Reinhart remains undecided as to whether or not QR should be allowed, somewhat redundantly, to create island-internal distributive scopings of indefinites. In a companion paper, Winter (1997) suggests that it should not.

3.2.2 Putting the data together

Although Reinhart (1995, 1997b) is content with accepting QR for well-behaved quantifiers, Hornstein's (1995) objections to QR as a non-Minimalist operation seem well founded. Given that the two theories cover largely complementary items of data, one may wonder whether Reinhart's and Hornstein's insights cannot be combined.

It seems they can; moreover, such a move might solve a fatal problem in Hornstein's theory. Recall from the discussion of (45) that the ambiguity of *Someone attended every seminar* is explained as follows. Both quantifiers have two copies: in their case positions and in their VP-internal positions. By Diesing's Mapping Hypothesis, *every seminar* must have its VP-internal copy deleted, whereas *someone* can have either copy deleted. The subject wide scope reading obtains if the copy of *someone* that survives is the one in AgrS, and the object wide scope reading obtains if it is the one inside VP. But, as Hornstein points out (1995: 237–8), the ambiguity of (64) cannot be accounted for along these lines:

(64) Everyone attended some seminar.

The reason is that by the Mapping Hypothesis, *everyone* is safely lodged in AgrS, and there is no position above it where the direct object might be located and take wider scope. Hornstein himself argues that (64) indeed only has a subject wide scope reading, and the apparent object wide scope reading is simply due to the fact that everyone may have attended the same seminar.

This line of argument is identical to Reinhart's (1978). As Reinhart (1995) points out, however, this argument, which depends on the fact that the inverse reading entails the direct reading, goes through for *every–some* but not in general – see the discussion of (56). Thus, the ambiguity of all of the following examples remains unaccounted for in Hornstein's theory, given that the definite/presuppositional subject must be interpreted VP-externally and the object wide scope reading does not entail the subject wide scope one:

- (65) Exactly half of the students attended some seminar.
 Most but not all of the students attended some seminar.
 Every second student attended some seminar.
 Two of the students attended three of the seminars.
 Neither student attended a seminar on rectangular circles.

On the other hand, if even the clause internal scope of indefinites must be obtained by existential quantification over choice functions, and the location of the existential quantifier is syntactically unconstrained, then all of (64) and (65) can be assigned an object wide scope reading simply by positing an existential quantifier somewhere – anywhere – above AgrS. Note, though, that if we must resort to assigning scope to direct object indefinites in a syntactically unconstrained manner, the strictly A-chain based account of the behavior of subject indefinites becomes a bit of an illusion.

Interestingly, however, Hornstein's theory makes solid predictions for a kind of datum he himself never considers: sentences involving the interaction of a universal and a "modified numeral." As Liu (1990) observed, (66) is ambiguous but (67) is not. Modified numerals do not take island-free scope; they even resist taking inverse scope within their own clause. Similar to *more/fewer than three seminars* is the behavior of *few seminars, no seminars, exactly three seminars, more seminars than concerts*, etc.:

- (66) More/fewer than three students attended every seminar.
 i. "more/fewer than three students are such that they attended every seminar"
 ii. "every seminar was attended by more/fewer than three students"
- (67) Every student attended more/fewer than three seminars.
 i. "every student is such that she or he attended more/fewer than three seminars"
 ii. *"more/fewer than three seminars were attended by every student"

These judgments would be derived as follows. *Every seminar* must be interpreted in AgrO in (66) and in AgrS in (67). In (66), *more/fewer than three students* is interpreted using either the copy in AgrS or the one in VP-internal position; the former is higher and the latter is lower than AgrO, hence the ambiguity. In (67), both positions of the modified numeral, AgrO and VP-internal, are below AgrS, whence only the subject can take wide scope.

3.2.3 A hybrid theory: A-chains plus feature driven A'-movement

To summarize, it does seem useful to assume that (i) some quantifiers, namely, modified numerals, never scope above their case position, but can be "reconstructed" into a lower link in their chains, whereas (ii) some other quantifiers, such as universals, reach a relatively high position and never "reconstruct." The question is whether the interpreted position of the latter is indeed a case

position, *à la* Hornstein, and whether the impossibility to “reconstruct” them into VP is indeed prevented by pre-suppositionality, *à la* Diesing. Hornstein writes off QR because he takes it for granted that QR cannot be feature driven. It seems correct that the omnivorous rule QR that applies to all scope-bearing noun phrases in a uniform manner cannot be feature driven. Given the differential behavior of indefinites, universals, and modified numerals, such a uniform rule has no descriptive validity, to begin with. But perhaps universals and some other quantifiers are driven to their high clause internal positions by the need to check certain interpreted features, probably a different feature for each type, and the reason why they do not “reconstruct” is simply that these features are relevant for interpretation.

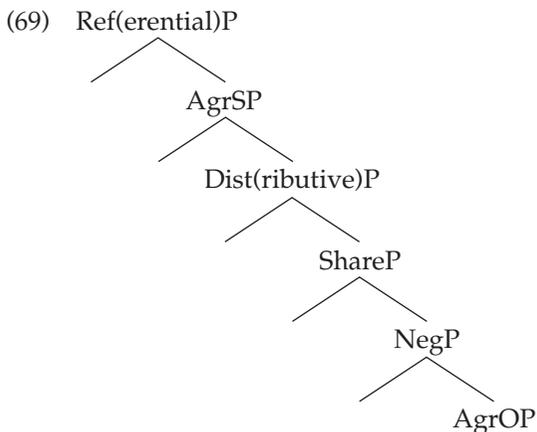
This is precisely the proposal in Beghelli (1993) and Beghelli and Stowell (1997).⁹ Their descriptive starting point is Liu’s observation that quantifiers fall into two big classes as to whether they take inverse scope (see the discussion of (66)–(67)). Beghelli and Stowell distinguish the two classes as follows:¹⁰

- (68) a. Quantifiers that readily take inverse scope (*two men, every man*, etc.) have interpreted features that send them to relatively high designated positions, whereas
- b. quantifiers that basically do not take inverse scope (*no man, more/fewer two men*, etc.) are either sent to some relatively low interpreted position, like NegP, or do not have any feature to check beyond their case features, wherefore they are always interpreted somewhere within their A-chains.

That is to say, in this theory, only type (b) quantifiers receive the treatment that Hornstein assumes for all quantifiers.

Case (a) deserves attention because of the specific interpreted features involved. We focus on one such feature: [+distributive], to show the general plausibility of the enterprise.

Beghelli and Stowell assume (at least) the following functional projections:



Every man and *each man*, but not *the men*, *a hundred men*, and *all the men* are obligatorily distributive:

- (70) a. *Every man/each man surrounded the fort.
 b. Every man/each man lifted the table (*together).
- (71) a. The men/a hundred men/all the men surrounded the fort.
 b. The men/a hundred men/all the men lifted the table (together).

This is accounted for by a [+dist] feature that they need to check against the distributive operator that heads DistP. Thus, specifier of DistP is the position where *every man* and *each man* land and cannot reconstruct from.

The Dist head selects as its complement a functional category (ShareP) containing the distributed share with the ability to referentially vary. The distributed share may be an existentially closed event variable, as in the correct distributive reading of (70b), or an indefinite, as in (72):

- (72) Every man/each man lifted a table.

Although *the men*, *all the men*, or topical indefinites can also be interpreted distributively, they never occur in DistP. They are driven to the specifier of RefP, and their optional distributivity is due to an independent distributive operator, as is also argued by Reinhart. Beghelli and Stowell assimilate this latter operator to binominal *each* (Safir and Stowell 1989), which accounts for its clause bounded nature; the clause boundedness of Dist, it being a head, is straightforward.

The ambiguity of (73) and (74) is accounted for with reference to the fact that *someone* may land either in RefP or ShareP:¹¹

- (73) Someone attended every seminar.
 i. [_{RefP} someone [_{DistP} every seminar [attended]]]
 ii. [_{DistP} every seminar [_{ShareP} someone [attended]]]
- (74) Everyone attended some seminar.
 i. [_{RefP} some seminar [_{DistP} everyone [attended]]]
 ii. [_{DistP} everyone [_{ShareP} some seminar [attended]]]

(75), with a modified numeral in subject position, is ambiguous, due to the fact that the subject can stay in AgrSP or reconstruct into a trace position:

- (75) More than two students attended every seminar.
 i. [_{AgrSP} more than two students [_{DistP} every seminar [attended]]]
 ii. [_{DistP} every seminar [more than two students attended]]

On the other hand, (76) is unambiguous, because *more than two seminars* cannot get higher than AgrOP and *every student* cannot reconstruct:

- (76) Everyone attended more than two seminars.
 i. [_{DistP} everyone [_{AgrOP} more than two seminars [attended]]]
 ii. *“there are more than two seminars that everyone attended”

To summarize, on Beghelli and Stowell’s approach, too, scope is a by-product of feature checking. They argue for the existence of at least three new functional projections into which phrases are driven to check interpreted features: RefP, DistP, and ShareP. Movement into the specifiers of these positions is what takes the place of QR in their version of a Minimalist approach to scope. Reconstruction from these positions is barred by the interpretive relevance of the features checked. Hierarchy predicts that an indefinite in RefP scopes above, and an indefinite in ShareP scopes below, a universal in DistP. Modified numerals typically do not move to any of these three positions; they scope in their AgrPs or in a lower link of their chains. The assumption that AgrSP is above DistP ensures that a modified numeral subject can always potentially scope above a universal direct object.¹²

3.2.4 Crosslinguistic evidence

It is interesting to confront these theories with languages that disambiguate scope relations at Spell-Out. How do they do it? We briefly consider Hungarian and Chinese.

The surface syntactic data of Hungarian, a language that has come to be known to “wear its LF on its sleeve” (see e.g. É. Kiss 1991), provide direct support for many details of the feature driven A’-movement hypothesis. Hungarian largely disambiguates scope by the linear order of quantifiers at Spell-Out. Two important negative facts are that (i) this linear order is not obtained by simply lining up quantifiers in the desired scope order, contrary to what a Montague/May style theory would predict, and (ii) this linear order is not determined by case or grammatical functions, as a Hornstein style theory would predict. Instead, as research since the late 1970s has firmly established, each type of quantifier occurs in its specific position, easily recognizable from surface clues like the position of adverbs, the finite verb, etc.:

- (77) Öt orvos minden betegnek kevés új tablettát írt fel.
 five doctor every patient-Dat few new pill-Acc wrote up
 “there are five doctors x such that for every patient y, x prescribed few new pills to y”

Scope falls out from the hierarchy so obtained: (77) is unambiguous. Moreover, while grammatical function does not determine linear order, the order of the DP types cannot be changed at will. For example:

- (78) *Öt orvos kevés betegnek minden új tablettát írt fel.
 five doctor few patient-Dat every new pill-Acc wrote up

Thus, the Hungarian data straightforwardly support Beghelli and Stowell’s general assumption that each quantifier type moves to its own characteristic

position to check some feature whose existence is independent of scope interaction. But, more specifically, Szabolcsi (1997b) argues that the order and nature of these positions correspond rather closely to Beghelli and Stowell's: in the grammatical (77), the position of *öt orvos* "five doctors" is RefP and that of *minden beteg* "every patient" is DistP. The position of *kevés új tablettá* "few new pills," dubbed Predicate Operator, is in many respects analogous to AgrP/VP.

The claim that there is a position specifically related to distributivity receives particularly strong confirmation from Hungarian. Certain quantifiers, *több, mint öt NP* "more than five NP" among them, can potentially occur in more than one linear position, and their interpretations vary accordingly. In the Predicate Operator position (which is adjacent to the finite verb stem), they can support either a distributive or a collective interpretation of the sentence:

- (79) *Több, mint öt fiú emelte fel az asztalt.*
 more than five boys lifted up the table-Acc
 "The number of boys who lifted the table (individually or collectively) is greater than five."

When, however, they occur in the same DistP position as distributive universals canonically occupy (note the particle–verb order), they are obligatorily distributive:

- (80) a. *Minden fiú fel-emelte az asztalt.*
 every boy up-lifted the table-Acc
 "Every boy lifted up the table (*collectively)."
 b. *Több, mint öt fiú fel-emelte az asztalt.*
 more than five boy up-lifted the table-Acc
 "More than five boys lifted up the table (*collectively)."

Let us now turn to Chinese, a language that has been argued to highlight the significance of A-chains. Aoun and Li (1993c) observe that scope in Chinese is, in some cases, disambiguated by case positions. Specifically, active sentences only have subject wide scope (81), whereas passive sentences are ambiguous (82):

- (81) *Yaoshi liangge nuren du guo meiben shu . . .*
 if two women read Asp every book
 i. "if there are two women who read every book . . ."
 ii. *"if for every book, there are two women who read it . . ."
- (82) *Yaoshi liangge xiansuo bei meigeren zhaodao . . .*
 if two clues by everyone found
 i. "if there are two clues that are found by everyone . . ."
 ii. "if for everyone, there are two clues she or he finds . . ."

- (1993), can derive any scopal order using only functional application.
- 3 For potential counter-examples, see Moltmann and Szabolcsi (1994) and Farkas and Giannakidou (1996).
 - 4 Both Hornstein (1995) and Beghelli and Stowell (1997) assume that Case is assigned in AgrP. Chomsky (1995) favors a theory with multiple specifiers. The issue does not seem settled yet; see Ura and Belletti (both this volume).
 - 5 Operators have a restriction and a nuclear scope. Diesing's Mapping Hypothesis says that material from VP is mapped into the Nuclear Scope and is captured by Existential Closure, while material from IP is mapped into a Restrictive Clause.
 - 6 For arguments against syntactic reconstruction, see Bittner (1994).
 - 7 The idea that QR applies only when it makes a difference for truth conditions is explored in Fox (1995, to appear).
 - 8 Given the semantics of conditionals, the improved formula, *for some x[x is a philosopher and (if we invite x, Max will be offended)]*, is still true if there is any philosopher that we do not invite.
 - 9 This theory was developed simultaneously with, rather than in response to, Hornstein's and Reinhart's, but we will not elaborate on the aspects that it shares with the others.
 - 10 According to Szabolcsi (1997b), the distinction between the two classes has a natural correlate in Discourse Representation Theory. DPs that readily take inverse scope are associated with discourse referents, while DPs that scope in situ are interpreted via "box splitting." Besides scope, this has consequences for anaphora. Szabolcsi argues for two semantic modifications of Kamp and Reyle's (1993) DRT. (i) Universals are associated with set referents, not box splitting. (ii) All referents are interpreted as variables ranging over witness sets of the generalized quantifier denoted by the DP. (For example, a witness of *two men* is any set containing two men and no non-men.) This takes care of the same problem for the sake of which Reinhart (1997b) invokes choice functions. Given these assumptions, Beghelli and Stowell's (1997) syntax can be viewed as a discourse representation structure construction algorithm.
 - 11 This chapter does not address the issue of island-free scope.
 - 12 For a strictly Minimalist presentation of these ideas, see Stabler (1997).