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QUANTIFIERS AND *WH*-INTERROGATIVES IN THE
SYNTAX-SEMANTICS INTERFACE

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the
Graduate School of The Ohio State University

By

Eun Jung Yoo, B.A., M.A.

* * * * *

The Ohio State University

1997

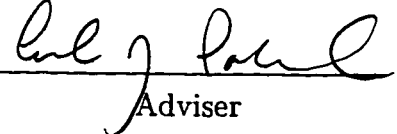
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ABSTRACT

This dissertation deals with quantifiers and *wh*-interrogatives, and provide a unified account of scope for both quantificational noun phrases and *wh*-phrases. Within transformational grammar, it has been generally assumed that logical form is represented in a separate level of syntactic representation, and scope of quantificational NPs and *wh*-phrases are determined by movement of such phrases (viz. quantifier raising and *wh*-movement). We propose an alternative, non-movement-based approach to quantifier and interrogative scope within Head-Driven Phrase Structure Grammar (HPSG).

Our theory of quantifier scope is an extended and revised version of Pollard & Sag's (1994) theory that utilizes Cooper's (1983) quantifier storage mechanism. The account of narrow scope quantification in raising verb constructions, unbounded dependency constructions, and postnominal adjuncts has been problematic in the earlier HPSG approach. By lexicalizing quantifier storage, we offer solutions to the account of these phenomena.

Our account of *wh*-interrogatives is based on the revised quantifier scope theory. We propose that *wh*-scope in a syntactic *wh*-movement language like English requires a syntactic licensing constraint on the retrieval of a stored *wh*-operator. Interrogative scope in various other types of syntactic *wh*-movement languages is explained in terms of different syntactic licensing conditions on *wh*-retrieval.

Scoping of in-situ *wh*-phrases are also taken into account. After pointing out some problems with movement-based approaches to *wh*-in-situ languages, we show how our theory extends to an account of languages such as Korean in which *wh*-questions are indicated by question marker.

Dedicated to my family

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PUBLICATIONS

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3. Yoo, Eun Jung. 1995. Raising Verbs and Case Marking in Korean. In Chungmin Lee, ed., *Interfaces in Korean Linguistics*. 69-85.
4. Yoo, Eun Jung. 1995. *Wh*-Phrases and Their Quantification in Korean. In Susumu Kuno et al. eds., *Harvard Studies in Korean Linguistics VI*. Cambridge, MA: Harvard University & Seoul: Hanshin. 458-473.
5. Yoo, Eun Jung. 1993. Temporal Interpretation of Korean without Tense Rules. In Andreas Kathol and Michael Bernstein, eds., *Proceedings of the Tenth Eastern States Conference on Linguistics*. 381-392.

6. Yoo, Eun Jung. 1993. Subcategorization and Case Marking in Korean. In Andreas Kathol and Carl Pollard, eds., *Papers in Syntax*, Ohio State University Working Papers in Linguistics, Vol. 42. 178-198.
7. Yoo, Eun Jung. 1989. *Small Clause Constructions in English*. MA Thesis, Seoul National University.

FIELDS OF STUDY

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CHAPTER 1

INTRODUCTION

1.1 Overview of the thesis

This thesis investigates quantification phenomena and *wh*-interrogatives, and provides a unified account of scope for both quantificational noun phrases and *wh*-phrases within Head Driven Phrase Structure Grammar (HPSG). Unlike an ordinary NP (e.g. *Joan* in (1a)), a quantificational noun phrase (e.g. *every student* in (1b)) does not refer to a specific individual (or element). Rather, example (1b) is interpreted as ‘For every individual *x* that is a student, that individual *x* lives in Chicago’, wherein the range of individuals can vary depending on the context in which the sentence is uttered.

- (1) a. Joan lives in Chicago.
- b. Every student lives in Chicago.

In such an interpretation of (1b), the part “every *x* such that *x* is a student” can be referred to as a (restricted) quantifier, which takes the nucleus “*x* lives in Chicago” as its scope. This can be represented as a formula of restricted quantificational logic as in (2), wherein “ \forall ” is a quantificational determiner, “*x*” is a variable, and “*student'(x)*” is the restriction on the variable:

- (2) $[(\forall x \mid \text{student}'(x)) [\text{live-in-chicago}'(x)]]$

The various quantifier scope phenomena that we will take into account in this study are illustrated in the following:

- (3) a. Joan believes that Bill read a book.
b. A unicorn seems to be approaching.
c. Every student probably doesn't live in Chicago.
d. Every student knows some French song.
e. Every professor from a Midwestern city met with Jim.

Example (3a) involves a propositional attitude verb *believes*, and thus the existential quantifier associated with *a book* can take either wide or narrow scope with respect to the verb. In (3b), a raising verb *seems* is involved, and the raising controller *a unicorn* takes narrow scope as well as wide scope with respect to the raising verb. In (3c), the quantificational noun phrase (QP, hereafter) *every student* takes maximally wide, maximally narrow, or intermediate scope with respect to the adverb *probably* and negation. Example (3d) is a typical case of multiple quantification in which ambiguity arises from the two possible relative scope orders between the two quantifiers. In (3e), the phrase *a Midwestern city* can take wide scope with respect to the *every* phrase that contains it, or take scope within the reduced relative PP. (Cf. Chapter 3)

Wh-question interpretations are obtained by the scoping of interrogative operators associated with *wh*-phrases. In the following examples in (4), each *wh*-phrase takes scope at the matrix clause.

- (4) a. Which sports does Mary play?
b. Which sports do you think Mary play?

- c. Whose friend's mother did Mary meet yesterday?
- d. Which kid prefers which vegetable?

When more than one *wh*-phrase takes the same scope as in (4d), it is interpreted as a multiple question, and can be replied to by the following kind of enumerative answer:

- (5) Sally prefers carrots, Mike prefers corns, and John prefers potatoes.

The scope of *wh*-phrases is often restricted by syntactic or morphological factors in many languages. For example, in English, while the positions of syntactically fronted *wh*-phrases (e.g. those in (4a-c)) indicate their scope, it is not always the case with nonfronted, i.e. “in-situ *wh*-phrases” (e.g. *which city* in (6a)).¹

- (6) a. Who remembers when we visited which city?
- b. Who knows whose pictures of whom Mary prefers?

The *wh*-phrase *which city* in (6a) can take either matrix or embedded scope, and accordingly (6a) can be answered by two different kinds of answers as in (7):

- (7) a. Mary remembers when we visited which city.
- b. Mary remembers when we visited Atlanta, Mike remembers when we visited San Diego, ...

In some languages, syntactic fronting of *wh*-phrases is not involved, but rather interrogative scope is indicated by a question marker (e.g. in Korean, Japanese). Some other languages involve different patterns of syntactic *wh*-movements; *wh*-fronting can be only optional (e.g. in French, Iraqi Arabic), or questions may involve more than

¹While the phrase *whom* in (6b) is contained in the larger *wh*-phrase that is fronted, we will see in 4.3 that this kind of phrase behaves like an in-situ *wh*-phrase in its scoping.

one fronted *wh*-phrases at the beginning (e.g. Bulgarian, Romanian). We will show how these diverse *wh*-scope phenomena can be accounted for on par with quantifier scope phenomena in (3). (Cf. Chapter 4.)

Representation of quantifier scope has been one of the long-standing subjects in logic, semantics, and the syntax-semantics interface. A typical quantification structure can be assumed to consist of a quantifier and a nonquantified nucleus, as illustrated in (2), which is represented in the following (8) in a simplified, schematic form:

$$(8) \quad [Qx \ [\dots x \dots]]$$

In many theories of quantifier scope, such a logical structure is reflected in the syntactic structure (or in the structure of some level of representations). Wide spread approaches such as Montague's (1974) "quantifying in" approach and May's (1977, 1985) Quantifier Raising assume a syntactic structure wherein a QP taking scope over an S combines with the S, as in (9):

$$(9) \quad [_S \text{ a fish}_i \ [_S \text{ Mary believes that John saw } x_i]]$$

In Montague, the structure in (9) is associated with the semantic rule for quantifying in, by which it is translated into a formula in intensional logic. In May, (9) occurs at LF (Logical Form), a separate level of representation which is obtained from SS (Surface Structure) by movement of QPs.

Even in approaches like Cooper's (1983) (and approaches essentially following Cooper) that do not assume a QP syntactically external to its scope, an unmotivated syntactic structure like (10) is involved in the analysis of a sentence at which a quantifier takes its scope.

$$\begin{array}{c}
 (10) \quad \begin{array}{c} S \\ \left[\begin{array}{l} \text{STORE } \Sigma - \alpha \\ \text{DENOTATION } \alpha[\chi] \end{array} \right] \\ | \\ S \\ \left[\begin{array}{l} \text{STORE } \Sigma \\ \text{DENOTATION } \chi \end{array} \right] \end{array}
 \end{array}$$

One advantage of the theory of quantifier scope that we will propose is that we eliminate such otherwise unmotivated syntactic structures in the grammar by making direct, simultaneous reference to the component that corresponds to logical representation, and to the surface structure of a sentence. Actually, certain other scoping mechanisms, such as van Riemsdijk & Williams' (1981) and Williams' (1986), have been proposed in order to represent quantifier scope at surface structure without positing unnecessary syntactic structures. However, it is not clear how one of our important goals in the present research, viz. to provide an unified and precise account for scoping of *wh*-phrases as well as quantifiers, can be achieved by this mechanism.

The representation of *wh*-scope in constituent questions has generally been assumed to involve quantification structures as in (8). Within transformational grammar, the scopal nature of *wh*-phrases has been accounted for by *wh*-movement.

$$(11) \quad [S' \text{ what}_i \text{ did } [S \text{ Mary eat } t_i]]?$$

In "syntactic *wh*-movement languages" such as English, constituent questions are formed with a fronted *wh*-phrase as in (11), and thus the surface form resembles the logical structure. By contrast, in "*wh*-in-situ languages" such as Chinese, *wh*-phrases remain in their ordinary positions without being fronted, as in (12), and the logical form is assumed to be obtained by movement of the *wh*-phrase at LF (Huang 1982).

- (12) a. Mary chi-le sheme?
 Mary ate what
 ‘What did Mary ate?’
 b. [_S’ sheme_i [_S Mary chi-le t_i]] (LF)

In-situ *wh*-phrases appear in syntactic *wh*-movement languages as well, in multiple questions like *Who likes whom*, and they are also assumed to be moved at LF to receive scope.

However, there are problems with such movement-based approaches to *wh*-in-situ. First, despite some arguments in favor of LF movement of in-situ *wh*-phrases (cf. Huang 1982, Pesetsky 1987), there is no convincing evidence for such a movement.² Unlike SS movement in (11) whose result is at least reflected in the surface form of the sentence, LF *wh*-movement is very abstract. Like Quantifier Raising, its primary purpose is to achieve a syntactic representation that corresponds to an appropriate logical structure with operator scope assigned.

Moreover, empirical facts involving *wh*-in-situ show that patterns of LF *wh*-movement often disobey the conditions (or principles) that have been assumed to hold for SS movements. Nishigauchi 1990, Pesetsky 1987, and Watanabe 1992 propose various accounts to avoid this problem of asymmetry, but none of these are successful (cf. Chapter 5).

In this study, we will propose an alternative, non-movement-based theory of quantifier and interrogative scope within the framework of HPSG. Within HPSG, such topics as quantifier scope, the syntax of English interrogatives, and the semantics of adjuncts have been dealt with only individually, and some related topics, such as interrogative scope in various languages have not been explored. This thesis aims at

²See Williams (1986:291-296) for counterarguments to Pesetsky (1987).

providing a syntax-semantics interface theory in HPSG that offers a unified account of these topics.

Our theory of quantifier scope is an extended and revised version of Pollard & Sag's (1994) theory that utilizes Cooper's (1983) storage mechanism. The proposed theory constitutes a significant advance over Pollard & Sag 1994 (P&S, henceforth), in that it provides a solution for one of the major problems with P&S, viz. the account of narrow scope readings in raising verb constructions (e.g. (13a)), unbounded dependency constructions (e.g. (13b)), and postnominal adjuncts (e.g. (13c)), by "lexicalizing" the quantifier store mechanism.

- (13) a. A unicorn appears to be approaching.
b. Five books, I believe Mary read.
c. John found a shelf with every science book.

Our account of *wh*-questions is based on the revised quantifier scope theory. We deal with syntactic properties of *wh*-questions in English, and show how such properties as pied-piping play a role in determining interrogative scope. We assume that *wh*-scope in a syntactic *wh*-movement language requires syntactic licensing in addition to the usual quantifier storage mechanism. Interrogative scope in various types of *wh*-questions across languages is explained in terms of different licensing conditions on retrieval of *wh*-operators.

Our analysis of English interrogatives accounts for the puzzling asymmetry between subject-*wh*-questions and nonsubject-*wh*-questions with respect to possible interrogative scoping, which is exemplified in the following:

- (14) a. Who knows which vegetable John hates? (unambiguous)
b. Who knows who hates turnips? (ambiguous)

In (14), unlike the fronted *wh*-phrase *which vegetable* that takes only embedded scope, the embedded subject *wh*-phrase *who* in (14b) may take either matrix or embedded scope. Our analysis also provides an account for unusual scope facts regarding amount *wh*-phrases (e.g. *how many books*).

(15) How many papers must everyone write in this course?

Example (15) has a reading ‘What is the number *n* such that everyone must write *n* papers in this course?’, and we explain this by assuming that *how many* phrases contain both a *wh*-operator and an existential quantifier in the quantifier storage.

The outline of the thesis is as follows. In the rest of Chapter 1, we provide a brief introduction to HPSG, along with the overview of HPSG analyses of some constructions relevant to this study. Chapter 2 gives a review of some past approaches to quantifier scoping. In Chapter 3, after discussing problems with P&S’s theory, we propose a concrete, revised version of quantifier scope theory and show how the proposed theory extends to accounts of various scope phenomena. Incorporation of Kasper’s (to appear) treatment of adjuncts provides a solid foundation for our syntax-semantics interface theory. Chapter 4 proposes a general approach to interrogatives, focusing on such issues as how to distinguish interrogative clauses from other types of clauses, how to explain embedded questions selected as complements, and how to represent interrogative scope in English and other syntactic *wh*-movement languages. In Chapter 5, we discuss some problems with existing approaches to *wh*-in-situ languages, and extend our analysis to an account of languages such as Korean in which questions are indicated by questions markers. Chapter 6 deals with interesting scoping facts in questions with amount *wh*-phrases, and scope interaction between quantifiers and *wh*-phrases in English. Chapter 7 points out some potential problems for

our assumptions about quantifier retrieval and discusses their implications for future study.

1.2 Preliminaries on theoretical framework

1.2.1 HPSG feature structures

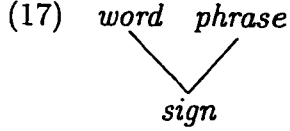
In HPSG, linguistic objects are modeled by a system of *sorted feature structures*, wherein various *features* (or *attributes*) are assigned appropriate *values*. The type of object a feature structure is modeling is indicated by a *sort symbol*, and the set of all sort symbols are partially ordered in terms of the *sort hierarchy*. (For example, an object of sort *number* is ordered below its subsort *sing(ular)* or *pl(ural)*.) Feature structures in HPSG are required to be *totally well-typed* and *sort-resolved*. A feature structure is *totally well-typed* if for each node to which a sort is assigned, all the features (or attributes) that are appropriate for the sort are actually present. A feature structure is *sort-resolved* in case the values of all of its attributes are *maximal* (i.e. most specific) in the sort hierarchy.

The set of well-formed feature structures is defined by a system of constraints. Ontological constraints on feature structures can be expressed by feature declarations in conjunction with sort hierarchies. Thus for example, with respect to feature declaration, an object of sort *sign* is assumed to have the attributes PHON(OLOGY) and SYN(TAX-)SEM(ANTICS), which respectively have as their values a list of objects of sort *phon* and an object of sort *synsem*.³ This can be formalized as in the following constraint:

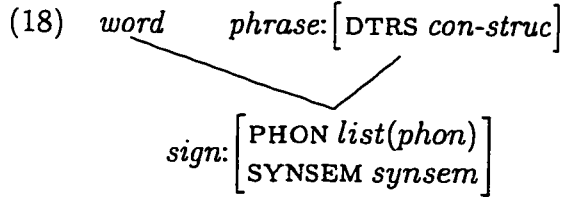
³The other two attributes QSTORE and RETRIEVED are omitted here for simplicity. (But see (20)). We make a different assumption from P&S on the QSTORE attribute, and detailed discussions are given in Chapter 3.

$$(16) \quad (sign \rightarrow (PHON: list(phon) \wedge SYNSEM: synsem))$$

With respect to sort hierarchies, the sort *sign* is partitioned into the subsorts *word* and *phrase*, as the following (17) shows:



When a sort has more specific subsorts, it is assumed that all the information of the given sort is “inherited” into each of the subsorts, and that a subsort may introduce additional attributes of its own. The sort *phrase* has a new feature DAUGHTERS (DTRS) with its value *con(stituent)-struc(ture)*. Thus the following sort hierarchy combined with feature declarations informally expresses feature geometry constraints associated with a *sign*.



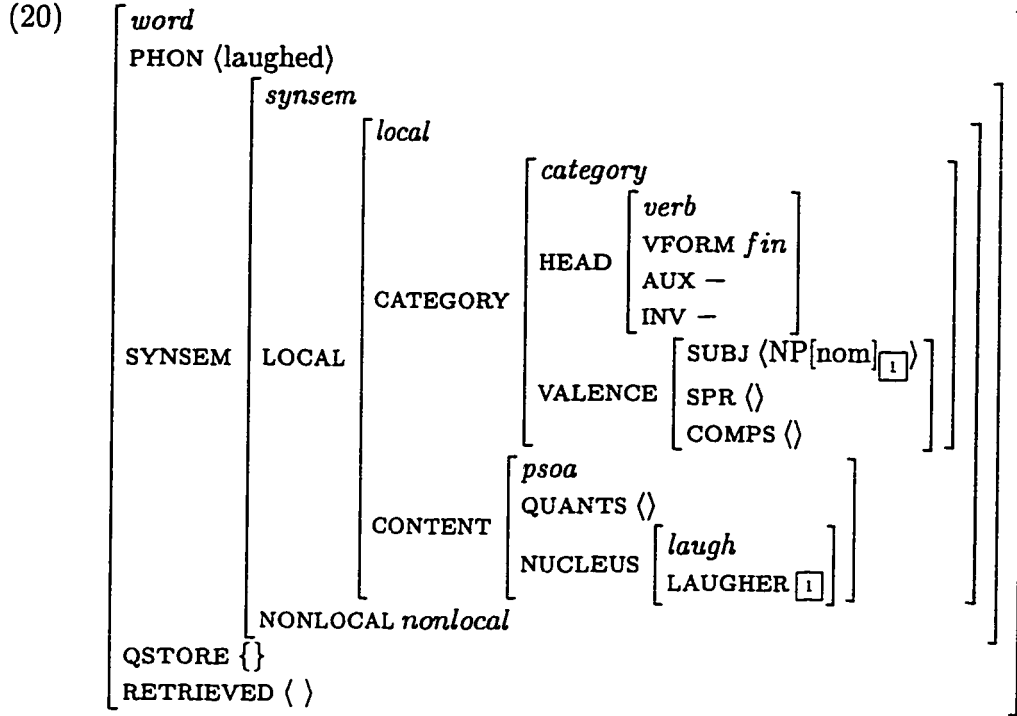
The value of the SYNSEM attribute is another structured object of sort *synsem* that has its own attributes LOC(AL) and NONLOC(AL). Among these two attributes, LOC has in turn CAT(EGORY) and CONT(ENT).⁴ The following set of constraints guarantees this:

$$(19) \quad (synsem \rightarrow (LOCAL: local \wedge NONLOCAL: nonlocal))$$

$$(local \rightarrow (CATEGORY: category \wedge CONTENT: content))$$

⁴Actually CONTEXT is another attribute of LOC, but will be ignored in this study for simplicity.

In order to illustrate such a feature geometry, we give a *description* of the word *laughed* in the following (20). Partial information about linguistic objects is represented by *descriptions*, and in normal practice of HPSG, *attribute-value matrices* (AVMs) as in (20) are used as descriptions.⁵



As shown in (20), the CAT value consists of the attributes HEAD and VAL(ENCE), which respectively are concerned with the sign's part of speech and associated morphosyntactic features, and the dependent elements that the sign syntactically selects. When the HEAD value is of sort *verb*, further information may be specified via VFORM, AUX and INV feature values.

The values of the VAL(ENCE) features, SUBJ(ECT), COMP(LEMENT)S, and SP(ECIFIER)R are lists of *synsem* objects. This means that in the case of a phrase, information on subconstituents other than that in the SYNSEM value is not available for selection.

⁵PHON values will simply be represented with orthographies for convenience.

Thus selection is strictly local. In (20), $\text{NP}[\text{nom}]_{\boxed{1}}$ abbreviates an NP bearing nominative case and the index $\boxed{1}$, more specifically the following SYNSEM value:

$$(21) \left[\begin{array}{c} \text{synsem} \\ \left[\begin{array}{c} \text{LOC} \\ \left[\begin{array}{c} \text{CAT} \\ \left[\begin{array}{c} \text{HEAD} \left[\begin{array}{c} \text{noun} \\ \text{CASE } \text{nom} \end{array} \right] \\ \text{VAL} \left[\begin{array}{c} \text{SUBJ } \langle \rangle \\ \text{SPR } \langle \rangle \\ \text{COMPS } \langle \rangle \end{array} \right] \end{array} \right] \\ \text{CONT} \left[\begin{array}{c} \text{nom-obj} \\ \text{INDEX } \boxed{1} \\ \text{RESTR } \boxed{5} \end{array} \right] \end{array} \right] \end{array} \right] \end{array} \right]$$

The CONT value of a sign represents the sign's semantic contribution. In P&S, the CONT value is of sort *content*, which is partitioned into the subsorts *possibly-quantified-parameterized-state-of-affairs (psoa)*, *nom(inal)-obj(ect)*, and *quant(ifier)*.⁶ In general, predicative phrases such as verbs and their projections, predicative APs, and predicative PPs have CONT values of sort *psoa*, which bears the attributes QUANT(IFIER)S and NUC(LEUS). The value of NUC is of sort *quantifier-free-parameterized-state-of-affairs(qfpsoa)*, whose subsorts correspond to various individual relations (e.g., *walk*, *laugh*, *promise*, *book*) and relation-specific roles. As shown in the NUC value of (20), semantic (or thematic) roles are assigned an index. In the case of (20), the index that bears the semantic role of WALKER is *token-identical* (or *structure-shared*) with the index of the NP in the SUBJ list.⁷

The CONT of nominals (i.e. nouns and their projections) is of sort *nom-obj*, as shown in (21), and bears the attributes IND(EX) and RESTR(ITION). A structure of sort *index*, which is the value of the IND(EX) feature, in turn contains the three agree-

⁶In Chapter 4, we will propose a slightly modified partition of *content*.

⁷In AVM descriptions, structure sharing is represented by multiple occurrences of *tags* (i.e. boxed numerals such as $\boxed{3}$).

ment features PERSON, NUMBER, and GENDER. Semantic restrictions imposed on the index of a nonexpletive nominal are represented as the value of the RESTR(ITION) feature, i.e. a set of possibly quantified psos.

The third kind of CONT value, an object of sort *quant(ifier)*, is assigned to quantificational determiners such as *every* and *some*, and contains the attributes DET(ERMINER) and REST(RICTED)-IND(EX). Detailed discussion of quantifier-related CONT values will be given in Chapter 3.

It should be also noted that in order to refer to the CONT value of a synsem object, the following notational abbreviations are commonly employed:

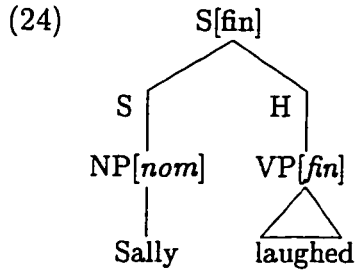
$$\begin{aligned}
 (22) \quad \text{a. } S:\boxed{1} &= \left[\text{LOC} \left[\text{CAT} \left[\begin{array}{l} \text{HEAD } verb \\ \text{VAL} \left[\begin{array}{l} \text{SUBJ } \langle \rangle \\ \text{SPR } \langle \rangle \\ \text{COMPS } \langle \rangle \end{array} \right] \end{array} \right] \right] \right] \right] \\
 \text{b. } VP:\boxed{1} &= \left[\text{LOC} \left[\text{CAT} \left[\begin{array}{l} \text{HEAD } verb \\ \text{VAL} \left[\begin{array}{l} \text{SUBJ } \langle synsem \rangle \\ \text{SPR } \langle \rangle \\ \text{COMPS } \langle \rangle \end{array} \right] \end{array} \right] \right] \right] \right]
 \end{aligned}$$

1.2.2 Phrasal signs and principles

As mentioned in 1.2.1, objects of sort *phrase* have the additional attribute DAUGHTERS (DTRS). Possible values of DTRS include objects of such sorts as *head-subj(ect)-struc(ture)*, *head-comp(lement)-struc(ture)* and *head-adj(unct)-struc(ture)*, which are subsorts of *head(ed)-struc(ture)*. Thus, for example, the structure of the phrase *Sally laughed* can be described as in (23):

$$(23) \left[\begin{array}{l} \text{phrase} \\ \text{PHON } \langle \text{Sally, laughed} \rangle \\ \text{SYNSEM } S[\text{fin}] \\ \text{DTRS} \left[\begin{array}{l} \text{head-comp-struct} \\ \text{HEAD-DTR} \left[\begin{array}{l} \text{phrase} \\ \text{PHON } \langle \text{laughed} \rangle \\ \text{SYNSEM } VP[\text{fin}] \end{array} \right] \\ \text{SUBJ-DTR} \left[\begin{array}{l} \text{phrase} \\ \text{PHON } \langle \text{Sally} \rangle \\ \text{SYNSEM } NP[\text{nom}] \end{array} \right] \end{array} \right] \end{array} \right]$$

Following the conventional representation of phrase structures, we will use a tree diagram for displaying the structure of phrasal signs. Thus, the following (24) corresponds to (23):



Within syntactic theory, there has been a general tendency to assume highly schematic forms of phrase structure rules (e.g. \bar{X} -schemata in Government and Binding theory). HPSG employs *immediate dominance* (ID) schemata and assumes that every headed phrase must satisfy (exactly) one of the ID schemata.

(25) a. Head-Subject Schema

$$X''[\text{SUBJ } \langle \rangle] \rightarrow \begin{array}{cc} \boxed{1}Y'' & X''[\text{SUBJ } \langle \boxed{1} \rangle] \\ \text{SUBJ} & \text{HEAD} \end{array}$$

b. Head-Specifier Schema

$$X'' \rightarrow \begin{array}{cc} \boxed{1}Y''[\text{SPEC } \boxed{2}] & X'[\text{SPR } \langle \boxed{1} \rangle] \\ \text{SPR} & \text{HEAD} \end{array}$$

c. Head-Complement Schema

$$XP \rightarrow \begin{array}{cc} \boxed{1} & X^0[\text{COMPS } \langle \boxed{1} \rangle] \\ \text{COMPS} & \text{HEAD} \end{array}$$

d. Head-Subject-Complement Schema

$$\begin{array}{ccccc} X'' & \rightarrow & X^0, & Y'', & Z''^* \\ & & \text{HEAD} & \text{SUBJ} & \text{COMPS} \end{array}$$

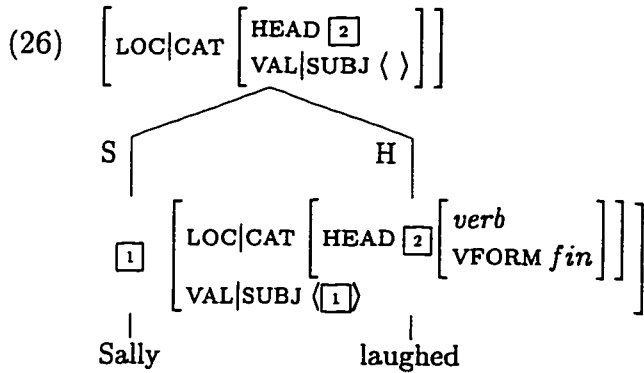
e. Head-Adjunct Schema

$$\begin{array}{ccccc} XP & \rightarrow & Y''[\text{MOD } \boxed{1}], & \boxed{1}XP \\ & & \text{ADJUNCT} & \text{HEAD} \end{array}$$

f. Head-Filler Schema

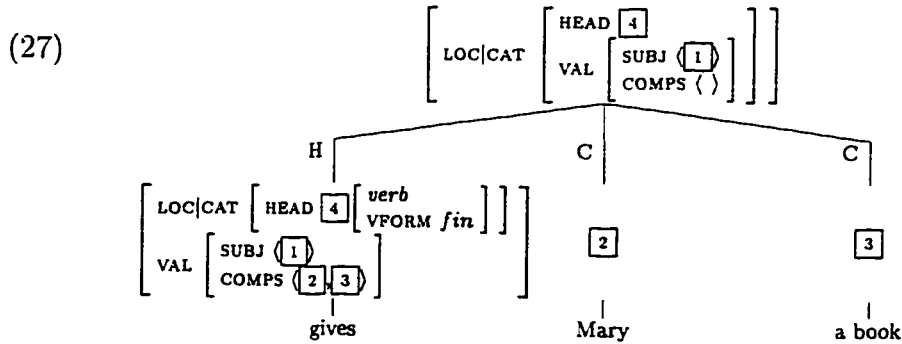
$$\begin{array}{ccccc} X'' & \rightarrow & Y''[\text{LOC } \boxed{1}], & V''[\text{SLASH } \{\dots, \boxed{1}, \dots\}] \\ & & \text{FILLER} & \text{HEAD} \end{array}$$

In (25), X^0 indicates words, whereas XP are phrases. Phrases are further distinguished as X' , which bear an unsaturated SPR value ($[\text{SPR } \langle Y'' \rangle]$), or X'' , which are saturated with respect to their SPR ($[\text{SPR } \langle Y'' \rangle]$). Some of the schemata ((25a-d)) involve local selections in terms of the valence features SUBJ, COMPS, and SPR. Consider the following structure of *Sally laughed*, with the VAL|SUBJ values specified:⁸



The structure in (26) is licensed by the Head-Subject Schema, since the object on the head daughter's SUBJ value is identical to the SYNSEM of the subject daughter. Likewise, the Head-Complement Schema can be instantiated by the following structure:

⁸In this kind of diagram with labeled nodes, the labels indicate attributes of the DTRS value of the given phrasal node: H (HEAD-DTR), C (COMP-DTR), S (SUBJ-DTR), F (FILLER-DTR), or A (ADJUNCT-DTR). In (26), the tag $\boxed{1}$ refers to a *synsem* object.



A few remarks are in order here. First, in the Head-Complement Schema in (25c), the tag [1] ranges over lists of X'' , and accordingly, a phrase like (27) with more than one complement daughter like (27) can be licensed. Second, in the COMPS value of a lexical head, *synsem* objects appear in the increasing order of the *obliqueness hierarchy*. Thus in (27), the object indicated by the tag [2] is less oblique than the one indicated by [3].⁹

Third, it should be also noted that the schemata in (25) do not specify any ordering between the daughters,¹⁰ and the ordering between sister constituents is determined by *linear precedence* (LP) statements. In English, the ordering between the head daughter and nonhead daughters is determined by the LP constraint in (28), which states that a lexical head must precede all of its sister constituents in a phrase (Pollard & Sag 1987:172).

(28) HEAD [LEX +] < []

Thus it follows from the constraint (28) that the head daughter precedes the two complement daughters in (27). On the other hand, the ordering among complement

⁹In English, the following obliqueness order is assumed, with the subject being the least oblique element:

(i) subject < primary object < secondary object < obliques < ...

¹⁰Therefore, various types of languages (e.g. VSO, SOV and SVO) can be represented by the universal ID schemata.

daughters is constrained by the following LP rule in Pollard & Sag (1987:174), wherein the symbol “ \ll ” indicates a special restriction on the constraint that the preceding element must be less oblique than the preceded one:

(29) COMPLEMENT \ll COMPLEMENT

Fourth, in (27), the element in the SUBJ value of the head daughter is retained in that of the mother phrase, while the elements in the head daughter’s COMPS value is taken off in the COMPS list of the phrase. Such values of VALENCE features are constrained by a universal principle called the *Valence Principle*.

(30) Valence Principle

In a headed phrase, for each valence feature F, the F value of the head daughter is the concatenation of the phrase’s F value with the list of SYNSEM values of the F-DTRS value.

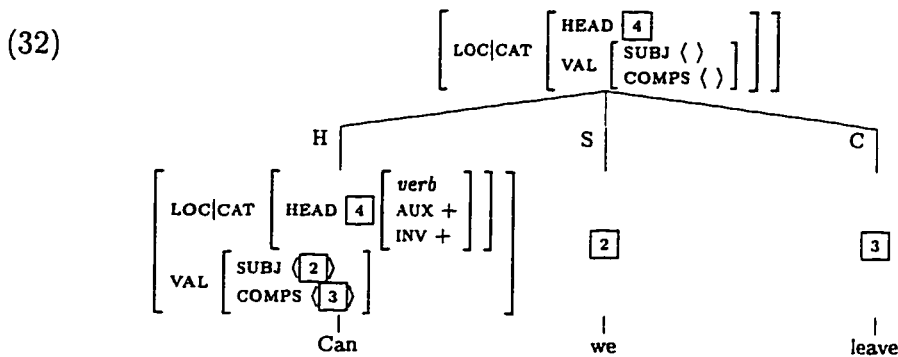
Finally, in both (26) and (27), there is structure sharing of the HEAD values between the phrase and its head daughter. Thus information borne by the HEAD attributes of the head daughter, e.g. the categorial status of the head, is passed up to a larger phrase. This is guaranteed by the *Head Feature Principle* in (31):

(31) Head Feature Principle

The HEAD value of any headed phrase is structure-shared with the HEAD value of the head daughter.

We now consider a different kind of structure, the one licensed by the Head-Subject-Complement Schema in (25d). Representative cases are subject-auxiliary inversion examples in English. As is discussed in detail in P&S (1994:41-43), inverted

structures are not assumed to involve any displacement in syntactic positions (e.g. head movement from INFL to COMP in GB theory). Rather the relationship between an ordinary clause *We can leave* and an inverted clause *Can we leave* is captured by the assumption that in both cases, the lexical head *can* is an auxiliary verb selecting a subject and a VP complement, the only difference being the INV value.¹¹ The analysis of the subject-auxiliary inversion example *Can we leave?* is as given in (32):



1.2.3 The treatment of unbounded dependencies

In this section, we briefly review the HPSG analysis of *unbounded dependency constructions* (UDCs), especially *filler-gap constructions* (or *strong UDCs*). In P&S, UDCs are handled by use of the three kinds of NONLOCAL features, SLASH, QUE, and REL. As in generalized phrase structure grammar (GPSG), topicalized sentences and nonsubject-*wh*-questions in English are analyzed in terms of filler-gap dependency, by employing the SLASH feature. The QUE and REL features are assumed for interrogative dependencies and relative clauses, respectively, although detailed analysis for the former is not explored in P&S.

The basic assumption behind the analysis is that the dependency is introduced by a nonempty value of a NONLOCAL feature, successively inherited onto larger phrases,

¹¹In English, further parochial conditions are imposed on the schemata, requiring that the HEAD value must bear the specification [-INV] for (25a-c) and [+INV] for (25d).

and then discharged or bound off at a certain point in the structure. In order to distinguish the NONLOC features that become bound from those that continue to be inherited into larger constituents, the distinction between INHERITED and TO-BIND is assumed for each NONLOCAL feature. The following principle is responsible for the successive inheritance of the NONLOCAL features:

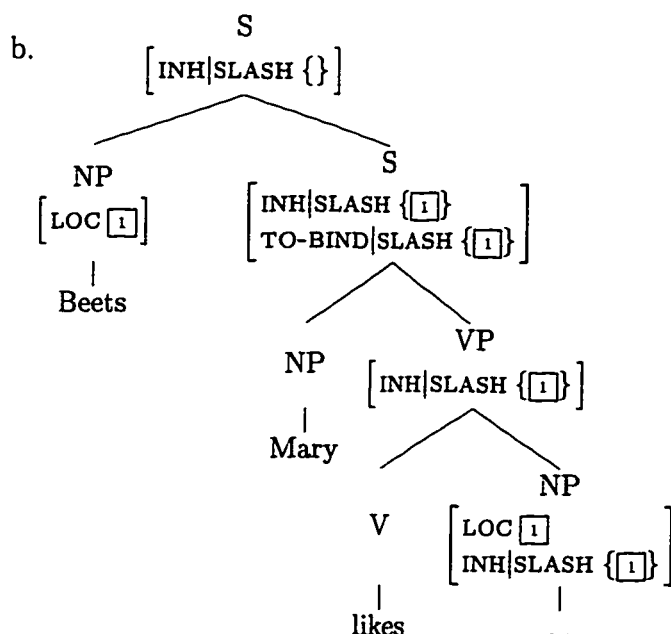
(33) Nonlocal Feature Principle

For each nonlocal feature, the INHERITED value on the mother is the union of the INHERITED values on the daughters minus the TO-BIND values on the head daughter.

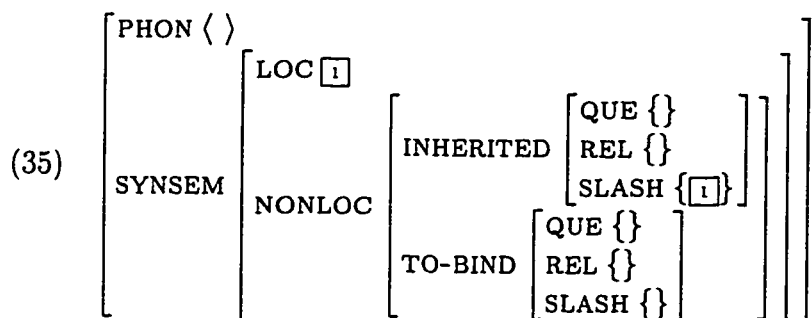
While essentially following P&S's analysis, we will make slightly different assumptions about NONLOCAL features, viz. that three features SLASH, QUE, and REL are attributes of SYNSEM values, and subject to different inheritance constraints. This will be discussed in 4.1.2.

As an illustration, the analysis of a simple topicalization example is given in (34).

(34) a. Beets_i, Mary likes _i.



It should be noted that in (34), the phrase consisting of the top S node and its immediate daughters is licensed by the Head-Filler-Schema in (25f). At the bottom of the structure a gap (or trace) is posited to introduce the SLASH dependency.¹² The lexical entry for the trace is given as follows (P&S 1994:164):



Likewise, the filler-gap dependency in a *wh*-question like *What does Mary like?* is analyzed in the same manner as in (34). On the other hand, *wh*-subjects are not

¹²An alternative analysis that eliminates the need for traces, employing the Complement Extraction Lexical Rule is discussed in P&S (1994:376-380). In this study, we assume the version of the theory that posits traces.

treated as fillers; thus a question like *Who left?* is represented by an ordinary Head-Subject-Schema.¹³

In our theory, interrogative scope in questions will be analyzed in terms of quantifier storage (which will be discussed in Chapter 3), not QUE dependency, and the detailed analysis will be given in Chapter 4.

¹³Essentially following a proposal by Gazdar (1981), subject extraction as in *Who did Kim claim left?* is handled in terms of the lexical rule in (i):

(i) Subject Extraction Lexical Rule (P&S 1994:383)

$$\left[\begin{array}{l} \text{SUBJ } \langle Y'' \rangle \\ \text{COMPS } \langle \dots, X'' [\textit{unmarked}, \text{SUBJ } \langle \rangle], \dots \rangle \end{array} \right] \Rightarrow \left[\begin{array}{l} \text{COMPS } \langle \dots, X'' [\text{SUBJ } \langle [\text{LOC } \boxed{2}] \rangle], \dots \rangle \\ \text{INH|SLASH } \{ \boxed{2} \} \end{array} \right]$$

CHAPTER 2

APPROACHES TO QUANTIFIER SCOPE

2.1 Quantifier raising

May (1977) proposes the rule of QR (quantifier raising) that maps SS (Surface Structure) to LF (Logical Form). By this rule, a QP is adjoined to S at the level of LF, and when there is multiple quantification involved in a sentence, it is disambiguated by structurally distinct LF representations, as a consequence of free application of QR. The following (1) exemplifies this:

- (1) a. Every spy suspects some Russian. (SS)
b. $[s_0 \text{ every spy}_3 [s_1 \text{ some Russian}_4 [s_2 t_3 [_{VP} \text{ suspects } t_4]]]]$ (LF)
c. $[s_0 \text{ some Russians}_4 [s_1 \text{ every spy}_3 [s_2 t_3 [_{VP} \text{ suspects } t_4]]]]$ (LF)

By contrast, in May (1985), a single multiply quantified LF representation is taken to manifest multiple interpretations as long as the involved QPs *govern* one another.¹ In May (1985), only one representation, viz. (1c) is adopted as the well-formed LF for

¹The notion of *government* is defined as in (i), essentially following Aoun & Sportiche (1983):

(i) α *governs* β =_{df} α c-commands β and β c-commands α , and there are no maximal projection boundaries between α and β .

(ii) α c-commands β =_{df} every maximal projection dominating α dominates β and α does not dominate β .

(1a), since the representation (1b) violates the ECP (and also the Path Containment Condition which replaces the ECP in May’s chapter 5).² In representation (1c), the S-adjoined NPs governs each other, and it is assumed that they, as members of a “ Σ -sequence”, are arbitrarily interpreted with respect to relative scope. This is referred to as the Scope Principle (May 1985:34).

(2) Scope Principle

Members of Σ -sequences take any relative scope relation.

- (3) A Σ -sequence is a class of occurrences of operators ψ such that for any $O_i, O_j \in \psi$, O_i governs O_j . Here “operator” means phrases in \bar{A} -positions at LF.

Thus the Scope Principle links syntactic structures at LF to their logical interpretations.

Following Pesetsky (1982), May (1985) assumes that cases involving multiple \bar{A} -bindings must observe the Path Containment Condition:

(4) Path Containment Condition

Intersecting \bar{A} -categorial paths must embed, not overlap.

A *path* here refers to “a set of occurrences of successively immediately dominating categorial nodes connecting a bindee to its binder”. Paths are assumed to *intersect* when they have at least two contiguous nodes; thus paths sharing a single node do not intersect. Thus, for example, in (1), the path structures of (1b) and (1c) are

²The structure in (1b) is parallel to the LF representation of **What did who admire* in (i), which is also assumed to be ruled out by the ECP.

(i) [_{whc₁} what₂ [_{t₁} admired t₂]]

represented as in (5a) and (5b), respectively, and (5a) violates the PCC since the two intersecting paths are overlapping.

- (5) a. $P(3) = \{S_2, S_1, S_0\}$
 $P(4) = \{VP, S_2, S_1\}$
b. $P(3) = \{S_2, S_1\}$
 $P(4) = \{VP, S_2, S_1, S_0\}$

One of May's major empirical claims is that there is a subject-object asymmetry in WH-quantifier scope interaction in pairs of examples such as (6).

- (6) a. What did everyone buy for Max?
b. Who bought everything for Max?

According to May, while (6a) is ambiguous due to two possible relative scope between the *wh*-operator and the quantifier, (6b) has only one interpretation, wherein the *wh*-phrase takes wide scope. In (6), when the involved QPs are S-adjoined, as in (7a) and (8a), only (7a) is well-formed, since (8a) violates the PCC:

- (7) a. $[_{S'} \text{ what}_4 [_{S_0} \text{ everyone}_3 [_{S_1} t_3 [_{VP} \text{ bought } t_4 \text{ for Max}]]]]$
b. $P(3) = \{S_1, S_0\}$
 $P(4) = \{VP, S_1, S_0, S'\}$
(8) a. $[_{S'} \text{ who}_3 [_{S_0} \text{ everything}_4 [_{S_1} t_3 [_{VP} \text{ bought } t_4 \text{ for Max}]]]]$
b. $P(3) = \{S_1, S_0, S'\}$
 $P(4) = \{VP, S_1, S_0\}$

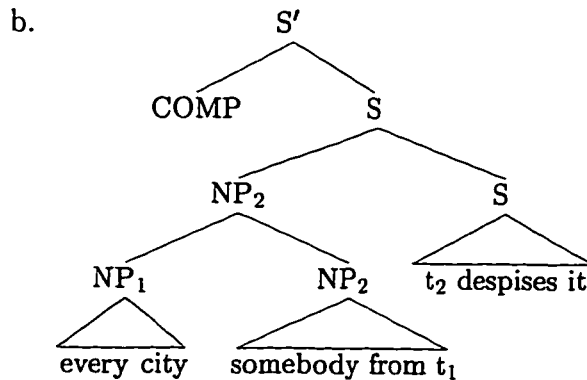
In order to avoid this kind of problem, May assumes that adjunction to other major phrasal categories such as VP, NP, and PP (as well as S) is possible. Thus the LF of (6b) is derived by VP adjunction, as in (9):

- (9) a. $[_{S'} \text{who}_3 [_{S} t_3 [_{VP_0} \text{everything}_4 [_{VP_1} \text{bought } t_4 \text{ for Max}]]]]]$
 b. $P(3) = \{S, S'\}$
 $P(4) = \{VP_1, VP_0\}$

In May's theory, (9) contrasts with (7), since the *wh*-phrase and the QP form a Σ -sequence only in (7), but not in (9). This contrast is taken as the explanation for the assumed subject-object asymmetry between (6a,b). While May's empirical claim on (6) has been assumed in much subsequent literature, we have a different assessment of these examples, which we discuss in Chapter 6.

May (1985) employs NP-adjunction in the account of so called "inversely linked" construal and multiple questions. Consider May's analysis of the inverse linking example in (10):

- (10) a. Somebody from every city despises it.



The embedded NP_1 is not extracted out of NP_2 , a possible island, yet it still takes clausal scope, since its c-command domain is S' , not NP_2 . As in Chomsky (1986), domination is defined in such a way that NP_2 does not dominate NP_1 , since only one segment of NP_2 dominates it.

May extends the analysis in (10) directly to multiple questions such as *Which person from which city despises it*, so that the embedded *wh*-phrase is NP-adjoined

to the phrase in the COMP. Such an analysis, in conjunction with the PCC account, yields empirical problems, and we will point these out in Chapter 4 (in 4.1.1), with our solutions (in 4.3).

2.2 Scope indexing

While May's quantifier raising approach was adopted as the standard way of handling quantifier scope within the GB (Government-Binding) model, there have been other approaches to quantifier interpretation that do not involve movement and a separate level of representation for quantification structure. Van Riemsdijk & Williams (1981; henceforth VR&W) and Williams (1986) propose that quantifier scope is represented at SS via *scope assignment* (SA) wherein the index of a quantified phrase is assigned to the S that is the scope of the phrase. This is represented as in (11), using Cooper & Parsons' (1976) notation:

$$(11) \quad [\dots [Q \ N']_{i\dots}]_{S:i} \text{ (in-situ schema)}$$

In terms of a typical quantification structure, (11) is interpreted as follows. The A-position with index i is a variable, and in the position of the variable, the determiner and the N' correspond to the quantifier and the restriction, respectively. The phrase bearing the index $:i$ is the scope.

Wh-structures are handled by the same mechanisms as quantification structures, the only difference being that a *wh*-phrase appears adjoined to the S that is the scope of the phrase, as in the following (12):

$$(12) \quad [[Q \ N'] [\dots t_i \dots]_{S:i}] \text{ (adjunction schema)}$$

In (12), the trace that arises by *wh*-movement is bound by the $:i$ operator on the S in S-Structure.

Williams (1986) argues that the level of LF is not required in a model of grammar, and proposes the *reduced VR&W model* that eliminates the levels LF and DS(D-Structure) from VR&W. NP-Structure and S-Structure are the only remaining levels of representations in the reduced model, and \bar{A} -positions or \bar{A} -binding is characterized at S-Structure.

Roberts (1990) further argues that the level of LF need not be posited for the account of quantifier scope and anaphora, and extends Williams' SS scope indexing approach by providing schemata for VP-scope and N'-scope in addition to the S-scope schema, incorporating Cooper & Parsons (1976). In Roberts, the theory of scope indexing extends to accounts of such phenomena as the interaction of quantifiers with discourse anaphora and distributivity, which lie outside the scope of the present study. More complex cases such as inverse linking and possessive QPs (e.g. in *Everyone's mother loves him.*) are accounted for by additional schemata.³

While a wide range of quantifier scope phenomena has been considered within the scope indexing approach, interrogative scoping has not been discussed in detail. Thus such questions arise as how the scope of in-situ *wh*-phrases can be properly assigned (in both syntactic *wh*-movement languages and *wh*-in-situ languages), and how various syntactic restrictions on *wh*-scoping can be imposed in this approach. For example, in English, there are some restrictions with respect to pied-piping of *wh*-phrases,

³Roberts' analysis of inverse linking that makes use of the following schema (i) makes a different predictions from May's analysis, in that (i) does not allow an outside QP to take scope between the inversely linked NP and its embedding NP.

(i) Inversely Linked Complement NP (optional):

[...DET [...NP_i...]N' ...]NP:_{i/j}

A potential counterexample for this prediction is the following (ii) from May (1995:83), wherein it seems possible for the *some*-phrase takes intermediate scope, while the *every*-phrase having the widest, and the *two*-phrase, the narrowest scope:

(ii) Some students will investigate two dialects of every language.

and asymmetry in scoping possibilities between subject and non-subject *wh*-phrases (cf. Chapter 4 (4.3)). These kinds of facts are challenging for the indexing-schema approach, since it is hard to make specific reference to certain syntactic positions or particular subconstituents within a schema.

2.3 Cooper's storage mechanism and related works

2.3.1 Cooper's quantifier storage

Cooper (1983) proposes a storage technique for a mechanism of wide scope quantification. If a structural description of a sentence is viewed as a tree, this technique can be understood as a mechanism of putting an NP interpretation in the storage until the subtree that represents the scope of the NP is interpreted. At that point, the NP interpretation can be taken out of storage and quantified in. For example, the determination of the wide scope reading of *a woman* in the sentence *Every man loves a woman* can be schematically represented as in the following (Cooper 1983:55-62):

(13)	STRUCTURAL DESCRIPTION (omitting labeled brackets)	DENOTATION (schematic)	STORE
	a woman	$[\sigma_7](\text{i.e.}\{X \mid \sigma_7 \in X\})$	$\ a\ woman\ _{\sigma} 7$
	loves a woman	$\ love\ _{\sigma, \omega}(\omega \mapsto [\sigma_7])$	$\ a\ woman\ _{\sigma} 7$
	every man	$\ every\ man\ _{\sigma, \omega}$	
	every man loves a woman	$\ every\ man\ _{\sigma, \omega}(\ love\ _{\sigma, \omega}(\omega \mapsto [\sigma_7]))$	$\ a\ woman\ _{\sigma} 7$
	every man loves a woman	$\ a\ woman\ _{\sigma} 7(\ every\ man\ _{\sigma, \omega}(\ love\ _{\sigma, \omega}(\omega \mapsto [\sigma_7])))$	

In (13), the denotation of various constituents in the tree is represented with respect to some sequence σ and some world ω .⁴ The element $\|a\ woman\|_{\sigma} 7$ in the store is a *binding operator* which is derived from the intension of the NP. Each SD (structural description) is assigned an intension (or a denotation) followed by zero or more stored binding operators. When such a binding operator is entered in the

⁴Here the notion of “sequences” is relevant, since in Cooper, variables are interpreted relative to infinite sequences of individuals, without using the mechanism of subscripted variables and variable assignments.

store, the NP is assigned a denotation which it would have received if it had been a pronoun with a bound-variable interpretation. The binding operator $\|NP\|_{\sigma i}$ and the variable σ_i as a placeholder bear the same index.⁵ Once all binding operators are retrieved (i.e. are taken out of the storage) and quantified in, the store is empty. An SD is assigned a real intension (or denotation) only when the store is empty.

Cooper (1983) distinguishes two different kinds of storage interpretations, i.e. *free quantification* and *controlled quantification*. Free quantification occurs when the assignment of wide scope to NP-interpretations is not reflected in the syntax. On the other hand, controlled quantification occurs when such a scope assignment is reflected in the syntax by being linked to any lexical items or syntactic rules (e.g. English *wh*-questions). As wide scope interpretations of ordinary quantificational NPs (e.g. *a unicorn*, *every student*) are not reflected in syntax, free quantification will be involved in this case.

Unlike controlled quantifications, quantifier store is optional in free quantification. Thus NP interpretations that do not involve wide scope quantification (e.g. *every man* in (13)) need not be stored. In (13), only the operator associated with *a woman* is put in the store, resulting in wide scope reading of the operator. For the other reading of *Every man loves a woman*, neither NP interpretation needs to be stored.

Cooper discusses on to what extent a wide scope mechanism is needed. According to him, there are three phenomena which wide scope quantification can be used to explain: i) scope ambiguities arising from multiple quantifiers in the sentence; ii)

⁵In the lexicon, the interpretation of a variable (or a pronoun with a bound-variable interpretation) is represented as ' $\sigma \mapsto (\omega \mapsto \sigma_i)$ ', which is a function from sequences to appropriate intensions. Thus the intension assigned to the variable relative to some sequence σ is the constant function which for any world picks out whatever is in the i th place of σ . Accordingly, in (13), both the binding operators and the denotation of variables depend on the same place in the sequence, as their place is marked by the same number.

ambiguities arising in intensional contexts; and iii) bound pronouns. Cooper explores the possibility of explaining those phenomena without a mechanism for wide scope quantification, in particular, the case of binding. I will not give the detailed analysis that he proposed, but the key element in the analysis is that the phrase structure rules are set up in such a way that a pronoun may only get bound by an NP in question if it is contained in a constituent that is a sister of the NP in the phrase structure. Cooper argues that this kind of treatment can capture wide range of facts on the restriction of binding possibilities. For example, it prevents the binding of *he/him* by *everyone* in the examples in (14-15):

- (14) He thinks that every man loves Mary.
- (15) a. The fact that Mary loves him thrills every man.
b. The fact that Mary loves every man thrills him.

On the other hand, he also points out disadvantages with this treatment by giving examples wherein an NP is contained in a larger constituent and yet still binds a pronoun. The examples that he provides are given in (16-18):

- (16) a. John talked to every man about a book that he liked.
b. John gave to every man a book that he liked.
c. We set before every man a plate of his favorite food.
d. The journalist stood uncomfortably close to every man while interviewing him.
- (17) a. Every man's mother loves him.
b. Every man's mother thinks that he is the greatest boy in the world.

- (18) The man who builds each television set also repairs it.

Given the examples in (16-18), Cooper concludes that some kind of wide scope quantification is necessary.

Of the two kinds of quantification viz. free quantification and controlled quantification, English *wh*-relatives and *wh*-questions are discussed as cases of controlled quantification, since there is a syntactic ‘reflex’ of wide scope quantification in those constructions. Some additional assumptions are necessary in the case of controlled quantification. First, a gap is assumed in the account of *wh*-interrogatives and relatives. The interpretation of the gap, $[]_{NP}$ is a *distinguished* NP-intension, designated by $*$. As with any other NP-intension, binding operators can be formed from $*$, and represented as $*I$ for any natural number I . Second, in order to calculate the semantics of examples like *who Mary loves*, the interpretation of the *wh*-phrase is substituted for the interpretation of the gap. That is, the interpretation of the sentence is calculated as if the interpretation of the *wh*-phrase were assigned to the gap. Third, once the substitution is done, the retrieval of the stored *wh*-binding operator must be performed. The procedure of interpreting the clause *who Mary loves* (which can be either a relative clause or an embedded question) is represented schematically in the following (Cooper 1983:106-116):

(19)

STRUCTURAL DESCRIPTION (omitting labeled brackets)	DENOTATION (schematic)	STORE
$[]_{NP}$	$[\sigma_7](i.e. \{X \sigma_7 \in X\})$	$*7$
love $[]_{NP}$	$ love _{\sigma,\omega}(\omega \mapsto [\sigma_7])$	$*7$
Mary love $[]_{NP}$	$ Mary _{\sigma,\omega}7(love _{\sigma,\omega}(\omega \mapsto [\sigma_7]))$	WH7
who	$[\sigma_7]$	$*7$
who Mary love $[]_{NP}$	$ Mary _{\sigma,\omega}7(love _{\sigma,\omega}(\omega \mapsto [\sigma_7]))$	WH7 (substitution)
	WH7($ Mary _{\sigma,\omega}7(love _{\sigma,\omega}(\omega \mapsto [\sigma_7]))$)	(retrieval)

Crucially, it is assumed that, in those constructions, retrieval of binding operators is required by the phrase structure rules that introduces such constructions.

2.3.2 Some extensions of Cooper storage

From a computational linguistics point of view, Hobbs & Shieber (1987) point out that a naive algorithm for generating quantifier scopings including the standard account of Cooper's storage mechanism may generate illegitimate readings in examples such as (20) that involve complex NP's:

- (20) Every representative of a company saw most samples.

Hobbs & Shieber explain that the unavailable reading in (20) is the one wherein *most samples* outscopes *a company* but is outscoped by *every representative*, and propose a more restricted algorithm of H&S for quantifier scoping in order to exclude such readings systematically.

Keller (1988) points out another problem with Cooper's mechanism arising from complex NP examples.

- (21) John seeks an agent of a company

According to Keller, (21) cannot have an interpretation wherein the embedding NP *an agent (of it)* has a *de re* reading while *a company* has a *de dicto* reading since it produces an unbound variable.⁶

As Keller points out, in Cooper's storage mechanism, it is possible to store both the translation of *a company* and that of the embedding NP, and to retrieve either of these first. Thus retrieving of *a company* first results in the illegitimate reading. In order to solve this problem, Keller proposes a new NP-Storage rule, following a similar suggestion in Engdahl (1986), in which quantifier store itself has structure so

⁶The three available readings are the *de re* and the *dicto* reading of the object term and the mixed reading in which only *a company* is given *de re* interpretation. See also Chapter 7 for discussion of this example.

that the retrieving order of binding operators can be made explicit. Keller's nested Cooper storage technique is adopted in Gerdemann & Hinrichs (1990) who develop an algorithm for quantifier scoping within a unification-based grammar formalism. This extension of Cooper's mechanism also assumes that the quantifiers involved in a complex NP are intrinsically ordered, and such ordering is achieved by assuming that the value of *store* is a list.

While the three approaches that we briefly described make it possible to preclude certain unavailable readings in sentences involving complex NPs in one way or another, it is not the case that they can exclude all illegitimate readings in a given sentence. For example, even in examples with a complex NP, when a bound variable pronoun is involved, the available readings may be further limited.

(22) Every representative of a company_{*i*} hates it_{*i*}.

In (22), the narrow scope of the QP *a company* with respect to the whole complex NP that contains the QP is prohibited by Keller's and Gerdemann & Hinrichs' nested Cooper storage, yet another kind of narrow scope reading wherein *a company* takes scope inside the restriction of the universal quantifier will be still generated, as it is in (20).⁷

Moreover, as Pollard & Sag (1994) discuss, even with simple NPs, such a restriction in scope assignment can be imposed by the presence of a pronoun.

(23) a. One of her_{*i*} students approached [each teacher]_{*i*}.

b. [Each man]_{*i*} talked to a friend of his_{*i*}. (Pollard & Sag 1994: 327)

⁷As Hobbs & Shieber's algorithm predicts, this is possible in (20), as long as *most samples* does not intervene between *every representative* and *a company*.

Given examples like (22) and (23), we will need a more general constraint on logical forms such as Pollard & Sag's Quantifier Binding Condition, in order to prohibit unbound variables in logical representations. We will return to the discussion of examples involving complex NPs and the use of the Quantifier Binding Condition in Chapter 3.

CHAPTER 3

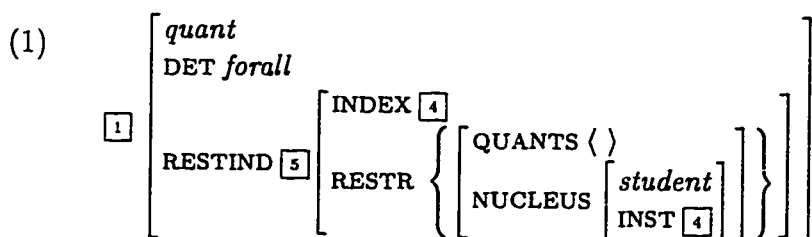
STRUCTURE OF QUANTIFIER SCOPE

3.1 Pollard & Sag's theory of quantifier scope

Pollard & Sag (1994) (P&S hereafter) presents an account of quantification that employs a variant of Cooper's (1975, 1983) storage technique. Central to their analysis is the assumption that all quantifiers 'start out in storage' and are 'inherited' by successively larger constituents, and 'retrieved' at an appropriate site in the structure.¹ It should be noted that the use of such terms as 'storage', 'inheritance', and 'retrieval' does not mean that we assume such processes to operate in the hierarchical structure. Rather they are adopted as procedural metaphors in order to explain structures in a more familiar, bottom-up fashion. Actually all the constituents of a sentence are represented as parts of the feature structure representation of the sentence, and quantifier inheritance and retrieval is formulated in terms of purely declarative constraints such as the Semantics Principle (6) below. The scope of a quantifier is determined by the node at which retrieval takes place and the order of retrieval relative to other quantifiers retrieved at the same node.

¹This diverges from Cooper's notion of free quantification in which storing a quantifier is optional. In Cooper, which provides denotational semantic interpretations, an in-situ quantifier results in narrow quantification, thus producing the *de dicto* reading of an intensional verb's complement, e.g. in *John seeks a unicorn*. In P&S, however, such a *de dicto* reading cannot be represented in the CONT value. We will return to the discussion of this problem in chapter 7.

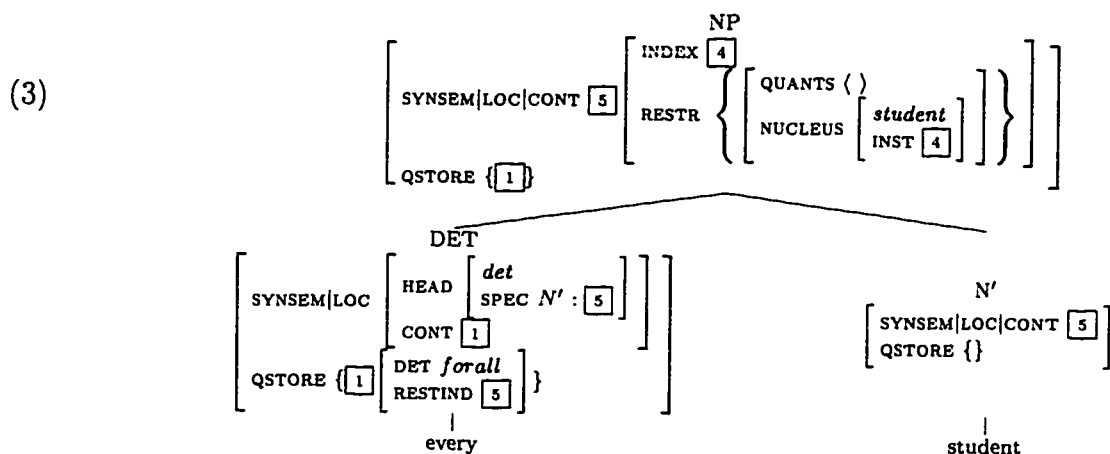
In P&S, a quantifier is stored in QSTORE and represented by an object of sort *quantifier* (*quant*). The following description of the quantifier associated with *every student* illustrates this:



Using an informal restricted quantificational logic notation, the quantifier in (1) can be roughly rendered as in (2):

(2) $[\forall x \mid \text{student}'(x)]$

Given a quantificational NP (henceforth QP) which consists of a determiner and a head N', the CONT value of the QP is of sort *nominal-object* (*nom-obj*), just like a nonquantificational NP, and the quantifier meaning appears only as a QSTORE value. In such a phrase, a quantifier is assumed to originate from the determiner. This is illustrated in the description of *every student* in (3):



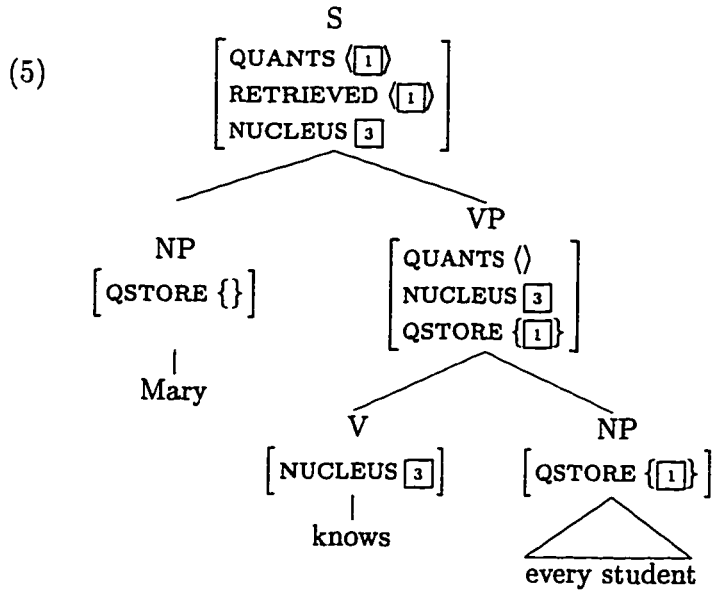
In (3), the quantifier's RESTIND value is guaranteed to be token-identical with the CONT of N' virtue of the determiner's selection of its N' sister via the SPEC feature.

A stored quantifier is inherited into the QSTORE of a larger constituent, until it is retrieved. Retrieval occurs only at nodes whose CONT is of sort *psoa* (*possibly quantified psOA*), i.e. at nodes which have a S type (not an NP type) interpretation. When a quantifier is retrieved, it appears in the RETRIEVED, and also in the QUANTS. Given a CONT value of type *psoa*, the quantifier in the value of QUANTS is taken to have scope over the value of NUCLEUS. For example, the CONT value of the sentence *Mary knows every student* is described as in (4a) and roughly rendered in an informal quantificational logic notation in (4b). In (4a), the tag $\boxed{1}$ indicates the quantifier in (1).²

- (4) a.
$$\left[\begin{array}{l} \textit{psoa} \\ \text{QUANTS } \langle \boxed{1} \boxed{4} \rangle \\ \text{NUCLEUS } \left[\begin{array}{l} \textit{know} \\ \text{KNOWER } \boxed{2} [\textit{3rd}, \textit{fem}, \textit{sing}] \\ \text{KNOWN } \boxed{4} \end{array} \right] \end{array} \right]$$
- b. $[\forall x \mid \text{student}'(x)] (\text{know}'(\text{mary}', x))$

The inheritance and retrieval of a stored quantifier in the sentence is shown in (5):

²The subscript tag $\boxed{4}$ is used for the INDEX value. Thus $\boxed{1} \boxed{4}$ in (4) indicates the quantifier whose RESTIND|INDEX value is $\boxed{4}$.



The Semantics Principle in (6) constrains inheritance and retrieval of quantifiers as well as CONT values in a headed structure:

(6) Semantics Principle (P&S)

In a headed phrase:

a. the RETRIEVED value is a list whose set of elements forms a subset of the union of the QSTORES of the daughters; and the QSTORE value is the relative complement of that set; and

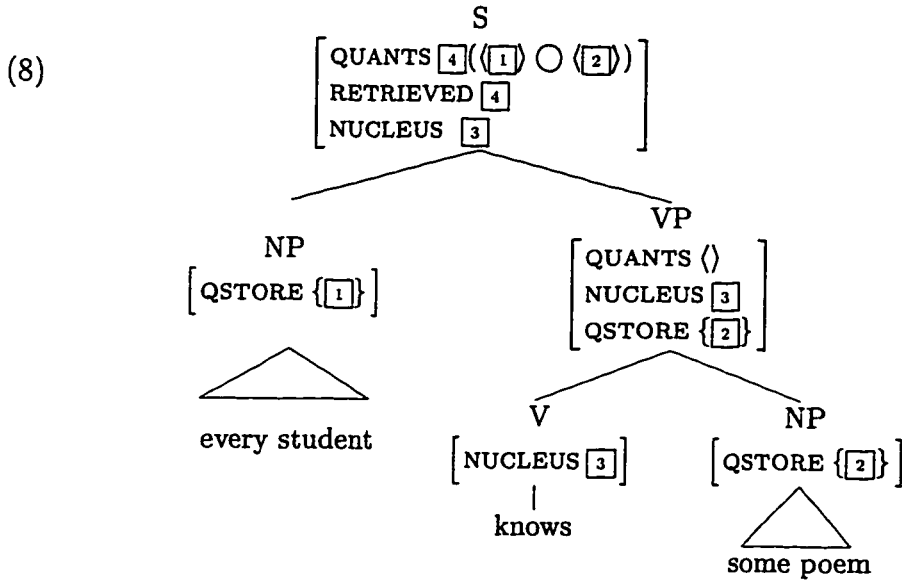
b. (Case 1) if the semantic head is of sort *psoa*, then the NUCLEUS value is identical with that of the semantic head, and the QUANTS value is the concatenation of the RETRIEVED value and the semantic head's QUANTS value;

(Case 2) otherwise the RETRIEVED value is empty and the CONTENT value is token-identical to that of the semantic head.

The notion of *semantic head* is defined as follows:

- (7) The *semantic head* of a headed phrase is
- 1) the adjunct daughter in a head-adjunct structure,
 - 2) the head daughter otherwise.

As the Semantics Principle does not constrain the order of quantifiers retrieved at the same node, well-known scope ambiguities in examples like *Every student knows some poem* are accounted for by more than one possible order of quantifiers in the RETRIEVED and QUANTS list. This is illustrated in (8): ³



Although P&S's analysis accounts for various scope facts, it encounters some empirical problems with certain narrow scope phenomena. First, as P&S note, a

³In (6), "O" indicates Reape's (1994) *sequence-union* or *shuffle* operation, and is employed here in order to abbreviate two fully scoped structures in P&S, viz. one with the QUANTS value $\langle 1, 2 \rangle$ and the other with the QUANTS value $\langle 2, 1 \rangle$. The shuffle operation is defined as (i) in Kathol (1995):

$$\begin{aligned}
 \text{(i) shuffle}(\boxed{1}, \boxed{2}, \boxed{3}) &\equiv (\boxed{1} : \langle \rangle \wedge \boxed{2} : \langle \rangle \wedge \boxed{3} : \langle \rangle) \\
 &\vee (\boxed{1} : \langle \boxed{H} | \boxed{L1} \rangle \wedge \boxed{3} : \langle \boxed{H} | \boxed{L3} \rangle \wedge \text{shuffle}(\boxed{L1}, \boxed{2}, \boxed{L3})) \\
 &\vee (\boxed{2} : \langle \boxed{H} | \boxed{L2} \rangle \wedge \boxed{3} : \langle \boxed{H} | \boxed{L3} \rangle \wedge \text{shuffle}(\boxed{1}, \boxed{L2}, \boxed{L3}))
 \end{aligned}$$

problem arises when a quantifier interacts with raising verbs and exhibits an ambiguity depending on the quantifier's scope with respect to the raising verb.

(9) A unicorn appears to be approaching.

(10) Sandy believes each painting to be fraudulent.

In P&S's analysis of raising verbs, they subcategorize for a VP complement that has an unexpressed subject whose SYNSEM value is structure-shared with that of the raising controller (i.e. the subject NP of a subject raising verb, or the complement NP of a object raising verb.). The following lexical entries exemplify this:

(11) *appear*

$$\left[\begin{array}{l} \text{CAT|VAL} \left[\begin{array}{l} \text{SUBJ } \langle \boxed{2} \rangle \\ \text{COMPS } \langle \text{VP} [\text{inf}, \text{SUBJ } \langle \boxed{2} \rangle] : \boxed{3} \rangle \end{array} \right] \\ \text{CONT|NUC} \left[\begin{array}{l} \textit{appear} \\ \text{SOA-ARG } \boxed{3} \end{array} \right] \end{array} \right]$$

(12) *believe*

$$\left[\begin{array}{l} \text{CAT|VAL} \left[\begin{array}{l} \text{SUBJ } \langle \text{NP } \boxed{1} \rangle \\ \text{COMPS } \langle \boxed{2}, \text{VP} [\text{inf}, \text{SUBJ } \langle \boxed{2} \rangle] : \boxed{3} \rangle \end{array} \right] \\ \text{CONT|NUC} \left[\begin{array}{l} \textit{believe} \\ \text{BELIEVER } \boxed{1} \textit{ref} \\ \text{SOA-ARG } \boxed{3} \end{array} \right] \end{array} \right]$$

Since P&S assumes that QSTORE is outside of the SYNSEM attribute, the QSTORE value of the raising controller is not shared with that of the VP complement subject. Even if the subject of the VP complement could be assigned a nonempty QSTORE value, the Semantics Principle (6) does not allow the QSTORE value to be retrieved within the VP complement, since the subject is not realized within the VP. Therefore, the QSTORE value of the raising controller can be retrieved only at the phrases that dominate it, i.e. at the the matrix S (or either matrix VP or matrix S in the case of object raising controllers), thus predicting only wide scope reading of the quantifier.

Second, P&S cannot predict the narrow scope reading of a QP in intensional contexts, when the QP is topicalized. A relevant example is given in (13):

(13) Five books_{*i*}, I believe John read t_{*i*}.

In (13), the propositional attitude verb *believe* creates an intensional context, and thus a so called *de re/de dicto* ambiguity is exhibited depending on whether the existential quantifier associated with *five books* takes scope inside or outside of *believe*. In P&S's analysis of strong UDCs (unbounded dependency constructions), only the LOCAL value is structure-shared between a filler and a gap. Thus, again, P&S's assumption that QSTORE is an attribute of signs precludes the possibility of quantifier lowering, i.e. the possibility of the structure-sharing between a filler and a gap. Therefore, in (13), the quantifier associated with the QP *five books* is stored only as the QSTORE value of the QP and can be retrieved only at the matrix S, generating only the wide scope reading (*de re*) of the QP.

Third, the Semantics Principle (6) does not allow quantifier scoping within a postnominal predicative modifier ('reduced relative') in examples like (14):

(14) [_{NP}A [_{N'}[_{N'}proposal] [_{PP}by every student]]] was passed.

Besides the so called 'inversely linked' reading in which the embedded universal quantifier takes scope over the existential, (14) has a reading 'A proposal which is made by every student is passed.' wherein the universal quantifier has scope within the postnominal adjunct. However, the CONT value of the adjunct PP is required to be token-identical with that of the modified phrase N' by (6b), therefore being of sort *nom-obj*. Accordingly, the quantifier stored in the QSTORE of *every student* cannot be retrieved at the adjunct PP. As Kasper (to appear) points out, P&S's requirement on

the CONT value in a head-adjunct structure also yields another kind of problem connected with the semantic interpretation of recursive modifiers. We will return to the discussion of those problems in section 3.3. In the following sections, we will discuss how we can extend and revise P&S's theory in order to eliminate the aforementioned problems.

3.2 Representing quantifier scope

3.2.1 Lexicalization of quantifier storage

In section 3.1, it was pointed out that P&S's account fails to predict certain narrow scope phenomena in raising constructions or UDCs, because it does not provide a way of inducing a quantifier lowering effect. Pollard & Yoo (to appear) propose a revised version of P&S's theory in order to eliminate such problems. Central to the proposal is the idea of relocating the QSTORE feature as a LOCAL attribute and making certain lexical heads “collect” all the QSTORE values of their “selected arguments”. As we will see shortly, relocation of the QSTORE feature within the LOCAL value makes structure-sharing of QSTORE values possible between a raising controller and the unexpressed subject of the complement and between a filler and a trace. The newly assumed feature geometry is shown in (15):

$$(15) \left[\begin{array}{l} \textit{sign} \\ \text{PHONOLOGY } \textit{list(phonstring)} \\ \text{SYNSEM} \left[\begin{array}{l} \text{LOCAL} \left[\begin{array}{l} \text{CATEGORY } \textit{category} \\ \text{CONTENT } \textit{content} \\ \text{QSTORE } \textit{set(quantifier)} \end{array} \right] \end{array} \right] \\ \text{RETRIEVED } \textit{list(quantifier)} \end{array} \right]$$

A lexical head may select synsem objects via its VAL (VALENCE) features, viz. SUBJ, COMPS, and SPR, and via its HEAD|MOD feature. Thus a head can access the

QSTORE value of the selected synsem objects. We now adopt the assumption that those arguments' QSTORE value also appear in the QSTORE of the lexical head. More specifically, we assume the following description is satisfied by most words:

(16) Constraint on quantifier storage of heads (preliminary)

For a lexical head, the QSTORE is the union of the QSTORES of all *selected arguments*, defined as either

- i) thematic elements selected via the SUBJ or COMPS feature,⁴
- ii) elements selected via the SPR feature, or
- iii) elements selected via the MOD feature.

This is illustrated by the lexical entries of a) the lexical head *know* in the head-complement phrase *know everyone*, b) *student* in the head-specifier phrase *every student* (which constitutes a head-specifier structure), and c) *from* in the head-adjunct phrase *everyone from Chicago*:

(17) *know* (in *know everyone*)

$$\left[\begin{array}{l} \text{CAT|VAL} \left[\begin{array}{l} \text{SUBJ} \langle [\text{LOC|QSTORE } \boxed{2}] \rangle \\ \text{COMPS} \langle [\text{LOC|QSTORE } \{\boxed{1}\}] \rangle \end{array} \right] \\ \text{CONT|NUCLEUS} \left[\begin{array}{l} \textit{know} \\ \text{KNOWER } \boxed{3} \\ \text{KNOWN } \boxed{4} \end{array} \right] \\ \text{QSTORE } \{\boxed{1}\}_{\boxed{4}} \cup \boxed{2} \end{array} \right]$$

(18) *student* (in *every student*)

$$\left[\begin{array}{l} \text{CAT|VAL|SPR} \langle [\text{LOC|QSTORE } \{\boxed{1}\}] \rangle \\ \text{QSTORE } \{\boxed{1}\} \end{array} \right]$$

(19) *from* (in *everyone from Chicago*)

$$\left[\begin{array}{l} \text{CAT|HEAD|MOD} \langle [\text{LOC|QSTORE } \{\boxed{1}\}] \rangle \\ \text{QSTORE } \{\boxed{1}\} \end{array} \right]$$

⁴By definition, an argument is *thematic* provided either i) the CONT of the argument is of sort *nom-obj* and its INDEX value fills a role in the CONT|NUCLEUS of the head, or ii) the CONT of the argument is of sort *psoa* and fills a role in the CONT|NUCLEUS of the head.

Given (16), the QSTORE value of a controlled subject in a raising construction will also appear in the QSTORE of the head verb of the VP complement, since the verb selects the controlled subject via the SUBJ feature and assign a thematic role to it. The following (20) illustrates this:

$$(20) \quad approach \left[\begin{array}{l} CAT|VAL|SUBJ \langle [2] [LOC|QSTORE \{ [1] [4] \}] \rangle \\ CONTENT \left[\begin{array}{l} approach \\ APPROACHER [4] \end{array} \right] \\ QSTORE \{ [1] [4] \} \end{array} \right]$$

Consequently, in the example (9), the QSTORE value of *a unicorn* will also appear in the QSTORE of the unexpressed subject and the head of the VP complement.

In the analysis of (9), it should be noted that the QSTORE value of *a unicorn* does not appear in the QSTORE of the raising verb *appear*, although it appears in that of VP complement head *approach*. This is because a raising controller is not assigned a thematic role by a raising verb, as (20) illustrates:

$$(21) \quad appear \left[\begin{array}{l} CAT|VAL \left[\begin{array}{l} SUBJ \langle [2] [QSTORE \{ [1] [4] \}] \rangle \\ COMPS \langle VP [inf, SUBJ \langle [2] [QSTORE \{ [1] [4] \}] \rangle] : [5] \rangle \end{array} \right] \\ CONTENT \left[\begin{array}{l} appear \\ SOA-ARG [5] \end{array} \right] \\ QSTORE \{ \} \end{array} \right]$$

While most words satisfy the description (16), two classes of words are exceptional with respect to (16). First, words that explicitly introduce a quantifier (i.e. quantificational determiners such as *some*, *a* and *every*, QPs such as *someone* and *everyone* and *wh*-words such as *which*, *who*, *what* and *when*). For example, the lexical entry of *every* is represented as in (22):

$$(22) \left[\begin{array}{l} \text{PHON } \langle \text{every} \rangle \\ \text{SYNSEM|LOC} \left[\begin{array}{l} \text{CAT} \left[\begin{array}{l} \text{HEAD } \text{det} \left[\text{SPEC } \text{N}' : \boxed{2} \right] \\ \text{SUBCAT } \langle \rangle \end{array} \right] \\ \text{CONT } \boxed{3} \left[\begin{array}{l} \text{DETERMINER } \text{forall} \\ \text{RESTIND } \boxed{2} \end{array} \right] \\ \text{QSTORE } \{ \boxed{3} \} \end{array} \right] \end{array} \right]$$

Second, words that make no independent semantic contribution, which we will refer to as *semantically vacuous*, are also exceptions to (16). Such words are defined as in (23) (cf. Pollard & Yoo (to appear)):

- (23) A lexical head is *semantically vacuous* just in case its CONTENT value is structure-shared with that of one of its complements.

Auxiliary verbs *to* and *be* are semantically vacuous by (24) and represented as follows:⁵

$$(24) \text{ to} \left[\begin{array}{l} \text{SYNSEM|LOC} \left[\begin{array}{l} \text{CAT} \left[\begin{array}{l} \text{HEAD} \left[\begin{array}{l} \text{VFORM } \text{inf} \\ \text{AUX } + \end{array} \right] \\ \text{VAL} \left[\begin{array}{l} \text{SUBJ } \boxed{2} \\ \text{COMPS } \langle \text{VP} [\text{base}, \text{SUBJ } \boxed{2}, \text{QSTORE } \boxed{3}] : \boxed{1} \rangle \end{array} \right] \end{array} \right] \\ \text{CONTENT } \boxed{1} \\ \text{QSTORE } \boxed{3} \end{array} \right] \\ \text{RETRIEVED } \langle \rangle \end{array} \right]$$

$$(25) \text{ be} \left[\begin{array}{l} \text{SYNSEM|LOC} \left[\begin{array}{l} \text{CAT} \left[\begin{array}{l} \text{HEAD } \text{verb} [+\text{AUX}] \\ \text{VAL} \left[\begin{array}{l} \text{SUBJ } \boxed{2} \\ \text{COMPS } \langle \text{XP} [+\text{PRD}, \text{SUBJ } \boxed{2}, \text{QSTORE } \boxed{3}] : \boxed{1} \rangle \end{array} \right] \end{array} \right] \\ \text{CONTENT } \boxed{1} \\ \text{QSTORE } \boxed{3} \end{array} \right] \\ \text{RETRIEVED } \langle \rangle \end{array} \right]$$

As shown in (24) and (25), for a semantically vacuous word, we assume that the QSTORE is identical with that of the complement with which the word shares the CONTENT.

⁵Nonpredicative prepositions (e.g. *on* in *depend on*) and certain complementizers that are analyzable as heads selecting a sentential complement are other examples of semantically vacuous heads.

By virtue of (16), in a head-adjunct structure, the head of the adjunct daughter (which selects a phrase via the MOD feature) has access to the QSTORE value of the head daughter, and in other types of headed structures, the head daughter may have access to the QSTORE of the subject, complement, or specifier daughter. Therefore, instead of allowing QSTORE inheritance from any daughter as in P&S, inheritance of QSTORE values can be restricted to the semantic head daughter of a phrase. Therefore, clause (a) of the Semantics Principle (6) needs to be revised as in (26):

(26) Semantics Principle (first revision)

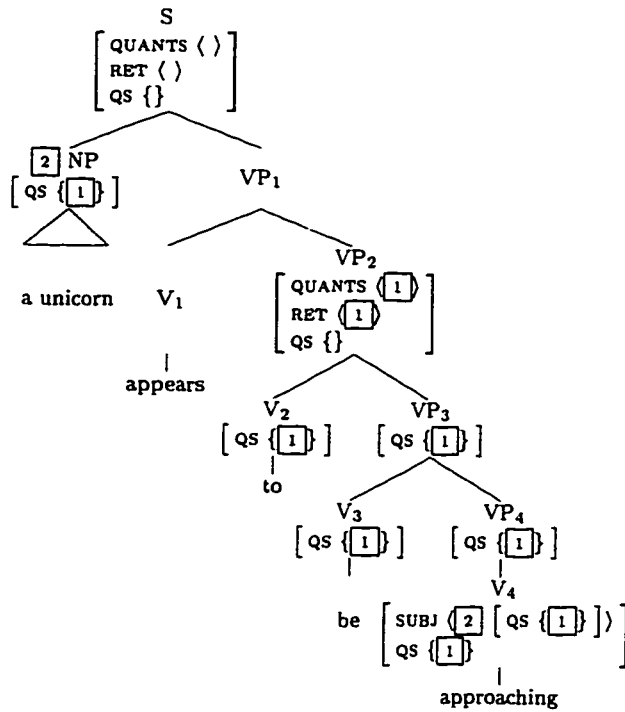
In a headed phrase:

- a. the RETRIEVED value is a list whose set of elements forms a subset of the QSTORE value of the **semantic head daughter**; and the QSTORE value is the relative complement of that set; and
- b. (Case 1) if the semantic head is of sort *psoa*, then the NUCLEUS value is identical with that of the semantic head, and the QUANTS value is the concatenation of the RETRIEVED value and the semantic head's QUANTS value;
(Case 2) otherwise the RETRIEVED value is empty and the CONTENT value is token-identical to that of the semantic head.

In accordance with (26), the narrow scope reading of (9) can be analyzed as follows:⁶

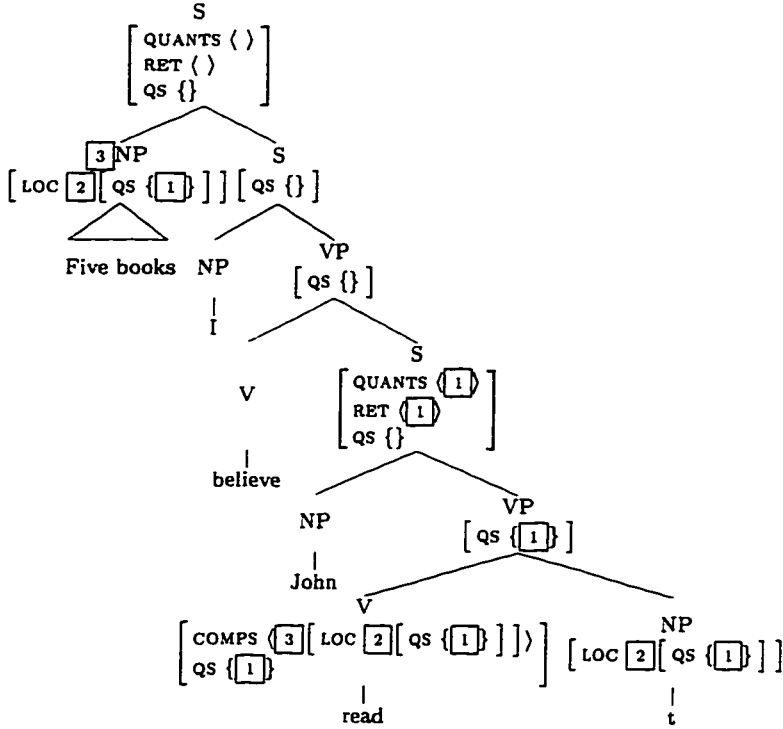
⁶Henceforth, QSTORE is abbreviated as QS, and RETREIVED as RET in tree diagrams.

(27) Narrow scope reading (preliminary)



Likewise, in UDCs, the QSTORE value of a filler that is structure-shared with that of a trace will also appear in the QSTORE of the verb which subcategorizes for and assign a thematic role to the trace. This is shown in the following tree that represents the narrow scope reading of (13):

(28) Narrow scope reading (preliminary)



3.2.2 Retrieval at lexical heads

The revision of quantifier scope theory presented in section 3.2.1 is focused on the account of narrow scope readings in raising constructions and UDCs. Although this repairs the main defect of P&S, it still retains a problem of spurious ambiguity. For example, in (5), both P&S's and our analysis allow another retrieval site, viz. the VP, for the same reading. I would not consider spurious ambiguity a real problem that must be eliminated from a theory: prediction and adequate explanation of certain linguistic phenomena will be far more important. Yet, it will be worth investigating whether there is a possible way of getting rid of it from our theory, so we will provide some discussion of it. However, as is revealed later in this section, we will conclude that we cannot eliminate the problem of spurious ambiguity under the current ap-

proach, given various empirical phenomena that we want to explain. In the following, we will point out some specific problem spots and show why we are led to such a conclusion.

In the structure in (27), the stored quantifier indicated by the tag $\boxed{1}$ is retrieved at VP_2 , resulting in the narrow scope of the quantifier. However, retrieval at VP_3 or VP_4 will result in the same CONT value of VP_2 , since the lexical entry of *to* in (24) and *be* in (25) enforce token-identity of the CONT value between VP_3 and V_2 and between VP_4 and V_3 , respectively, and by the Semantics Principle (26), a retrieved quantifier in the QUANTS of V_2 and V_3 will appear in that of VP_2 and VP_3 , respectively.

This kind of spurious ambiguity can be eliminated by preventing retrieval at VP_3 or VP_2 , whose semantic head is a semantically vacuous head, *be* or *to*. Then, retrieval at VP_3 or VP_2 can be prevented by modifying the first part of the clause (b) of the Semantics Principle as follows:

(29) Semantics Principle (second revision)

In a headed phrase:

a. the RETRIEVED value is a list whose set of elements forms a subset of the QSTORE of the semantic head daughter; and the QSTORE value is the relative complement of that set; and

b. (Case 1) if the semantic head is of sort *psoa* and **semantically nonvacuous**, then the NUCLEUS value is identical with that of the semantic head, and the QUANTS value is the concatenation of the RETRIEVED value and the semantic head's QUANTS value;

(Case 2) otherwise the RETRIEVED value is empty and the CONTENT value is token-identical to that of the semantic head.

However, when more than one projection of the same nonvacuous head can serve as a retrieval site, spurious ambiguity still arises e.g. in (5) and (8). In our theory (and in P&S), quantifiers are inherited and retrieved at phrase structural nodes, some of which may have the same CONT value. Given a phrase whose head is of sort *psoa*, and in the absence of adjuncts, all the projections of the same nonvacuous head (e.g. V, VP, and S) have an identical NUCLEUS value, and retrieval of a quantifier at any of those projections results in the same CONT of the maximal projection. Then there are two possible ways to circumvent the problem of spurious ambiguity: to permit retrieval either only at the maximal projection or only at the lexical head. If we choose the former option, we can attempt to add a constraint saying that in a phrase whose NUC value coincides with that of a (semantic head) daughter, the RETRIEVED value of that daughter is empty. Such an additional constraint can be restated as a part of the Semantics Principle. The reformulation of the principle is given (30).

(30) Semantics Principle (third, tentative revision)

In a headed phrase:

- a. the RETRIEVED value is a list whose set of elements forms a subset of the QSTORE of the semantic head daughter; and the QSTORE value is the relative complement of that set; and
- b. if the semantic head is of sort *psoa*, and
 - (i) if the NUC coincides with that of a daughter, then the RETRIEVED of that daughter is empty.
 - (ii) if the semantic head is semantically nonvacuous, then the NUCLEUS value is identical with that of the semantic head, and the QUANTS value is the concatenation of the RETRIEVED value and the semantic head's QUANTS value;

c. otherwise the RETRIEVED value is empty and the CONTENT value is token-identical to that of the semantic head.

This way, only the maximal projection can be a retrieval site, given the projections of a head whose CONT is of sort *psoa*.

This approach has a potential problem, however, when there is topicalization out of a *wh*-clause. Consider (31):

(31) [_{S1} A situation this intolerable, [_{S2} how long [_{S3} can you put up with]]]?

In (31), S1, S2, and S3 have the same NUC value and the semantic head of each S is of sort *psoa*. Thus, by (30), it is required that whatever quantifier stored in the lexical head of this sentence be retrieved only at S1. Presumably, there are two quantifiers involved in (31), the existential quantifier associated with *a situation this intolerable* and the *wh*-quantifier associated with *how long*. As will be discussed in detail in chapter 4, we assume that *wh*-quantifiers associated with *wh*-phrases are handled in the QSTORE and that their retrieval is restricted by their syntactic position in English. Thus a constraint on *wh*-retrieval will be posited to the effect that a *wh*-quantifier associated with a fronted *wh*-phrase must be retrieved at the S immediately dominating the fronted phrase (viz. S2 in (31). (Cf. the Syntactic Licensing Constraint on *Wh*-retrieval in 4.3) Then this constraint on *wh*-retrieval conflicts with (30bi) when we analyze (31).

Manning *et al.* (1996) propose the other possible way of eliminating such a spurious ambiguity, i.e. to allow quantifier retrieval only at lexical heads. They adopt Pollard & Yoo's (to appear) idea that QSTORE is an attribute of LOCAL and a lexical head may access the QSTORE value of its (role-assigned) arguments, and further propose

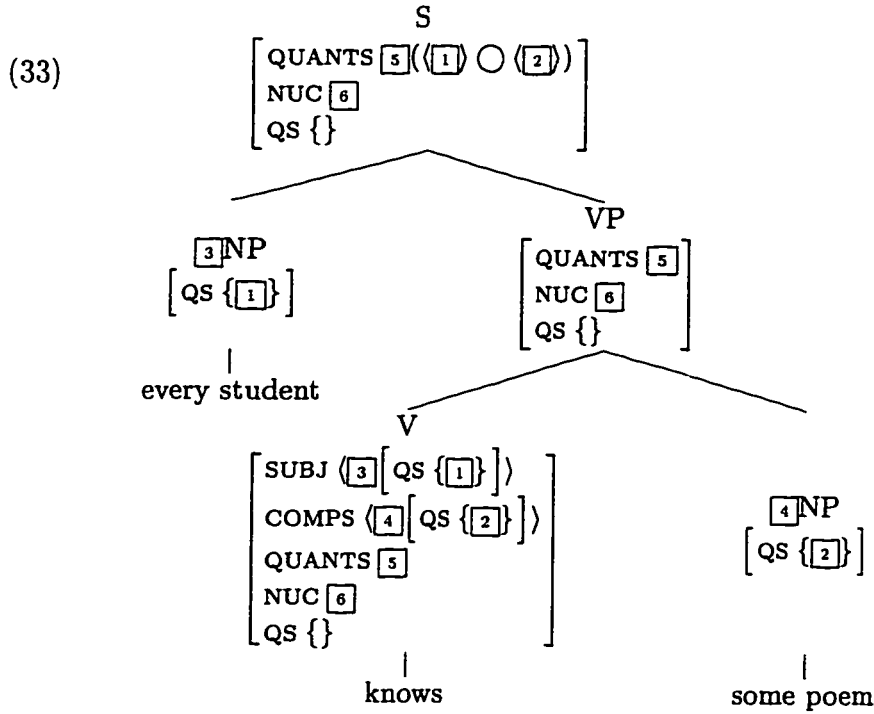
that the members in the QUANTS of a lexical head form a subset of the union of the QSTORE values of the head's arguments. The unretrieved members of the QSTORE are passed up into larger syntactic phrases, and are retrieved at the head of one of those phrases. The following lexical entry for *reads* illustrates this:⁷

$$(32) \left[\begin{array}{l} \text{word} \\ \text{PHON } reads \\ \text{SUBJ } \langle [1] NP_i \rangle \\ \text{COMPS } \langle [2] NP_j \rangle \\ \text{QS } (QS([1]) \cup QS([2])) - ! [3] \\ \text{CONT } \left[\begin{array}{l} \text{QUANTS } order([3]) \\ \text{NUC } \left[\begin{array}{l} read-rel \\ \text{READER } i \\ \text{READ } j \end{array} \right] \end{array} \right] \end{array} \right]$$

In Manning *et al.*, since the head's CONT value directly refers to a subset of the union of its arguments' QSTORE values, it is possible to eliminate the feature RETRIEVED. Thus under this proposal, the sentence *Every student knows a poem* will be analyzed as in (33), with the head V being the only retrieval site:

⁷Here, the notation QS(X) is used to designate the QSTORE value of an object X, and \cup denotes the relation of set union. The notation -! is employed in Manning *et al.* to designate the relation of contained set difference: if S_2 is a subset of S_1 , then $S_1 -! S_2 = S_1 - S_2$, wherein - denotes the standard notion of set difference, otherwise the contained set difference is not defined.

The definite relation *order* is defined in order to make an ordered list out of a set of members.



In getting rid of spurious ambiguity, Manning *et al.* seem to provide a more elegant and simpler solution, comparing to the former approach that achieves the effect of maximal projection retrieval by adding a constraint. However, a bigger question arises about this approach as to whether it suffices to allow retrieval only at a lexical head. Unfortunately, when we consider interrogatives under the assumption that *wh*-phrases give rise to stored operators in their QSTORE (see Chapter 4 for details), it seems very difficult to account for the scope of fronted *wh*-phrases solely on the basis of lexical retrieval. We will leave the precise analysis of interrogatives to Chapter 4, but will briefly consider (34) and (35) for the comparison between interrogative scope and ordinary quantifier scope in English.

(34) A storybook, I think Mary read.

(35) What does John remember Mary read?

By (16), the quantifier associated with *a storybook*, and the *wh*-operator associated with *what* becomes a member of the QSTORE of the embedded verb *read*, in (34) and (35), respectively. Although the retrieval of those operators (or quantifiers) should be possible in principle in either matrix or embedded clauses, (35) cannot receive an interpretation with the *wh*-operator taking an embedded scope. If it did, it would not be a question any more, but an indirect question meaning ‘John remembers what Mary read’.

Under the lexical retrieval approach, then, retrieval at the embedded head should be prohibited in (35), but it is not clear how this can be done, since in other examples like (36), retrieval of *wh*-operator should be possible at the same lexical head.

(36) What did Mary read?

Thus under the lexical retrieval approach, a lexical head should be able to tell where its argument *wh*-phrase ends up in the structure, which doesn’t seem possible under the current assumptions. Therefore, at this point, in the absence of a successful account on how to make Manning et al.’s analysis compatible with our analysis of interrogatives, we consider structure-based retrieval still necessary for the account of *wh*-operator scope.⁸

On the other hand, we cannot entirely reject the idea of lexical retrieval and solely depend on phrase-level retrieval, since there is empirical evidence from German that necessitates retrieval at lexical heads.

Tibor Kiss and Anke Feldhaus (p.c.) point out that in German modal verb constructions, the nonauxiliary main verb is usually assumed not to project to a phrase,

⁸Przepiorkowski 1997 proposes a preliminary account of *wh*-retrieval under the assumption that operator retrieval is allowed only at the lexical level. However, as he himself remarks, the appropriate licensing constraint for *wh*-retrieval has to be a global one, which seems to be a high price to pay.

but a QP selected by the verb may receive a narrow scope interpretation with respect to both modals. The following (37) exemplifies this:

- (37) weil Ulrich einen Kuchen kaufen können muss
 because Ulrich a cake buy POSS-MODAL NEC-MODAL
 ‘because Ulrich must be able to buy a cake’

According to Kiss, in an example like (37), it is generally agreed that the object *einen Kuchen* does not form a constituent with either *kaufen* or *können* and that *kaufen* alone does not project to a phrase (cf. Hinrichs & Nakazawa 1994, Nerbonne 1994, Kiss 1994 and Gerdemann 1994). Thus if we assume this line of syntactic analysis for (37), we cannot explain narrow scope of the quantifier without a mechanism of lexical retrieval.

A similar example is found in Korean. Consider (38), in which the QP *chayk (han kwen)-ul* can take either narrow or wide scope with respect to the modal:

- (38) Minho-ka chayk (han kwen)-ul ilk-eya ha-n-ta
 Minho-NOM book (a volume)-ACC read MODAL-PRES-DEC
 ‘Minho must read a book.’

Chung (1995) argues that in auxiliary verb constructions wherein a main verb is followed by one or more auxiliary verbs, they together form a complex predicate. Thus in (38), *ilk-eya ha-n-ta* is analyzed as a complex predicate, and the main verb *ilk-eya* and its complement *chayk (han kwen)-ul* do not form a VP. Rather the complement of the main verb also becomes a complement of the complex predicate via the mechanism of “argument composition” (Hinrichs & Nakazawa 1989, 1994). Therefore, under this line of analysis that does not posit a VP for the main verb and its QP complement, the narrow scope reading of the QP cannot be achieved.⁹ On the other hand, if lexical

⁹For the arguments against positing such a VP in auxiliary verb constructions, see Chung (1995:151-159).

retrieval is allowed, the quantifier can be retrieved at the main verb before it forms a complex predicate.¹⁰

So far we have argued that we need both phrasal and lexical retrieval. Although this will yield still more possible retrieval sites, thus adding further spurious ambiguity, we will not attempt to solve the problem of spurious ambiguity here. Rather, we will move on to the discussion of how to revise our theory to allow both phrasal and lexical retrieval of operators.

3.2.3 A revised theory of quantifier retrieval

In section 3.1, we proposed (16) in order to enable a lexical head to access arguments' QSTORE. However, the description (16) as it stands prevents lexical retrieval, since it specifies the QSTORE value of the head. We follow Pollard & Yoo's (to appear) proposal in solving this problem. In Pollard & Yoo, a new feature POOL is introduced as an additional local attribute in order to keep track of a set of quantifiers from which a subset of quantifiers are retrieved.¹¹ Thus quantifiers are retrieved from the POOL and the QSTORE value is the set difference between the POOL value and the set of retrieved elements. The modified feature structure is shown in (39):

$$(39) \left[\begin{array}{l} \text{sign} \\ \text{PHONOLOGY } \text{list}(\text{phonstring}) \\ \text{SYNSEM} \left[\begin{array}{l} \text{LOCAL} \left[\begin{array}{l} \text{CATEGORY } \text{category} \\ \text{CONTENT } \text{content} \\ \text{QSTORE } \text{set}(\text{quantifier}) \\ \text{POOL } \text{set}(\text{quantifier}) \end{array} \right] \\ \text{RETRIEVED } \text{list}(\text{quantifier}) \end{array} \right] \end{array} \right]$$

¹⁰For this, details should be worked out in order to represent the semantics of complex predicates properly, which I do not explore here.

¹¹The POOL is assumed to be a local feature in order to guarantee that the POOL value of a trace is the same as that of the corresponding filler.

Once we employ the new feature `POOL`, the description (16) needs to be restated as in (40):

(40) Constraint on quantifier storage of heads (first revision)

For a lexical head, the `POOL` is the union of the `QSTORE` of all *selected arguments*, defined as either

- (i) thematic elements selected via the `SUBJ` or `COMPS` feature,
- (ii) elements selected via the `SPR` feature, or
- (iii) elements selected via the `MOD` feature.

As we discussed in 3.2.1, (40) (and its preliminary version (16)) should be taken as a description that is satisfied by most words (which we can call ‘ordinary lexical heads’). As mentioned in 3.2.1, there are two other kinds of words, viz. quantifier-introducing words and semantically vacuous lexical heads, that do not satisfy this description. Thus we assume the three kinds of words in (41):

$$(41) \text{ word} \rightarrow \text{ord-head} \vee \text{quant-word} \vee \text{sem-vac}$$

The words that we refer to *quant-word* in (41) can be described as words that introduce a nonempty `QSTORE` value. Another kind of words, i.e. a semantically vacuous lexical head, has the `CONTENT` value that is structure-shared with that of one of its complements (cf. (23)), and its `QSTORE` is token-identical with that of the complement with which the word shares the `CONTENT`. We also assume that the `RETRIEVED` value of semantically vacuous lexical heads are empty.¹² (See (24) and (25) for lexical

¹²Thus these words satisfy the following description:

$$(i) \text{ sem-vac} = \left[\begin{array}{l} \text{SYNSEM|LOC} \left[\begin{array}{l} \text{CAT|VAL|COMPS} \left\langle \dots \left[\begin{array}{c} \text{CONT} \boxed{1} \\ \text{QSTORE} \boxed{3} \end{array} \right] \dots \right\rangle \\ \text{CONT} \boxed{1} \\ \text{QSTORE} \boxed{3} \end{array} \right] \\ \text{RETRIEVED} \langle \rangle \end{array} \right]$$

entries of semantically vacuous lexical heads *to* and *be*.)

The POOL value of a phrase should be governed by another constraint. As POOL is a feature of LOCAL objects, a phrase also bears this feature. As its value should be a set of quantifiers from which retrieval can occur, it should be the QSTORE value of the semantic head daughter. (Cf. the Semantics Principle (29a)) Accordingly, the relevant part of the Semantics principle is replaced with the following constraint:

- (42) For a phrase, the POOL value is token-identical with the QSTORE value of the semantic head daughter.

With regard to retrieval of quantifiers, the Semantics Principle (29) deals with only headed phrases. However, with the new feature POOL, we can state a general constraint (43) and (44) that govern both lexical and phrasal level retrieval.

- (43) $[\text{RETRIEVED } nelist] \rightarrow [\text{CONT } psoa]$

- (44) $sign \rightarrow \left[\begin{array}{l} \text{SYNSEM|LOC} \left[\begin{array}{l} \text{QSTORE } [1] \\ \text{POOL } [2] \end{array} \right] \\ \text{RETRIEVED } [3] \end{array} \right]$
 $\wedge \text{set-of-elements}([3], [4])$
 $\wedge [4] \subseteq [2]$
 $\wedge [1] = [2] - [4]$

As mentioned earlier, the RETRIEVED of a semantically vacuous lexical head is an empty list. Retrieval is possible at semantically nonvacuous heads, and its QUANTS value is governed by (45):

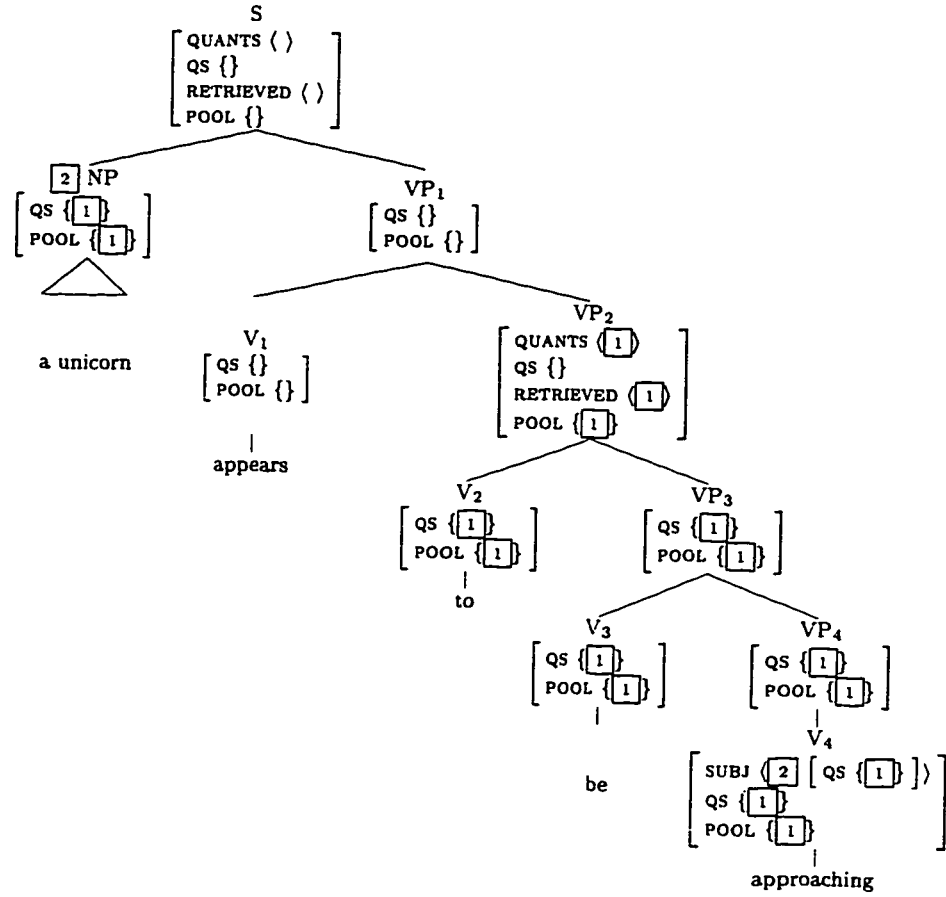
- (45) For a semantically nonvacuous lexical head, the QUANTS value is token-identical with its RETRIEVED value.

Meanwhile, the other aspects of the Semantics Principle (29) are retained and restated as follows:

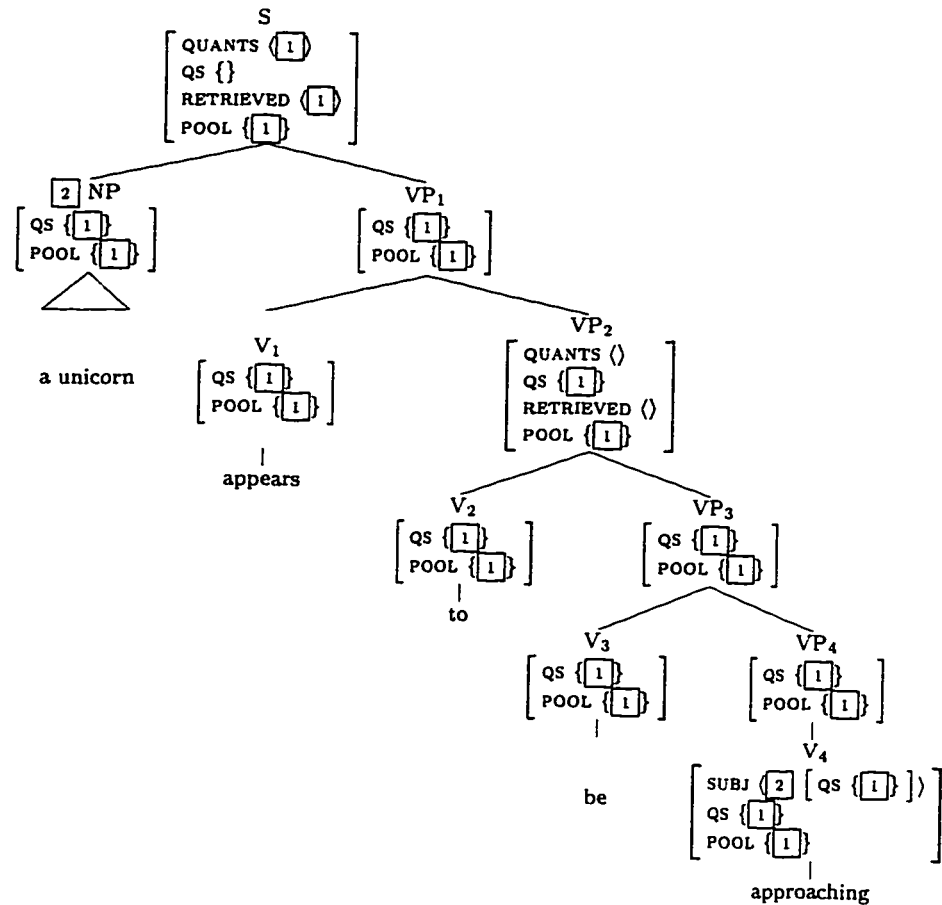
- (46) For a headed phrase whose `CONT` is not of sort *psoa*, the `CONT` value is token-identical to that of the semantic head.
- (47) For a headed phrase whose `CONT` is of sort *psoa*, the `NUCLEUS` value is identical with that of the semantic head, and the `QUANTS` value is the concatenation of the `RETRIEVED` value and the semantic head's `QUANTS` value.

Therefore, our extended version of theory consists of the description (40) and the constraints (42)-(47), which replace the Semantics Principle. Now the two readings of example (9) are analyzed as in (48)-(49):

(48) Narrow scope reading



(49) Wide scope reading



Likewise, although I don't illustrate it here, the preliminary analysis of (13) in (28) can be easily converted to one using the POOL feature.

3.3 Some semantic aspects of adjuncts

3.3.1 Pollard & Sag's treatment of adjuncts

As in the tradition of categorial grammar wherein adjuncts are assumed to be functions that take modified categories as arguments, P&S assume that adjuncts select their heads via the head feature MOD (MODIFIED). This is reflected in the ID schema in (50):

- (50) (Schema 5) a phrase with DTRS value of sort *head-adjunct structure* (*head-adj-struct*), such that the MOD value of the adjunct daughter is token-identical to the SYNSEM value of the head daughter.

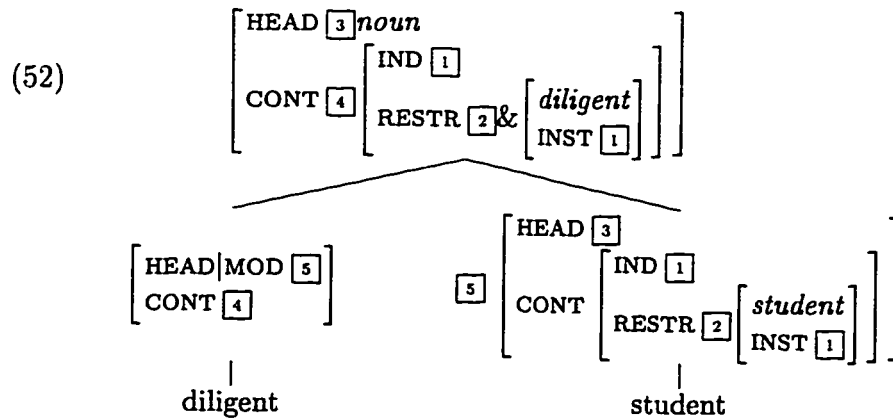
Given a head-adjunct phrase, P&S's Semantics Principle (cf. section 3.1) requires that the CONT value of the adjunct daughter, which is a semantic head, determine that of the mother. More specifically, when the adjunct daughter is of sort *psoa*, its NUCLEUS value is token-identical with that of the mother; when the adjunct daughter is of sort *nom-obj*, its entire CONT value is identified with that of the mother. Thus in a phrase like *diligent student*, the CONT of the adjective *diligent* is token-identical with that of the N' *diligent student*, reflecting the combinatorial semantics of the adjective and the nominal. Since the adjective *diligent* is an intersective modifier that gives an additional restriction to the modified nominal, its CONT is described as in (51) along with its CAT value:¹³

$$(51) \left[\begin{array}{l} \text{CAT|HEAD} \left[\begin{array}{l} \text{adjective} \\ \text{MOD } N' : \left[\begin{array}{l} \text{IND } \boxed{1} \\ \text{RESTR } \boxed{2} \end{array} \right] \\ \text{PRD } - \end{array} \right] \\ \text{CONT} \left[\begin{array}{l} \text{IND } \boxed{1} \\ \text{RESTR } \boxed{2} \& \left[\begin{array}{l} \text{diligent} \\ \text{INST } \boxed{1} \end{array} \right] \end{array} \right] \end{array} \right]$$

A head-adjunct phrase constituted from this type of adjective and a nominal is illustrated in (52):

¹³Multiple restrictions on indices are represented as conjunctive psos rather than sets, following Kasper (to appear), which in turn adopts one of the possible solutions suggested in P&S (pp.330-331, fn.4), in order to avoid the problem of the same *psoa* being used as a set of *psoa* for the RESTR value and as a single *psoa* for the ARG value, in the analysis of an operator type adjective like *alleged*. Following Kasper, I assume the following abbreviatory convention for conjunctive psos:

$$(i) \text{psoa1} \& \text{psoa2} = \left[\begin{array}{l} \text{conj-psoa} \\ \text{CONJ1 } \text{psoa1} \\ \text{CONJ2 } \text{psoa2} \end{array} \right]$$



In (52), *diligent* select the nominal via its MOD feature and identifies its CONT value with that of its mother, complying with (50) and P&S's Semantics Principle (6) .

3.3.2 Recursive modification and Kasper's proposal

Kasper (to appear) points out that P&S's assumption that the semantic content of an adjunct is identified with the combinatorial semantics resulting from the adjunct and the modified phrase has some undesirable consequences. First, it introduces multiple lexical ambiguity for adjuncts, since the CONT of an adjunct should vary depending on the semantic type and/or usage of the modified phrase, if there is any. For example, given an adjective, its CONT can be of sort *psoa* or *nom-obj*, depending on whether it is used predicatively (e.g. *The student is diligent.*) or attributively (e.g. *a diligent student*). Moreover, given an adverb modifying an adjective, its CONT can be of sort *psoa* or *nom-obj* depending on whether the modified adjective is predicative (e.g. *The student is unbelievably diligent.*) or attributive (e.g. *They know an unbelievably diligent student.*).

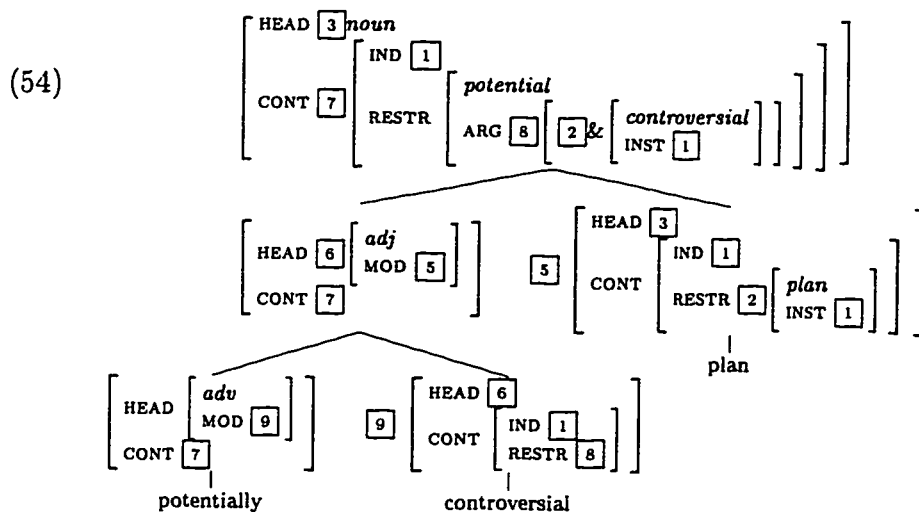
A more serious problem with P&S's analysis is that it fails to provide a correct semantic interpretation when a modifier phrase itself contains a modifier. Such an

embedded structure of modifiers is referred to as *recursive modification* in Kasper (to appear) and illustrated in (53):

- (53) a. Congress reconsidered the [[potentially] controversial] plan.
 b. the [[unintentionally] controversial] plan
 c. the [[obviously] unintentionally controversial] plan
 d. the [[[very] obviously] unintentionally controversial] plan (Kasper (to appear))

As shown in (53), embedding of a modifier is not limited in its depth. In (53a), the correct interpretation can be roughly paraphrased as ‘Congress reconsidered the plan that is potentially controversial’. In other words, within the NP, the adverb modifies only the adjective not the nominal; hence it should have the content ‘ $x|plan'(x) \wedge potential'(controversial'(x))'$ ’.

However, P&S’s Semantics Principle yields the following (54), which represents the incorrect interpretation ‘ $x|potential'(plan'(x) \wedge controversial'(x))'$ ’:



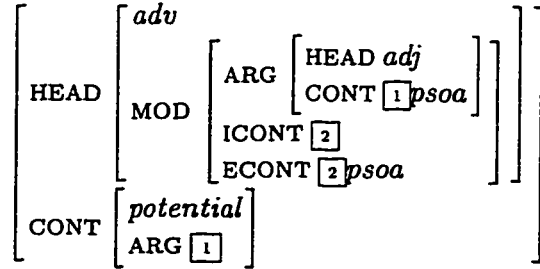
Since the RESTR value of *controversial* is a conjunctive psOA consisting of the *controversial* psOA and the *plan* psOA, when the adjective is modified by the adverb *potentially*, the whole conjunctive psOA becomes the argument of the *potential* psOA; thus the *plan* psOA is wrongly included in the scope of the adverb.

Kasper points out that these kinds of problems are caused by not recognizing the inherent semantic content of a modifier. Thus he proposes to separate the (inherent) content of a modifier from its combinatorial semantics (i.e. the representation of the content resulting from the combination of the modifier and the modified phrase). In his revised theory, the CONT attribute is used to represent the inherent semantics, and two new attributes, ICONT (internal content) and ECONT (external content) are employed, which respectively represent the CONT of the modifier's maximal projection, and the CONT of the phrase resulting from combination with the modified constituent. Since such information is about modifier-head combination and needs to be propagated from the lexical head to its maximal projection, the two new attributes are located inside the MOD attribute, which is a HEAD feature. The information represented by the MOD value in P&S, i.e. the SYNSEM value of the modified constituent, appears as the MOD|ARG value. The proposed structure of MOD values is given in (55):

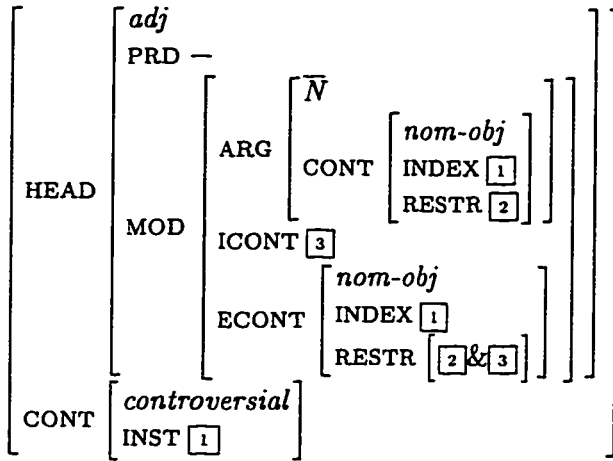
$$(55) \quad \left[\begin{array}{c} head \\ MOD \left[\begin{array}{c} mod \\ ARG \textit{ synsem} \\ ICONT \textit{ cont} \\ ECONT \textit{ cont} \end{array} \right] \end{array} \right]$$

Thus in (53b), lexical entries for the modifiers *controversial* and *potentially* are revised as in the following:

- (56) *potentially* (adverb operator; revised version, Kasper (to appear))



- (57) *controversial* (attributive adjective, intersective; revised version, Kasper (to appear))



To accommodate the change in MOD structure, the head-adjunct schema is reformulated as in (58), and the ECONT and ICONT values are governed by the revised Semantics Principle in (59):

- (58) Schema 5 (revised) a phrase with DTRS value of sort *head-adjunct structure* (*head-adj-struc*), such that the MOD|ARG value of the adjunct daughter is token-identical to the SYNSEM value of the head daughter.

- (59) Semantics Principle (Revised version, Kasper (to appear))¹⁴

- a. For a head-adjunct phrase, the CONT is token-identical with the MOD|ECONT

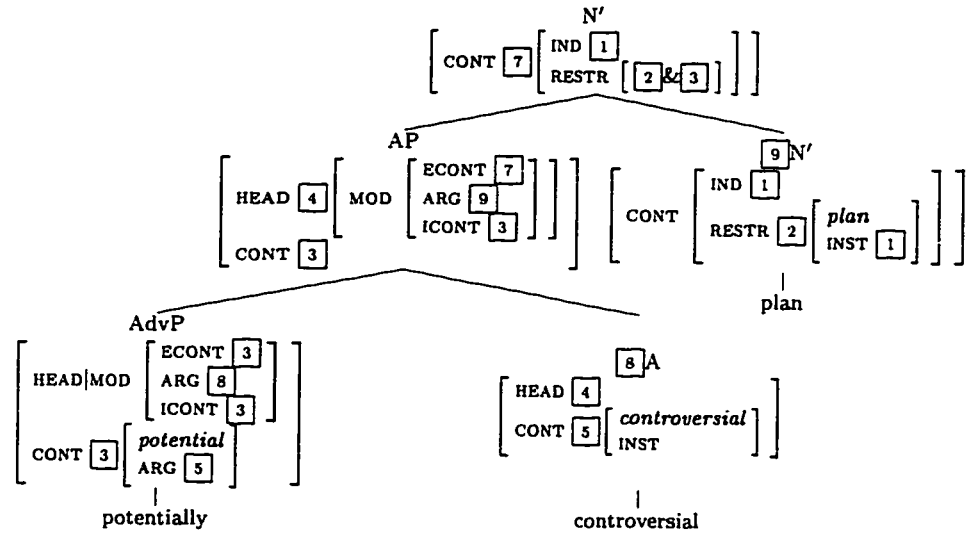
¹⁴In Kasper the Semantics Principle is simplified by not taking quantification into account.

value of the adjunct daughter, and the MOD|ICONT value of the adjunct daughter is token-identical with its (=the adjunct daughter's) CONT.

b. For all other types of headed phrases the CONT is token-identical with the CONT of the head daughter.

Consequently, we can derive the correct semantic interpretation for examples involving recursive modification. This is illustrated in the following description of *potentially controversial plan*:

(60)



In the $CONT$ value of the higher N' , which is structure-shared with the $ECONT$ value of the AP by the Semantics Principle (59), the *plan* $psoa$ (indicated by the tag $[2]$) appears as a conjunct together with the *potential* $psoa$ inside $RESTR$, thus providing the intended interpretation ' $x|plan'(x) \wedge potential'(controversial'(x))$ '.

3.3.3 Quantifiers and adjuncts

In order to represent appropriate semantics for a head-adjunct structure, we adopt Kasper's proposal in our theory. The relevant constraints are (46) and (47) and they are now replaced with the following (61) and (62):

- (61) For a headed phrase whose `CONT` is of sort *psoa*, the `QUANTS` value is the concatenation of the `RETRIEVED` value and the semantic head's `QUANTS` value.
- (62) a. For a head-adjunct phrase, the `CONT` is token-identical with the `MOD|ECONT` value of the adjunct daughter, and the `MOD|ICONT` value of the adjunct daughter is token-identical with its `CONT`.
- b. For all other types of headed phrases,
- (Case 1) if the `CONT` is of sort *psoa*, the `NUCLEUS` value is identical with that of the head daughter.
- (Case 2) otherwise, the `CONT` value is token-identical to that of the head daughter.

Moreover, the description (40) that refers to the `MOD` feature of P&S should be changed as in (63) using the `MOD|ARG` feature of Kasper.

- (63) Constraint on quantifier storage of heads (final version)

For a lexical head, the `POOL` is the union of the `QSTORES` of all *selected arguments*, defined as either

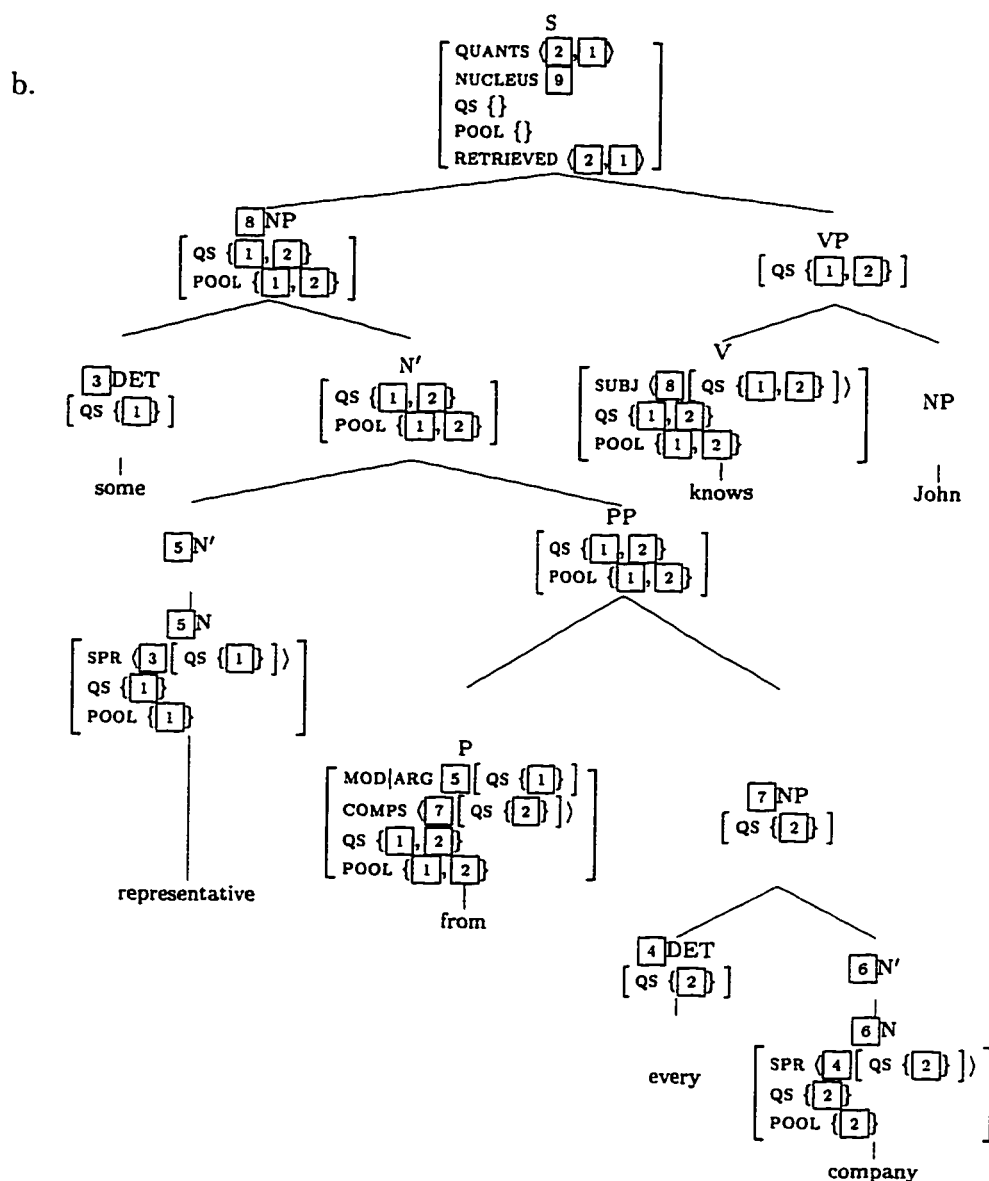
- i) thematic elements selected via the `SUBJ` or `COMPS` feature,
- ii) elements selected via the `SPR` feature, or
- iii) elements selected via the `MOD|ARG` feature.

Given the new set of constraints (42)-(45) and (61)-(63), we can account for various scope interactions between modifiers (or quantifiers contained in a modifier phrase) and other QPs. Consider (64):

- (64) Some representative from every company knows John.

In (64), so called inverse linking (May 1977, 1985) is possible; the universal quantifier associated with *every company* can outscope the existential quantifier associated with the embedding phrase. This reading, represented in (65a), is analyzed in (65b):

(65) a. $(\forall y \mid \text{company}'(y))(\exists x \mid \text{representative}'(x) \wedge \text{from}'(x,y)) \text{know}'(x,\text{john})$



In (65b), another possible order of quantifier retrieval (i.e. with S's QUANTS and RETRIEVED being $\langle \boxed{1}, \boxed{2} \rangle$) is prohibited by the Quantifier Binding Condition of P&S.

(66) Quantifier Binding Condition (P&S 94)

Given a quantifier contained within a CONTENT value, every occurrence within that CONTENT value of the quantifier's index must be captured by that quantifier.¹⁵

Thus the reading ' $(\exists x \mid \text{representative}'(x) \wedge \text{from}'(x,y)) (\forall y \mid \text{company}'(y)) \text{know}'(x, \text{john})$ ' which contains an unbound variable is ruled out.

There is another reading logically possible in (64), ' $(\exists x \mid \text{representative}'(x) \wedge (\forall y \mid \text{company}'(y)) \text{from}'(x,y)) \text{know}'(x, \text{john})$ ', wherein the universal quantifier is retrieved within the modifier phrase. This kind of narrow scope reading is hard to get in (64) for pragmatic reasons, but is available in examples like (67):

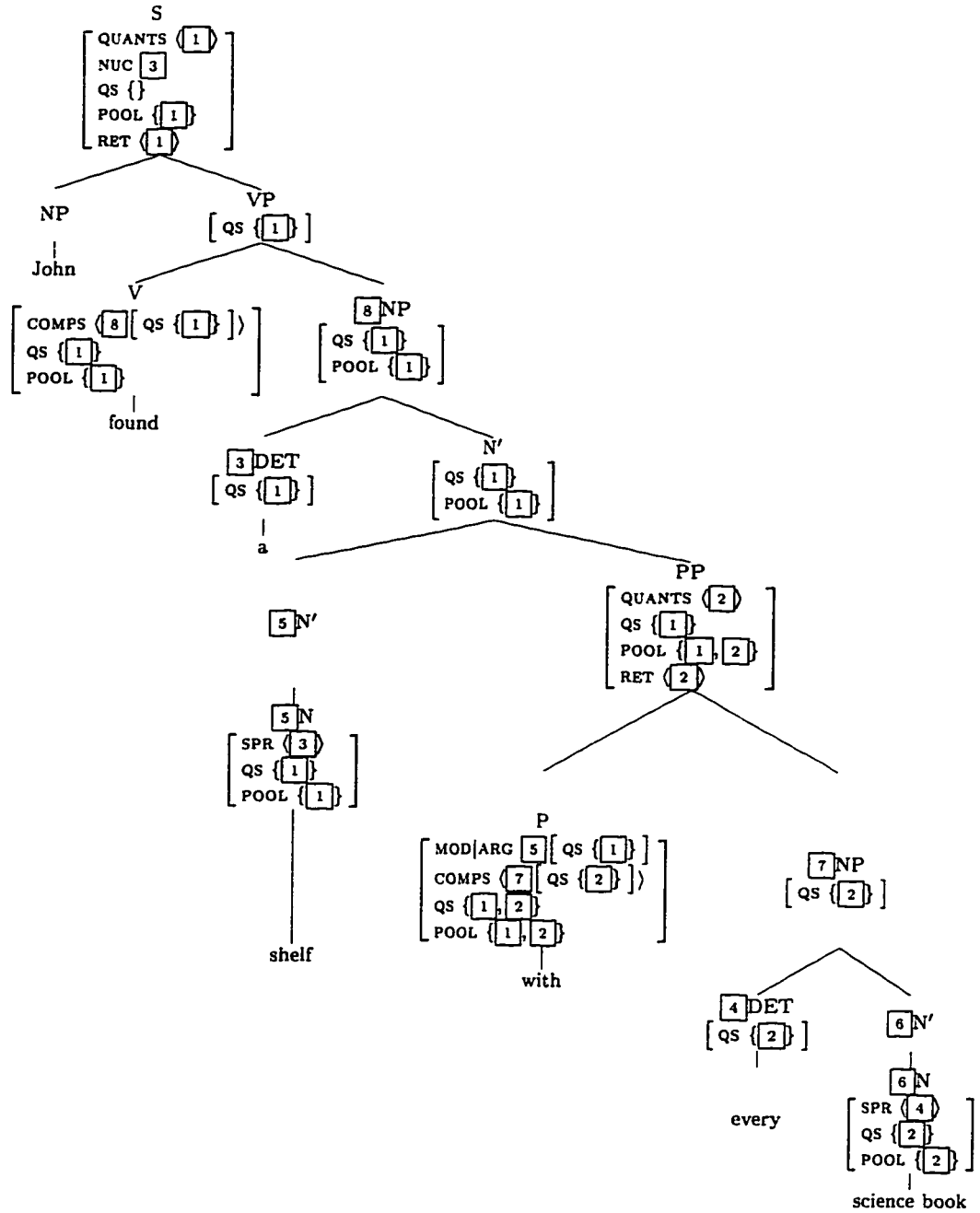
(67) John found a shelf with every science book.

With the narrow scope of the universal quantifier, (67) can be interpreted as 'John found a shelf on which all science books are located.' This reading in (68) is analyzed in (69):

(68) $(\exists x \mid \text{shelf}'(x) \wedge (\forall y \mid \text{s-book}'(y)) \text{with}'(x,y)) \text{find}'(\text{john}, x)$

¹⁵By definition, a quantifier on a QUANTS list of a psoa *captures* an occurrence of the index that belongs to it provided the occurrence is either (i) in the RESTRICTION of the quantifier, (ii) in another quantifier to the right of the quantifier in question on the same QUANTS list, or (iii) in the NUCLEUS of the psoa in question.

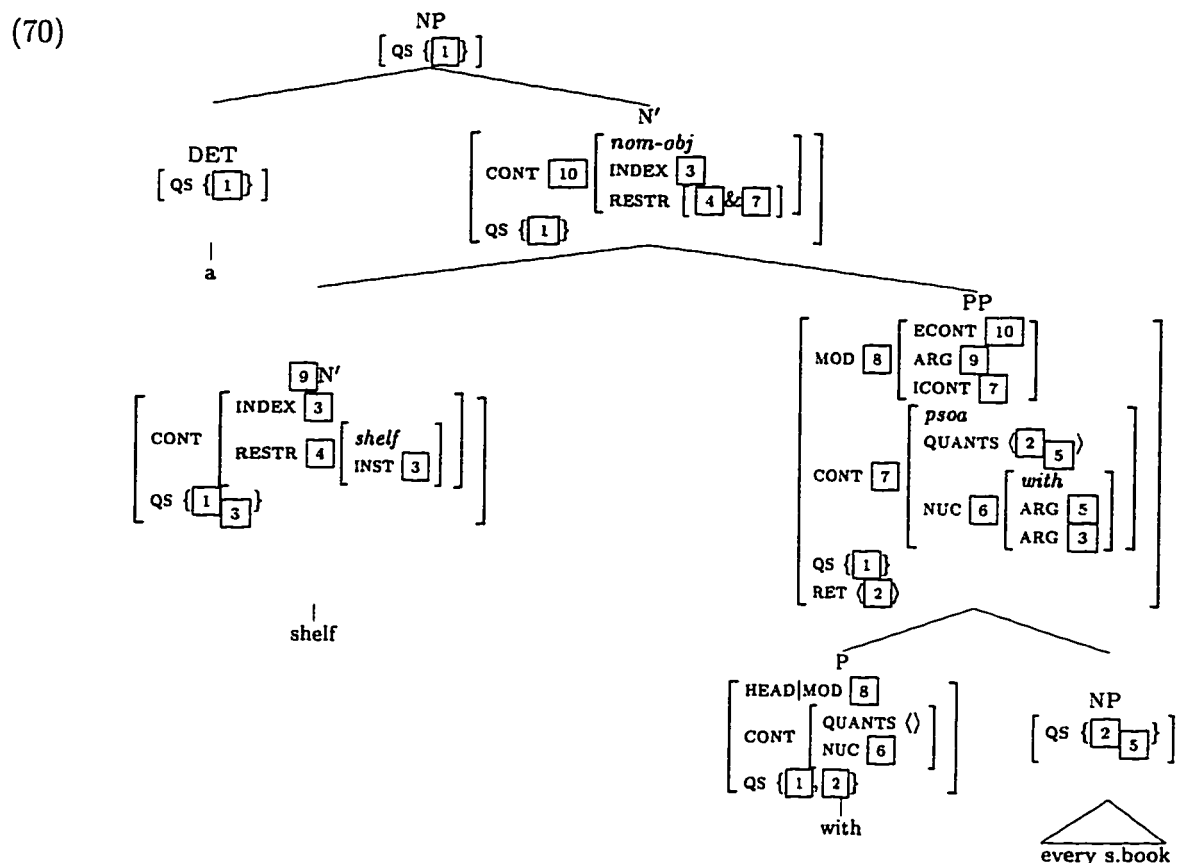
(69)



- $\boxed{1} = [\exists x \mid \text{shelf}'(x) \wedge (\forall y \mid \text{s-book}'(y)) \text{ with}'(x,y)]$
 $\boxed{2} = [\forall y \mid \text{s-book}'(y)]$
 $\boxed{3} = \text{find}'(\text{john}', x)$

It should be noted that in (69b), retrieval at PP is made possible by adopting Kasper's proposal: the CONT value of the adjunct PP (and its head P) is of sort *psoa* as the constraint on retrieval (43) requires, although their ECONT value is of sort *nom-obj*,

reflecting the resulting combinatorial semantics of the N' *shelf with every science book*. In (70), the structure of the NP *a shelf with every science book* in (69b) is shown with details of the CONT and MOD values of each node:



On the other hand, it is questionable whether all scope possibilities related to postnominal adjuncts can be accounted for by the set of constraints that we proposed (42)-(45) and (61)-(63). Jackendoff (1983) and Creary *et al.* (1989) claim that locative PPs refer to locations. Thus the PP *on the Ohio*, for example, refers to a particular spatial region that is (uniquely) determined by the name of the river and the P *on*. Kasper (to appear) adopts the essentials of this proposal and argues that the appropriate type of CONT value for locative PPs is *nom-obj*. Accordingly, if we take

this view on locative PPs, which I am sympathetic with, quantifier scoping within a postnominal locative PP is not accounted for in examples like (71):

(71) John read every book on a table.

Since the *CONT* values of the locative PP (and *P*) is not of sort *psoa* in (71), they are not appropriate sites for retrieval. Kasper (p.c.) suggested that a possible way out is to allow *MOD|ECONT|RESTR* to be another retrieval site, so that the existential quantifier in (71) can appear in the *QUANTS* of the *MOD|ECONT|RESTR* value of the PP. We will explore the ramifications of this strategy in Chapter 7, wherein we resume the discussion of the problem concerning adnominal locative PPs.

3.3.4 Quantifiers and negation

It is well known that quantifiers may exhibit scope ambiguity with respect to the scope of a negative element. Consider (72):

(72) Everyone didn't leave.

Example (72) is ambiguous between two readings 'It is not the case that everyone left. (Someone did not leave.)' and 'For every person, it is the case that he did not leave. (No one left.)'. In the former reading, the universal quantifier takes narrow scope with respect to negation, and in the latter, wide scope.

In Pollard & Sag (1987), negation is represented via polarity of "circumstances" (which roughly corresponds to *psoa* objects in P&S). Thus adopting a variant of situation semantics notation, the circumstance of Mary laughing is described as $\langle\langle\text{laugh, laughter:Mary; 1}\rangle\rangle$, and the circumstance of Mary not laughing as $\langle\langle\text{laugh, laughter:Mary; 0}\rangle\rangle$. In the feature structure, the polarity, either positive or negative,

is handled with the POLARITY feature, which is an attribute of a CONTENT value.

Accordingly, the CONT value of *Mary didn't laugh* is described as in (73):

$$(73) \left[\begin{array}{l} \textit{basic-circumstance} \\ \text{RELATION LAUGH} \\ \text{LAUGHER MARY} \\ \text{POLARITY 0} \end{array} \right]$$

For a quantified structure, another subtype *quantified-circumstance* is assumed, in which a quantifier takes scope over another circumstance. Consequently, for an example like (72), only the wide scope reading of the quantifier can be generated, as in (74):¹⁶

$$(74) \left[\begin{array}{l} \textit{quantified-circumstance} \\ \text{QUANT} \left[\begin{array}{l} \boxed{2} \\ \boxed{1} \end{array} \right] \\ \text{SCOPE} \left[\begin{array}{l} \text{RELATION } \textit{leave} \\ \text{LEAVER} \boxed{1} \\ \text{POLARITY 0} \end{array} \right] \end{array} \right]$$

In this analysis, the narrow scope reading of the quantifier cannot be generated, since the POLARITY is always located inside the scope of the quantifier.

In order to overcome this problem, we give up positing the POLARITY feature. Instead, following Kim & Sag (1995), negation will be represented as a type of *psoa*. In Kim & Sag (1995), the negative adverb *not* in English is described as in (75):

$$(75) \textit{not} \left[\begin{array}{l} \text{HEAD } \textit{adv} [\text{MOD VP} [\textit{nonfin}] : \boxed{2}] \\ \text{CONT} \left[\begin{array}{l} \textit{not} \\ \text{ARG} \boxed{2} \end{array} \right] \end{array} \right]$$

In (75), the CONT value of *not* is a *not* relation whose argument is the CONT value of the VP that it modifies. We can assume that the content of the verb *don't* is represented in a similar way. This is shown in the following proposed entry:

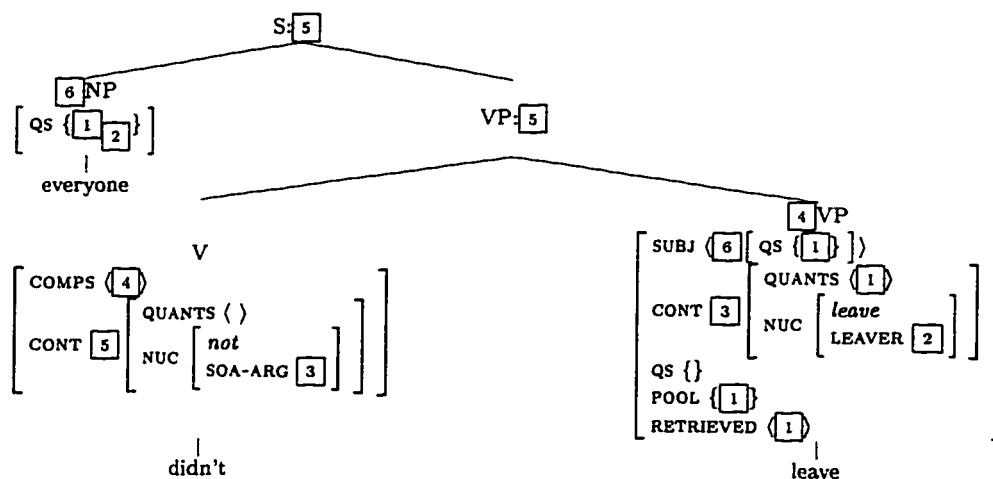
¹⁶In (74), without the attribute POLARITY, the SCOPE value corresponds to the NUCLEUS value of P&S.

- (76) *didn't*
- $$\left[\begin{array}{l} \text{HEAD } \textit{verb}[+\text{AUX}] \\ \text{COMPS } \langle \text{VP} : [2] \rangle \\ \text{CONT } \left[\begin{array}{l} \text{QUANTS } \textit{list} \\ \text{NUC } \left[\begin{array}{l} \textit{not} \\ \text{SOA-ARG } [2] \end{array} \right] \end{array} \right] \end{array} \right]$$

We assume negated forms of auxiliary verbs to be lexical items, since they exhibit idiosyncratic properties in meaning. For example, most negated modals are understood with negation outside of the modal, whereas certain forms like *mustn't* can only be interpreted with negation inside the modal. Thus *John can't leave* means "It is not the case that John can leave.", while *John mustn't leave* means "It is required that John not leave." (Dowty 1979).

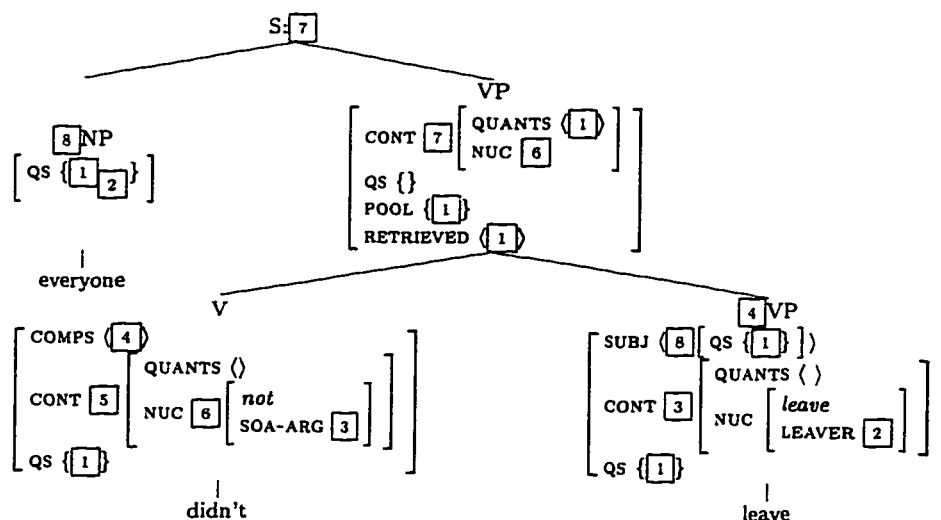
Given (76), two distinct readings of (72) can be analyzed as in (77) and (78):

- (77) a. Narrow scope reading



- b. $[\text{not}'([\forall x \mid \text{person}'(x)] \text{leave}'(x))]$

(78) a. Wide scope reading



b. $[[\forall x \mid \text{person}'(x)] \text{not}'(\text{leave}'(x))]$

Next, let us consider (79), which involves an operator type adverb as well as a negative element:

(79) Everyone probably didn't leave.

Carpenter (1994) notes that an example like (79) is three-ways ambiguous depending on the scope of *everyone* with respect to those of the adverb and the negation: the universal quantifier can scope either wholly inside, wholly outside, or in between the adverb and negation. These readings are shown in (80):

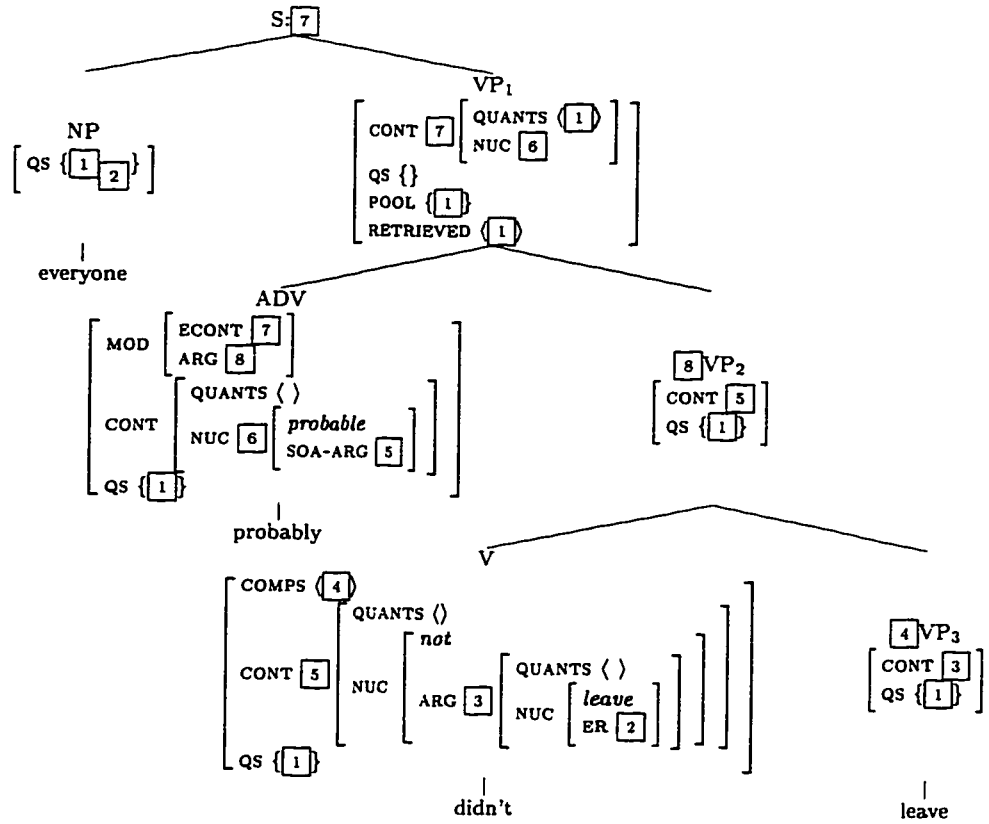
(80) a. $[\text{probably}'(\text{not}'([\forall x \mid \text{person}'(x)] \text{leave}'(x)))]$

b. $[[\forall x \mid \text{person}'(x)] \text{probably}'(\text{not}'(\text{leave}'(x)))]$

c. $[\text{probably}'([\forall x \mid \text{person}'(x)] \text{not}'(\text{leave}'(x)))]$

The reading (80b) is analyzed in (81):

(81)



Likewise, the reading in (80a) is generated with the retrieval at VP₃, and the reading in (80c), with the retrieval at VP₂ (or at its head V).

CHAPTER 4

REPRESENTATION OF INTERROGATIVE SCOPE

4.1 Representing interrogatives

4.1.1 *Wh*-movement and *wh*-scope

In this chapter, we will investigate how scope of interrogative operators can be represented based on the theory that we have developed in the previous chapter. We begin with the assumption that a *wh*-question like (1) is represented as in (2) in restricted quantificational logic notation:

(1) Who did Mary meet?

(2) $[(\text{which } x \mid \text{person}'(x)) [\text{meet}'(\text{mary}', x)]]$

In a transformational approach, such a logical form is acquired by *wh*-movement, that moves a *wh*-phrase into a particular position in the hierarchical structure, viz. SPEC of CP in the *Barriers* framework of Chomsky (1986) or COMP in pre-*Barriers* analyses (e.g. Chomsky 1981, Huang 1982, and May 1985). Thus the *wh*-trace in an *A*-position is taken to be a (logical) variable bound by the *wh*-phrase in the \bar{A} position. The scope of a *wh*-phrase is defined in terms of hierarchical relationships. A

wh-phrase in COMP is assumed to have scope over all the nodes that it c-commands at LF.¹

However, as Chomsky (1977:83) notes, a trace of *wh*-movement cannot always be identified with the variable that falls within the scope of a *wh*-quantifier.

- (3) [Whose_j mother]_i did Mary meet t_i?

In (3), the trace cannot be interpreted as a variable bound by an operator associated with *whose*. In dealing with this, Chomsky (1977) suggests the notion of ‘reconstruction’, so that certain elements moved at SS can be moved back at LF. The following (4) is the reconstructed form of (3):

- (4) [Whose_j [Mary meet t_j’s mother]] (LF)

The idea of reconstruction is adopted in subsequent transformational approaches, and among other things, is used for the account of crossover phenomena (cf. Chomsky 1981). Thus the strong crossover case in (5) is assimilated to that of **He_j saw John’s_j brother*, which induces violation of Binding Condition (C) of Chomsky (1981), while the weak crossover case in (6) is accounted for by an independent constraint on operator binding:

- (5) a. *[Whose mother]_i did he meet t_i?

- b. [Who(se)_j [he_j meet t_j’s mother]] (LF)

- (6) a. ??[Whose mother]_i did his brother meet t_i?

- b. [Who(se)_j [his_j brother meet t_j’s mother]] (LF)

¹Cf. May (1985)’s definition

(i) The scope of α is the set of nodes that α c-commands at LF.

As May notes, a problem with such a reconstruction account is pointed out in Higginbotham (1980).

- (7) a. Which driver of which millionaire_i's car was hired by his_i father?
 b. [_{S'} which millionaire_i [_S which driver of t_i's car was hired by his_i father]]
 (LF)

Reconstruction yields (7b); however, since (7b) does not satisfy the constraint that every *wh*-phrase must occur in a [+Wh] COMP at LF (cf. May 1985, Huang 1982, Lasnik & Saito 1984), the phrase *which driver of t_i's car* must move to the COMP again. However, this would mean to reface the problem that existed before the reconstruction.

May's (1985) analysis eliminates such a reconstruction process. Rather he proposes that an embedded QP/Wh-P can be adjoined to the embedding NP without being extracted out of the embedding phrase. Thus in (8), the possessive *wh*-phrase is adjoined to the NP in the COMP as in (8):

- (8) [_{S'} [_{NP} who₂ [_{NP} t₂'s mother]]]₃ [Mary met t₃]]

As we saw in Chapter 2, adjunction to an NP applies to multiple quantification sentences in general – when there is more than one operator, only a single operator is adjoined to S, and the other(s) is adjoined to this S-adjoined NP (May 1985:81). Concomitantly, for multiple interrogation, only a single *wh*-phrase is moved to COMP, and the other(s) is adjoined to the NP in COMP. Thus in the following example (9) from van Riemsdijk & Williams (1981), the multiple direct question reading with respect to the pair *who* and *whom* is analyzed as in (10):

(9) Who knows which pictures of whom Bill bought?

(10) [_{S'}[_{NP} whom₃ [who]₂][_S t₂ knows [_{S'}[which pictures of t₃]₄ [_S Bill bought t₄]]]]]

In (9), the *which*-phrase cannot be interpreted as paired with *who* to form a multiple question, since its fronting will move the embedded *wh*-phrase as well, thus leaving no *wh*-phrase in the embedded [+Wh] COMP.

However, the same account does not hold for the following example (11) from Engdahl (1986):

(11) Q: Who remembers whose recordings of which Beethoven symphony Mary prefers?

A: a. John does.

b. John remembers whose recording of the fifth symphony Mary prefers and Bill remembers whose recording of the ninth symphony Mary prefers and ...

c. (not) John remembers that Mary prefers Karajan's recording of the fifth symphony.

The two possible answers in (11) suggest that the embedded *wh*-phrase *which Beethoven symphony* can take either embedded scope (in (a)) or matrix scope (in (b)), while unavailability of (c) shows that *whose recordings of which Beethoven symphony* cannot be construed as taking matrix scope. Although it is not discussed in Engdahl, there is another reading not available in (11), wherein *whose* takes matrix and *which Beethoven symphony* takes embedded scope. This reading, if it were available, would possibly yield an answer like 'John remembers which Beethoven symphony Mary prefers Karajan's recording of, and Bill remembers which Beethoven symphony Mary prefers Bernstein's recording of.'

However, since May allows movement of a possessive phrase and embedded NPs via adjunction to NP, *which Beethoven symphony* is adjoined to the NP in the embedded COMP, and *whose* can be adjoined to the matrix COMP, without violating the Path Containment Condition (PCC). (Cf. Chapter 2)

- (12) $[_{S1'} [_{NP2} \text{ who}_5 [\text{who}_2]] [_{S1} t_2 \text{ remember } [_{S2'} [_{NP4} \text{ which Beethoven symphony}_3$
 $[_{NP4} t_5 \text{'s recordings } [_{PP} \text{ of } t_3]]] [_{S2} \text{ Mary prefers } t_4]]]]]$

$$\begin{aligned} P(3) &= \{PP, N', NP_4\} \\ P(4) &= \{VP, S_2, S_2'\} \\ P(5) &= \{NP_4, S_2', VP, S_1, S_1', NP_2\} \\ P(2) &= \{S_1, S_1'\} \end{aligned}$$

This will generate the fourth, nonavailable reading, thus posing a problem for May's analysis.

In van Riemsdijk & Williams's (1981) theory (cf. Chap. 2), the same kind of problem arises. In the revised T-model, they claim that rules of LF should not apply to the output of *wh*-movement but rather to a level which precedes it (viz. their NP-structure). Thus the pied-piped *wh*-phrase in *To whom did you talk?* receives quantifier interpretation (QI) as in (14), in accordance with the rule (13): *wh*-movement applies to (14) afterwards.

- (13) Quantifier Interpretation:

$$[_{S...Q...}]_S \Rightarrow [_S i [_S ...Q_i...]]_S$$

where Q is a lexical quantifier element.

- (14) a. You talked to whom.

b. $[_{S'} [_S i [_S \text{ you talked to whom}_i]]]$

In order to account for cases like (9), they propose (15) as a filter. The term *wh-phrase* in (15) is defined in (16a), which includes the examples in (16b), but not the ones in (16c):

(15) A *wh-phrase* immediately dominated by COMP must govern its own index or a complex index containing its own index.²

- (16) a. *Wh-phrase*: (P) *wh-word* X
 b. whose book, to whose mother, in which store
 c. picture of whom

For the wide scope reading of *whom*, (9) has the following S-Structure, after QI and *wh-movement*:

(17) [_{S'} who_i [_S (i,j) [_S t_i knows [_{S'} [which picture of whom_j]_k [_{S'} k [_S Bill bought t_k]]]]]]

However, this still does not guarantee that in the English example (11), *whose* must take embedded scope. This is because the *wh-phrases* immediately dominated by the embedded COMP do not have the same index as the scope-taking element *whose*. The following representation of (11) illustrates this:

- (18) a. [_S (i,j) [_S who_i remembers [_{S'} [_S k [Mary prefers [_{NP} whose_k recordings of [_{NP} which Beethoven symphony]_j]_l]]]]]] (QI, NP-Structure)
 b. [_{S'} who_i [_S (i,j) [_S t_i remembers [_{S'} [_{NP} whose_k recordings of [_{NP} which Beethoven symphony]_j]_l [_S k [Mary prefers t_l]]]]]]

²A complex index has the form (i,j) in their analysis.

In (18b), the index of the *wh*-phrase in the COMP of the embedded S (i.e. *l*) is different from that of the *wh*-operator that must take scope exactly equal to the S (i.e. *k*), thus violating (15).³

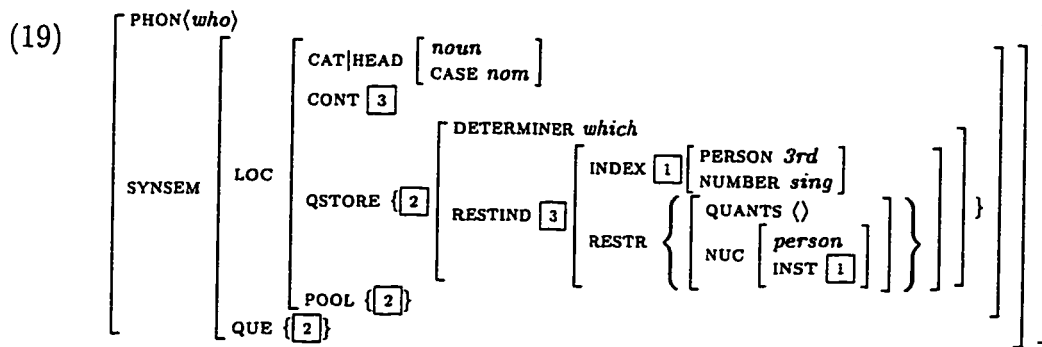
So far we have seen that transformational approaches wherein *wh*-scope is defined in terms of hierarchical positions in a phrase structure often necessitates use of cumbersome devices such as reconstruction or adjunction to NP in an abstract level, in order to locate a scope-taking *wh*-phrase in an appropriate position with respect to elements in its scope. Such devices are assumed in those approaches, because a fronted *wh*-constituent does not always coincide with a *wh*-operator associated it. We pointed out some specific problems with such reconstruction/adjunction based accounts of pied-piped *wh*-phrases. Note that the same kind of problem occurs for in-situ *wh*-phrases in both syntactic *wh*-movement languages and *wh-in situ* languages, when LF *wh*-movement is assumed for those phrases. In this case, the idea of reconstruction is carried out even more abstractly, since an in-situ *wh*-phrase (e.g. *which book* in *Who found which book?*) is moved at LF and then reconstructed at the same level. Further related issues regarding amount quantifier phrases (e.g. *how many books*) will be discussed in Chapter 6.

4.1.2 *Wh*-phrases and interrogative scope

In this section, we briefly introduce our analysis of *wh*-scope. More detailed accounts are developed in 4.3 after discussing how to represent interrogatives in general in

³Williams (1986) proposes the Reduced Van Riemsdijk and Williams (VR & W) model wherein LF and D-Structure are eliminated and a reconstruction device is reintroduced. S-Structure and NP-Structure, the only remaining levels of representation in the Reduced model, are assumed to be base-generated and a sentence is considered to form a pair {S-Structure, NP-Structure}, the first derivable from the second by *wh*-movement. We do not provide direct comparison between them, since Williams (1986) does not offer any concrete proposal on multiple questions.

4.1.3 and 4.2. We assume that interrogative scope of a *wh*-phrase is determined by the storage and retrieval of the interrogative operator associated with the *wh*-phrase. Thus *wh*-phrases are treated parallel to QPs in that an operator originates in their QSTORE/POOL. Again parallel to QPs, the CONT value of the *wh*-phrase is assumed to be of sort *nom-obj*, like an ordinary NP. This is in line with Cooper's (1983) treatment wherein a *wh*-phrase is assigned a bound-variable pronoun interpretation while its binding operator is in the store. The following (19) is a description of the *wh*-phrase *who*:



The QSTORE analysis of *wh*-operators diverges from previous HPSG approaches to interrogatives. In Pollard & Sag (1987), it is assumed that *wh*-scope is determined by propagating and binding off a logical quantifier which originates in the QUE value of a *wh*-phrase. In Ginzburg (1992), binding off of the QUE value marks an S as [+Int(errogative)], and such an interrogative clause receives a question interpretation by an accompanying semantic rule. In both Pollard & Sag (1987) and Ginzburg, (and also in Pollard & Sag 1994, which does not provide a concrete analysis of interrogatives) QUE is employed as a nonlocal feature that takes care of unbounded dependencies. Thus, together with the other nonlocal features SLASH and REL, QUE is assumed to be governed by the Nonlocal Feature Principle.

By contrast, as we assume that interrogative scope is determined by inheritance and retrieval of *wh*-operators in the QSTORE, which is governed by sets of independent constraints, QUE is not assumed to be a nonlocal feature any more. The feature geometry in (19) is in accordance with this assumption. Rather as we will see in 4.3 and 4.4, when the feature QUE is employed, its inheritance is subject to a language-particular constraint, which accounts for language-specific syntactic restrictions on interrogative sentences. Thus while the scopal nature of *wh*-phrases is explained via operator storage and retrieval, inheritance of the QUE, which is much more restricted, will control some aspects of the syntactic distribution of *wh*-phrases.

As a consequence of our assumptions about QUE, the Nonlocal Feature Principle in P&S is now renamed as the Slash Feature Constraint and only governs the SLASH.

(20) Slash Feature Constraint

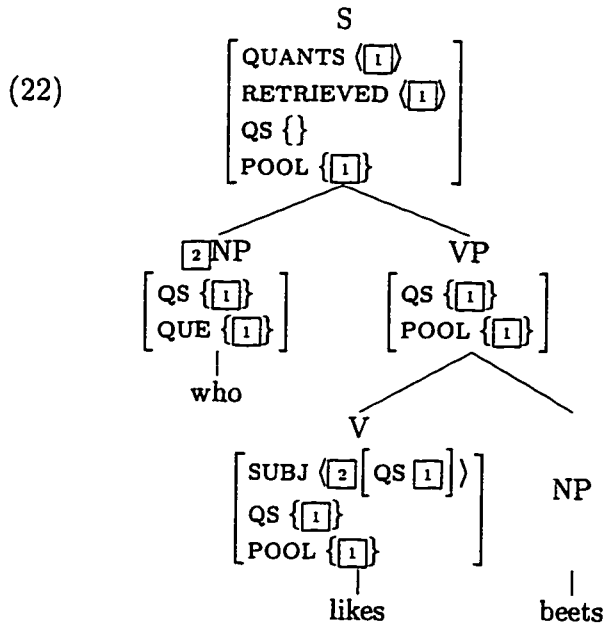
In a headed phrase, for the SLASH feature, the INHERITED value on the mother is the union of the INHERITED values on the daughters minus the TO-BIND value on the head daughter.

We assume that QUE and REL are governed by separate constraints, one of the main reasons being the well-known contrast in (21).

- (21) a. This is the man pictures of whom they have on the wall.
 b. *Pictures of whom do they have on the wall?

Details on QUE will be discussed in 4.3 and 4.4.

Just like ordinary quantifiers, stored interrogative operators are subject to the constraints proposed in Chapter 3, in their inheritance and retrieval. Therefore, the *wh*-scope of the phrase *who* in the example *Who likes beets?* is analyzed as in (22):



Given the Constraint on Quantifier Storage of Heads (see 3.3.3), which is repeated in (23), in *wh*-phrases such as *which student*, *whose mother*, *which pictures of whom* and *whose recordings of which Beethoven symphony*, the head noun will collect the QSTORES of its selected argument.

(23) Constraint on Quantifier Storage of heads

For a lexical head, the POOL is the union of the QSTORES of all *selected arguments*, defined as either

- i) thematic elements selected via the SUBJ or COMPS feature,
- ii) elements selected via the SPR feature, or
- iii) elements selected via the MOD|ARG feature.

In (24), the description of the noun *pictures* in *which picture of whom* is given for illustration.

$$(24) \text{ pictures (in which picture of whom)} \\ \left[\begin{array}{l} \dots | \text{VAL} \left[\begin{array}{l} \text{SPR} \langle [\text{QSTORE } \{\boxed{1} \boxed{4} \text{wh-op}\}] \rangle \\ \text{COMPS} \langle [\text{QSTORE } \{\boxed{2} \text{wh-op}\}] \rangle \end{array} \right] \\ \dots | \text{POOL } \{\boxed{1}, \boxed{2}\} \\ \dots | \text{CONT} | \text{RESTIND} | \text{IND } \boxed{4} \end{array} \right]$$

As is shown in (24), the operator associated with a *which*-phrase bears the index $\boxed{4}$ of the head noun. On the other hand, in a *whose*-phrase like *whose mother*, the stored operator will have a distinct index from the head noun.

Although both *wh*-operators and quantifiers can appear as members of the QSTORE, POOL, RETRIEVED, and QUANTS values, *wh*-operators can be distinguished from quantifiers by the different kind of DETERMINER value that they have (viz. *which* vs. *every*, *some*). Whenever such distinction/specification is needed, a stored/retrieved operator with the DETERMINER value *which* will be simply referred to as *wh-op*, as in (24).

In sum, in our approach, however complex the structure of a given *wh*-phrase, all operators associated with the phrase are stored in the POOL of its semantic head by the constraint (23), which is independently motivated for the account of quantifier scope in Chapter 3. Then the operators in the QSTORE of the *wh*-phrase will be collected by the head verb for which it is a selected argument. We will return to the discussion of more complex examples in 4.3, after we lay out our analysis of interrogatives in the following sections.

4.1.3 Questions and interrogative mood

Interrogatives are distinguished from other types of sentences such as declaratives and imperatives, by the different kinds of semantic interpretations and discourse functions that they carry. That interrogatives form a natural class is clearly shown by the fact

that there are some verbs that take only interrogatives as complements. The following (25) exemplifies this:

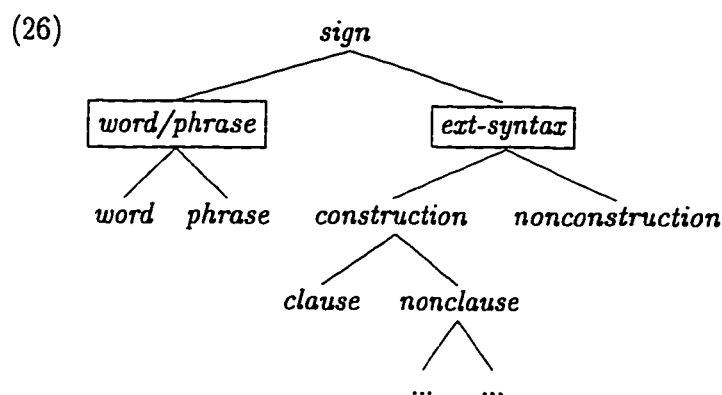
- (25) a. Mary asks/wonders when John left.
b. Mary asks/wonders whether John left.
c. *Mary asks/wonders (that) John left.

In Baker (1970), interrogative sentences are distinguished from other types of sentences by the clause-initial abstract question morpheme *Q*. In other approaches, the same effect is achieved by assuming a null head *Q* as the head of an interrogative sentence. In transformational approaches, it is common to assume that such a null head bears a question-marking feature [+Wh]. A null head *Q* is posited in some nonderivational approaches as well. In the HPSG analysis of Johnson & Lappin (to appear), a null head bears information on terminating QUE dependencies for interrogatives.

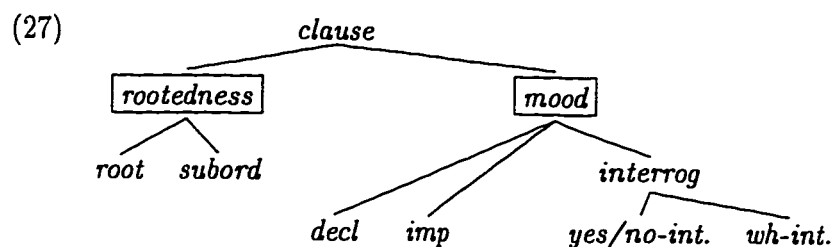
In all such approaches, an abstract, invisible element is posited, whether it is an abstract morpheme or a null head. Moreover, various syntactic properties such as subject-aux inversion in English root questions and the presence of a complementizer (*whether*, *if*) in English embedded polar questions are accounted for via abstract association with a null lexical element (or a feature associated with the null element).

By contrast, the HPSG framework offers an inheritance hierarchy by which different sentence types can be represented by different sorts. Some recent literature in HPSG has adopted the view of *construction grammar*, which assumes different “constructions” that are characterized by direct association between syntactic properties and constraints on meaning (Fillmore & Kay 1993, Zwicky 1994). Sag (to appear), for example, introduces a multidimensional organization of phrasal types, wherein each

type of phrase is classified in two dimensions, CLAUSALITY and HEADEDNESS, and constraints are stated in terms of subtypes in each dimension. On the other hand, in Kathol (1995), clause types are not part of a phrasal type hierarchy; rather they are assumed to be subtypes of *construction* that are cross-classified with the standard word/phrase distinction of *sign*, as in (26):



Following Kathol (1995), I assume that different types of *clause* are subtypes of *construction* (as in (26)) and that a clause is classified in two dimensions, *sentence-mood* and *rootedness*. Three basic sentence moods, declarative, interrogative, and imperative constitute a partition of *mood*, and this partition can be cross-classified with *rootedness* of a clause. Interrogative clauses are further partitioned into *yes/no-interrogative* and *wh-interrogative*. Depending on languages in question, further subtypes can be assumed. The basic hierarchy that we will assume is shown in (27):



It is an important property of the hierarchy that given any sort in the hierarchy, constraints associated with the sort are inherited to all of its subsorts. Thus for

example, *wh-int.* inherits all the constraints associated with *interrog.*⁴ For the type *clause*, I assume that the following constraint holds:

$$(28) \quad clause \rightarrow \left[\begin{array}{l} \dots | CAT \left[\begin{array}{l} VAL \left[\begin{array}{l} SUBJ \langle \rangle \\ SPR \langle \rangle \\ COMPS \langle \rangle \end{array} \right] \\ HEAD \textit{verb} \end{array} \right] \\ \dots TO-BIND | SLASH \{ \} \end{array} \right]$$

In Kathol 1995, each clause type is associated with constraints that characterizes the syntactic structure of the clause type. For example, in his analysis of German, *decl* is required to have empty QUE value, whereas *wh-interrog* is required to have a nonempty QUE value. I will further assume that the constraints associated with the clause types, *decl*, *interrog* and *imp* relate them not only to their syntactic forms, but also to the content value of the clause.

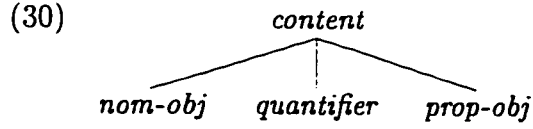
In the previous chapter, we have only dealt with declarative sentences, and assumed that the CONT value of an (ordinary) sentence is of sort *psoa*. Considering other types of sentences as well, we will assume that the CONT value of a sentence is of sort *prop(ositional)-obj*, which includes information on the “mode” in which a sentence is interpreted.⁵

$$(29) \quad \left[\begin{array}{l} CONT \left[\begin{array}{l} \textit{prop-obj} \\ MODE \textit{mode} \\ ISSUE \left[\begin{array}{l} \textit{psoa} \\ QUANTS \textit{list(quantifiers)} \\ NUC \textit{q(quantifier)f(ree)psoa} \end{array} \right] \end{array} \right] \end{array} \right]$$

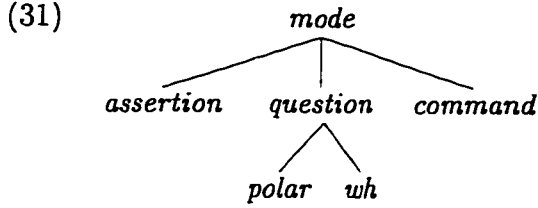
The old *psoa* is now a value of the attribute ISSUE in the feature geometry in (29), and a new sort *prop(ositional)-obj* replaces the sort *psoa* in the partition of *cont(ent)*:

⁴Although partitions of *decl* and *imp* are not represented in (27), it can be easily added in accordance with the subtypes of clauses observed in the language in question. For example, as in Kathol, *cond(itional)* and *rel(ative)* can be assumed to be subsorts of *decl*, together with *ord(inary declarative)*.

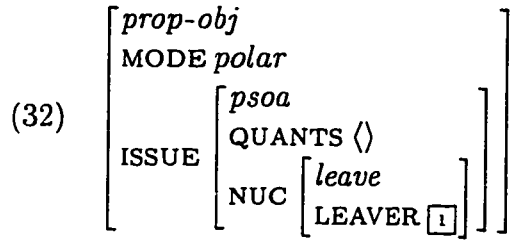
⁵The feature MODE is also employed in Yoo 1995 with different partitions of its value sort *mode*. Unlike Yoo 1995, negation is not analyzed as a partition of *mode*.



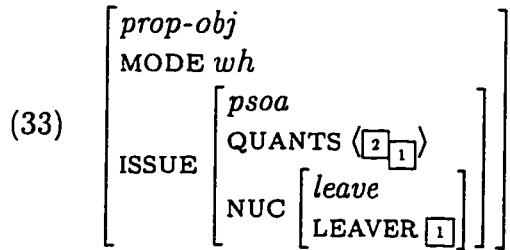
In (29), the MODE value is of sort *mode* that is partitioned as in (31):



Accordingly, the CONT of a polar question *Did she leave?* is analyzed as in (32):



On the other hand, the CONT of a *wh*-question *Who left?* is analyzed as in (33), wherein the tag $\boxed{2}$ indicates the *wh*-operator $\boxed{2}$ described in (19):



It should be noted that the CONT values in (32) and (33) do not directly represent model-theoretic semantic interpretations of questions; rather we assume that these are logical forms of questions, which can be connected to appropriate semantic interpretations.

Given the new structure of the CONT, the constraints on each clause type are stated by directly referring to its CONT|MODE value.

(34) *interrog* → [...|CONT|MODE *question*]

(35) *yes/no-int.* → [...|CONT|MODE *polar*]

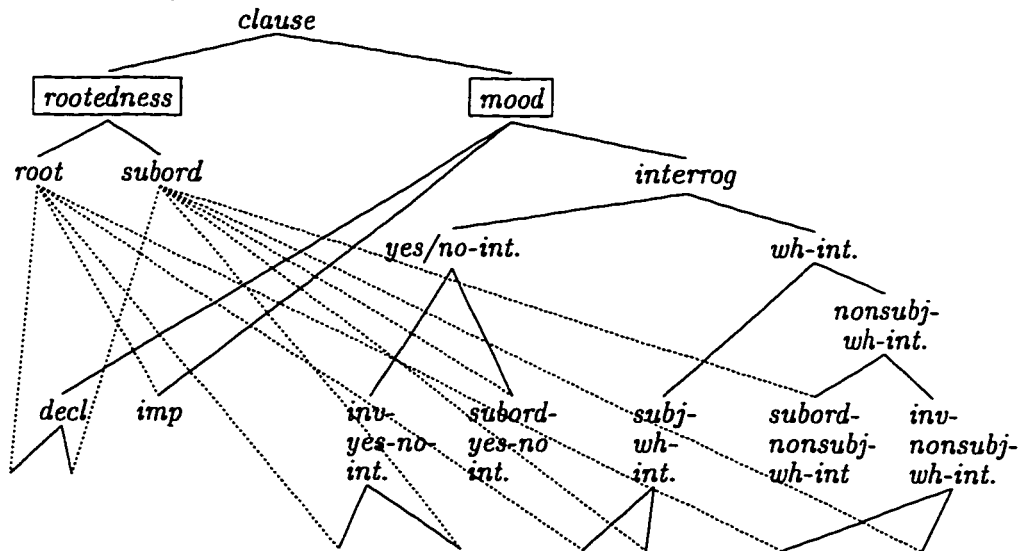
(36) *wh-int.* → [...|CONT|MODE *wh*]

Since the CONT|MODE value can be *wh* if and only if the QUANTS contains a *wh*-operator, we need an additional constraint to ensure this:

(37) [...|MODE *wh*] ↔ [...|ISSUE|QUANTS ⟨..wh-op..⟩]

Depending on morpho-syntactic characteristics of the language in question further constraints can be imposed on (35-36), or on their subtypes possibly cross-classified with either *root* or *subord*. For example, in English, the type *yes/no-int.* can be further partitioned into the two subtypes *inv(erted)-yes/no-int.* and *subord-yes/no-int.*, depending on the property of subject-aux inversion, and the type *wh-int* can be further classified into the subtypes *subj(ect)-wh-int* and *nonsubject-wh-int*, depending on whether the left peripheral *wh*-constituent is a subject or not. This is shown in the following (38):

(38) (For English)



Each subtype of *interrog* is associated with a constraint that governs the possibility of subject-aux inversion. For example, the subtype *subj-wh-int* must be [INV -], since inversion does not occur in this type of clause. In addition to the constraint on the INV value, the subtype *subord-yes/no-int.* is required to be [MARKING *whether* ∨ *if*], in order to explain that uninverted embedded polar questions in English must begin with *whether* or *if*, which we assume is a functional head *marker* that combines with an S. (See P&S:44-46 for the discussion of markers.) Constraints imposed on each subtype of *interrog* are given in the following:⁶

$$(39) \text{ } inv\text{-}yes/no\text{-}int. \rightarrow [\dots|HEAD|INV +]$$

$$(40) \text{ } subord\text{-}yes/no\text{-}int. \rightarrow \left[\dots \left[\begin{array}{l} HEAD|INV - \\ MARKING \textit{whether} \vee \textit{if} \end{array} \right] \right]$$

$$(41) \text{ } subj\text{-}wh\text{-}int. \rightarrow [\dots|HEAD|INV -]$$

$$(42) \text{ } inv\text{-}nonsubj\text{-}wh\text{-}int. \rightarrow [\dots|HEAD|INV +]$$

$$(43) \text{ } subord\text{-}nonsubj\text{-}wh\text{-}int. \rightarrow [\dots|HEAD|INV -]$$

4.2 Indirect questions and selectional restrictions

It is well known that verbs that take sentential complements exhibit selectional restrictions as to whether the complement is declarative or interrogative. Some verbs take only questions as sentential complements, some verbs take only declaratives, and the other verbs take either of these. This is shown in the English examples in (44):

- (44) a. Mary asked/wondered what John bought.

⁶In (38), some subtypes of *interrog*, i.e. *subord-yes/no-int.* and *subord-nonsubj-wh-int.* are also subtypes of *subord*, but not subtypes of *root*. This explains that the two aforementioned subtypes of clauses appear only in a subordinate context in English. See also Green & Morgan (1996) for the discussion of auxiliary inversions in English.

- b. Mary asked/wondered whether John bought a book.
 - c. *Mary asked/wondered that John bought a book.
- (45) a. *Mary believed/thought what John bought.
- b. *Mary believed/thought whether John bought a book.
 - c. Mary believed/thought that John bought a book.
- (46) a. Mary knew/remembered what John bought.
- b. Mary knew/remembered whether John bought a book.
 - c. Mary knew/remembered that John bought a book.

In many transformational approaches, the contrast between the (a) examples and the (c) examples in (44-46) is accounted for by assuming that the head of the embedded CP bears a [+WH] or [-WH] feature. Thus the verbs in (44) take a [+WH] CP, verbs in (45) take a [-WH] CP, and verbs in (46) take either [+WH] or [-WH] CP. (May 1985, Rizzi 1991).

In order to explain the distribution of *wh*-phrases with respect to [+Wh] C, the following condition is generally assumed:⁷

- (47) The *Wh*-Criterion (Rizzi 1991)
- a. A *Wh*-operator must be in a Spec-head configuration with an X^0 [+Wh].
 - b. An X^0 [+Wh] must be in a Spec-head configuration with a *Wh*-operator.

The effect of the *Wh*-Criterion is that whenever there is a [+Wh] Comp, *wh*-movement to the Spec of CP is required. The condition (47) is assumed to be universal, so that it holds at SS in English-type languages while it does at LF in Chinese-type languages.

⁷This principle is first proposed in May (1985), and (47) is Rizzi's version made compatible with the CP structure of Chomsky 1986.

Another fact that should be taken into consideration is that the distribution of embedded polar questions shows the same pattern as that of embedded *wh*-questions. Verbs that take *wh*-questions also take polar questions as a complement. Polar questions are sometimes assimilated to *wh*-questions under the assumption that *whether* is a [+Wh] phrase in Spec of CP (Lasnik & Saito 1992),⁸ which obeys the *Wh*-criterion.

A potential problem with this approach is how to explain differences between polar questions and *wh*-questions. For example, it is a basic fact that only a *wh*-question, but not a polar question, allows *wh*-phrases within it, thus yielding a multiple question reading.

(48) a. Mary asked where John bought what.

b. *Mary asked whether who bought the book.

In the uniform treatment of *wh*- and polar questions as [+Wh] CP, the ungrammaticality of (48b) is unexpected and requires an explanation. Moreover, such an approach cannot be adopted in a *wh*-in-situ language like Korean which does not employ an element that corresponds to *whether* in forming a polar question. Since there would be no [+Wh] phrase in such a polar question, it should be accounted differently than in terms of (47b). Alternatively, it is possible to assume that *wh*-questions are CP[+wh,+Q] while polar questions are CP[-wh,+Q] (cf. Aoun & Li 1993), and that the *Wh*-Criterion applies only to *wh*-questions, but in this case, the obligatoriness of *whether* or *if* in English embedded questions requires explanation.

By contrast, in our account, we simply specify the CONT|MODE value of the complement S. For example, the verbs in (44) select S[MODE *question*] as their complement. In embedded polar interrogatives as in (48b), we assume that *whether*

⁸Suñer (1991) takes this approach for Spanish *si* 'whether'.

and *if* bear a lexical specification that they select a clause which is $[MODE\ polar]$.⁹ Accordingly, the *S who bought the book* in (48b) must be $[MODE\ polar]$. Since a $S[MODE\ polar]$ cannot have a *wh*-operator in the QUANTS list, by the constraint in (37), the *wh*-operator associated with *who* would have to be retrieved at a larger phrase than the *S*. However, as we will discuss in detail in 4.3, this is not allowed in our analysis (due to the constraint (65)). Therefore, the unacceptability of (48b) is accounted for in terms of an unretrieved *wh*-operator.¹⁰

Yet there is another dimension that should be taken into account in selection of embedded questions. Although the embedded questions in (44) and (46) look the same syntactically, the ones in (44) are interpreted differently from those in (46). In Ginzburg's (1992) terms, these are two different uses of embedded interrogative sentences, *question interrogative* (QI) and *resolving answer interrogative* (RI). According to Ginzburg, "QI complements can be used to report queries", whereas "RI complements can be used to report only a strictly partial subset of felicitous responses to queries, namely those that convey resolving answers".

As is noted in Suñer (1993), an easy way to show the distinction is to paraphrase the embedded questions. For example, (44b) can be paraphrased as 'Mary asked the question whether John bought a book', whereas (46b) can be paraphrased as 'Mary knew the answer to whether John bought a book'. Thus in (46a), if this sentence is stated in a situation wherein John bought a car, then it entails that Mary knew/remembered that John bought a car. In Suñer, the embedded questions in

⁹Bob Levine pointed out to me that complement clauses of *doubt* are exceptional in this respect. In (i), *doubt* selects a declarative clause (viz. a clause that is $[MODE\ assertion]$), yet *whether* or *if* can appear in its complement clause.

(i) I doubt {that/whether/if} Mary has a car.

¹⁰As we will discuss in 4.3, this kind of unretrieved operator violates the constraint (67).

(44a,b) and (46a,b) are referred to as *indirect questions* and *semi-questions*, respectively.

Suñer claims that subcategorization frames must minimally specify the semantic type of the CP-complement and whenever it is necessary, the syntactic type of the complement. In her analysis, semi-questions (RI) as in (46a,b) are propositions with the semantic type $\langle s,t \rangle$, while indirect questions (QI) are propositional concepts with the semantic type $\langle s, \langle s,t \rangle \rangle$. Thus a semi-question forms a semantic natural class [-Qu(estion)] together with a *that*-complement, whereas indirect questions form a distinct class, [+Qu]. Such a dichotomy is motivated by distinctions in Spanish embedded questions, viz. the fact that a *que*+wh construction, unlike an ordinary *wh*-construction, can only be interpreted as an indirect question, but not as a semi-question. In her theory, *que* 'that' in such constructions is taken as the manifestation of an intension-operator which indicates the intension of the *wh*-complement.

However, Suñer's analysis raises some problems. First, as Barberá (1994) points out, her analysis does not explain why *que* must be present in the indirect question complement of a certain classes of verbs (viz. manner of speaking verbs, e.g. *susurrar/gritar* 'whisper/shout' and *decir/repetir* 'say/repeat' type verbs), while it is only optional in the complement of *preguntar(se)* 'ask/wonder'.

(49) a. Preguntaron (que) quién camina dormido.

'They asked (that) who walks in his sleep.'

b. Susurraron/repitieron que quién camina dormido.

'They whispered/repeated that who walks in his sleep.'

Suñer (1993) explains that the optionality of *que* in (49a) is because *que* can be null C [+Qu,+wh]; however, the obligatoriness of *que* in (49b) is not explained by this,

since there is no reason why such a null C cannot appear in (49b).

Second, this analysis introduces a dual lexical entry for *que* which only differs by [Qu],[wh] feature values. That is, the *que* preceding an interrogative complement is [+Qu,+wh], whereas *que* that precedes a declarative complement is [-Qu,-wh]. Such a dual analysis lacks an independent motivation, and can be avoided if *que* is simply treated as a marker as in Barberà.¹¹

Third, Suñer's classification of CP complements is problematic in some respects. Above all, it does not explain why an interrogative CP can only be [+Qu, +wh] when it is a matrix clause, while it can be either [+Qu, +wh] or [-Qu, +wh] when it is embedded as a complement of a verb. In other words, as CP itself is classified in terms of different combinations of features, it is unexplained why a certain combination (viz. [-Qu, +wh], which stands for semi-question) is available only in embedded contexts. Moreover, Suñer claims that there is a syntax-semantics match in Spanish such that, in an embedded question, the *que* before a *wh*-clause flags a question interpretation (i.e. [+Qu]); however, in this case, it is mysterious why a matrix question, which is presumably [+Qu], is never introduced by *que* in Spanish. One cannot argue that there is no [\pm Qu] distinction in a matrix clause, since there is still a semantic distinction between propositions and questions ([-Qu] and [+Qu], respectively, in Suñer's terms).

Such asymmetry in interpretation between matrix and embedded questions can be explained if we assume that a certain interpretation viz. the RI (or semi-question) of a clause is triggered by a verb that selects it as a complement. Thus we agree with Ginzburg (1992) in that the choice between QI and RI uses of a propositional

¹¹See Barberà for the discussion of empirical problems with Suñer's analysis.

complement is determined by the nature of the embedding predicate, and that the semantics of a VP consisting of a verb and a propositional complement comes from the semantic composition of the relation denoted by the verb and the standard content of the complement. In this connection, Barberá (1994) proposes that the various verb relations can be distinguished by two types of relations, $V\text{-rel} \in \text{RI}$ and $V\text{-rel} \notin \text{RI}$.

$$(50) \begin{bmatrix} V\text{-rel} \\ V\text{-ER } \boxed{1} \\ V\text{-ED } \boxed{2} \end{bmatrix}$$

Barberá explains that for a $V\text{-rel} \in \text{RI}$, (50) is interpreted as ‘ $\boxed{1}$ *V-rels* the answer to the question expressed by $\boxed{2}$ ’. Thus $V\text{-rel} \in \text{RI}$ requires $\boxed{2}$ to be a question. On the other hand, for $V\text{-rel} \notin \text{RI}$, (50) is interpreted as ‘ $\boxed{1}$ *V-rels* $\boxed{2}$ ’, in which $\boxed{2}$ does not need to be a question.

I adopt Barberá’s distinction between $V\text{-rel} \in \text{RI}$ and $V\text{-rel} \notin \text{RI}$, and assume that such a distinction holds only for verbs that take interrogative complements (viz. complements whose CONT|MODE value is *question*).¹² Therefore, in the lexical entries of the verbs, *ask*, *believe* and *know*, that each takes a different type of complement clauses, can be described as follows:

$$(51) \text{ask} \begin{bmatrix} \text{COMPS } \langle \text{S:} \boxed{2} [\text{MODE } \textit{question}] \rangle \\ \text{CONT|NUC } \begin{bmatrix} \textit{ask} \notin \text{RI} \\ \text{ER } \boxed{1} \\ \text{SOA-ARG } \boxed{2} \end{bmatrix} \end{bmatrix}$$

$$(52) \text{believe} \begin{bmatrix} \text{COMPS } \langle \text{S:} \boxed{2} [\text{MODE } \textit{assertion}] \rangle \\ \text{CONT|NUC } \begin{bmatrix} \textit{believe} \\ \text{ER } \boxed{1} \\ \text{SOA-ARG } \boxed{2} \end{bmatrix} \end{bmatrix}$$

¹²Thus we follow Ginzburg (1992) wherein the distinction between QI and RI is introduced to explain two different uses of embedded interrogatives.

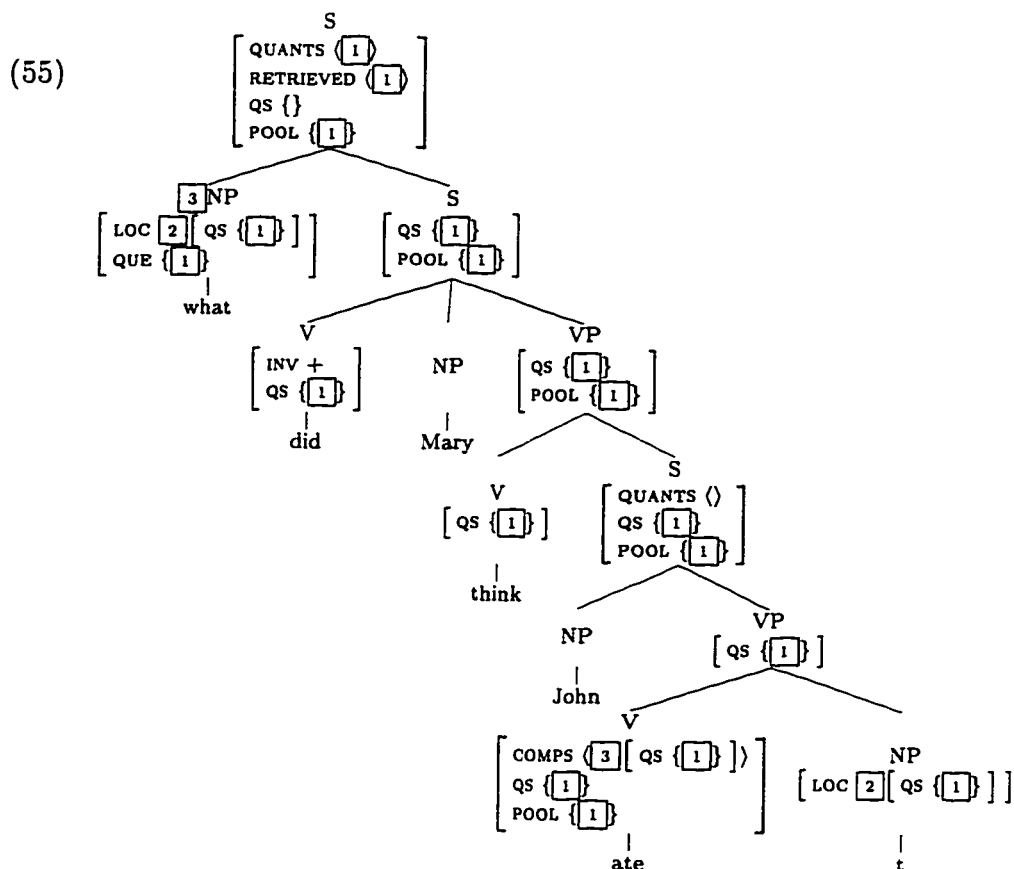
$$(53) \quad \textit{know} \quad \left[\begin{array}{l} \text{COMPS } \langle \text{S:} \boxed{2} [\text{MODE } \textit{assertion}] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} \textit{know} \\ \text{ER } \boxed{1} \\ \text{SOA-ARG } \boxed{2} \end{array} \right] \end{array} \right] \quad \text{or} \quad \left[\begin{array}{l} \text{COMPS } \langle \text{S:} \boxed{2} [\text{MODE } \textit{question}] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} \textit{know} \in \textit{RI} \\ \text{ER } \boxed{1} \\ \text{SOA-ARG } \boxed{2} \end{array} \right] \end{array} \right]$$

It should be noted that the descriptions of selectional restrictions in (51-53) eliminate the use of the features [+Int] and [+Decl] which are employed in Ginzburg and Barberà in order to distinguish a *wh*-complement from a *that*-complement. Introducing such features via ID schemata posits some problems, which we will discuss in section 4.3. By contrast, in our approach, selectional restrictions are stated simply by specifying CONT values of the complement S.

4.3 *Wh*-scope in English

In previous sections, we have discussed basic mechanisms for analyzing interrogatives. Together, they already provide accounts for many English interrogative sentences. For example, the following (54) is analyzed as in (55):

(54) What did Mary think John ate?



In (55), the operator cannot be retrieved at the embedded S, since if it were, its QUANTS would contain a *wh-op*, which is possible only when the MODE of the clause is *wh*. Of course the embedded clause cannot be [MODE *wh*] due to the selectional restriction of the verb *think* (see (52) in section 4.2 for the description of the same restriction).

Then let us consider how we can rule out (56) in our theory.

(56) a. *Mary thought what John ate.

b. *Did Mary think what John ate?

Although retrieval of the operator at the embedded clause is prohibited by the same reason as in (54), so far nothing blocks retrieval of the operator at the matrix clause.

If this were allowed, the sentences in (56) would be predicted good, with the same reading as (54).

Consider a related example (57) wherein the matrix verb is a question-selecting verb *wonder*:

(57) *What_i did Mary wonder John ate t_i?

The ungrammaticality of (57) is predicted, if the stored operator associated with *what* is retrieved at the matrix, but not in the embedded clause. However, so far nothing in our theory rules out the possibility of retrieval at the embedded clause, thus generating the reading ‘Mary wondered what John ate.’, which is not available in (57).

The generalization that we can make from the examples (54-57) is that an operator associated with a fronted *wh*-phrase can be retrieved only at the clause to which it is fronted. In other words, the fronted position of a *wh*-phrase indicates its scope in English.

This is confirmed by (58), wherein the embedded clause can only be interpreted as an indirect question, although in principle, *remember* can take either a question or a declarative proposition. In other words, *what* in (58a,b) cannot take matrix scope, yielding a reading ‘What does Mary remember that John ate?’:

(58) a. Mary remembers what John ate.

b. Does Mary remember what John ate?

The following (59) illustrates the same point that the fronted *wh*-phrase must take the clause to which it is fronted as its scope.

(59) A: Who knows (that) which sports John plays?

B: a. Bill does./ Bill knows which sports John plays.

b. *Bill knows John plays baseball, and Mary knows John plays tennis.

On the other hand, as for a subject *wh*-phrase, which is not assumed to be fronted or moved, its position does not always indicate its scope. Consider the following examples:¹³

(60) Who wonders who hates parsnips? (unambiguous)

(61) A: Who knows who hates parsnips? (ambiguous)¹⁴

B: a. Bill does./ Bill knows who hates parsnips.

b. Bill knows John hates parsnips, and Mary knows Sandy hates parsnips.

The subject *wh*-phrase in (60) must take embedded scope, since the verb *wonder* must take a question (i.e. $S[\text{MODE } \textit{interrog}]$). However, in (61), when such a selectional restriction is not imposed, either embedded or matrix scope is possible, as is verified by the two possible answers. The matrix reading in (61) has not been much discussed in the literature, but as is claimed in Pollard & Yoo (to appear), such a reading is fully acceptable, especially in colloquial American English. The following (62) further illustrates this:¹⁵

¹³Examples in (60-62) are due to Carl Pollard.

¹⁴Insertion of the complementizer *that* disambiguates this sentence. Thus *Who knows that who hates parsnips?* only has the reading wherein the embedded *who* takes embedded scope.

¹⁵Under our assumption that examples of this kind are fully acceptable, Kayne's (1983) Connectedness Condition wrongly rules out the questions in (61) and (62).

(62) A: (So) who thinks who's gonna win?

B: Well, Kim thinks the Buckeyes will win, but Sandy thinks
Michigan will.

Therefore, unlike a fronted *wh*-phrase which is represented as a filler daughter in the phrase structure, the syntactic position of a subject *wh*-phrase in a simple clause may or may not indicate *wh*-operator retrieval position.¹⁶

In Ginzburg (1992), the syntax of English *wh*-interrogatives is accounted for by QUE dependency, and the following ID (immediate dominance) rule-LP (linear precedence) rule pairs (63) and (64) are imposed to capture the generalization that an S can be marked as [+Int(errogative)] when a *wh*-phrase, which bears a nonempty QUE value, is the left-peripheral daughter of the S:

(63) $S[\text{fin}, +\text{INT}] \longrightarrow (H, VP[\text{fin}, \text{TO-BIND} | \text{QUE}\{\boxed{2}\}]),$
 $(C, NP[\text{nom}, \text{INHER} | \text{QUE}\{\boxed{2}\}])$
 $[\text{INHER} | \text{QUE}] \prec X$

(64) $S[\text{fin}, +\text{INT}] \longrightarrow (H, S[\text{fin}, \text{INHER} | \text{SLASH}\{\boxed{1}\}, \text{TO-BIND} | \text{SLASH}\{\boxed{1}\},$
 $\text{TO-BIND} | \text{QUE}\{\boxed{2}\}], (F, \boxed{1}(\text{INHER} | \text{QUE}\{\boxed{2}\})))$
 $[\text{INHER} | \text{QUE}] \prec X$

Although these ID-LP rule pairs can license the available readings of the examples that we have discussed so far, they do not guarantee that only those readings are available. For example, the presence of the ID rules themselves do not explain the

¹⁶An extracted *wh*-subject is, of course, treated as a filler, in examples like (i):
 (i) Who did Mary claim left?

Following P&S, we assume that subject extraction is accounted for by the SELR (Subject Extraction Lexical Rule).

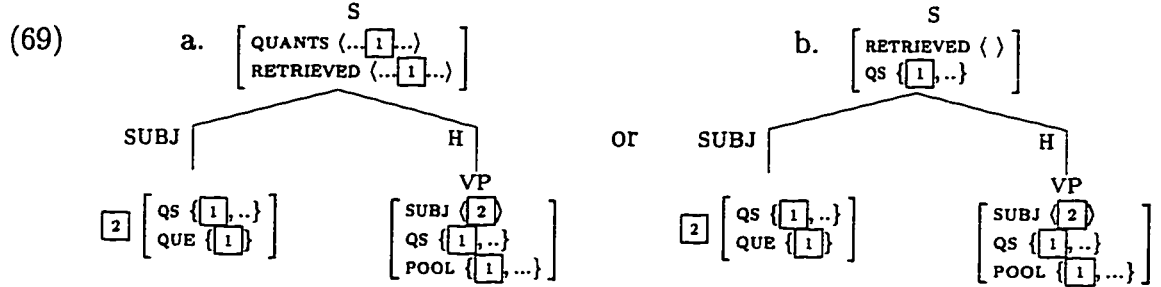
contrast between (59) and (61), viz. why the matrix reading is possible only with the subject *wh*-phrase, but not with the fronted *wh*-phrase in the embedded clause. In order to account for this, there would have to be ID rules for $S[+Decl(arative)]$, one for a head-subject structure and another for a head-filler structure. Then, in those ID rules for $S[+Decl]$, it would have to be specified that while the subject daughter of $S[+Decl]$ can bear a nonempty QUE value which is not bound off by the head daughter, the filler daughter of $S[+Decl]$ cannot bear a nonempty QUE that is not bound off by the head daughter. Although this line of analysis is not impossible, positing separate ID rules for different moods of sentences and encoding constraints on QUE dependency within such ID rules do not fit the standard assumptions about ID rules that they are very general and language-universal in nature.

By contrast, in our theory, the descriptive generalization can be stated as a licensing constraint on operator retrieval.

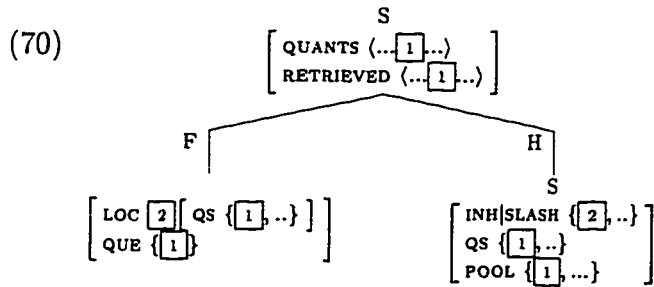
- (65) Syntactic Licensing Constraint on *Wh*-Retrieval (for “English-like” syntactic *wh*-movement languages)
- a. At any node, retrieval, if any, of *wh*-operators must include the member of the left peripheral daughter’s QUE value (which must, therefore, be nonempty).
 - b. At any filler-head node, if the filler has nonempty QUE value, then its member must belong to the node’s RETRIEVED value.

Given clause (a) of (65), there can be either no retrieved operator or any number of retrieved operators. However, when there are one or more retrieved operators, one of these must be token-identical with the member of the QUE value of the left peripheral daughter. In other words, *wh*-retrieval at a node is licensed only when the left-peripheral daughter’s QUE value is nonempty. In English, either a subject or

Therefore, given a head-subject structure that has a subject daughter with a nonempty QUE, two possibilities are allowed: there can be no retrieved operators or one or more retrieved operators containing the member of the QUE value. These options are represented in (69):



On the other hand, in a head-filler structure, a further constraint is imposed as in (65b). This ensures that whenever a filler daughter bears a nonempty QUE value, there must be *wh*-retrieval which includes the QUE member. The feature values in (70) represents this:

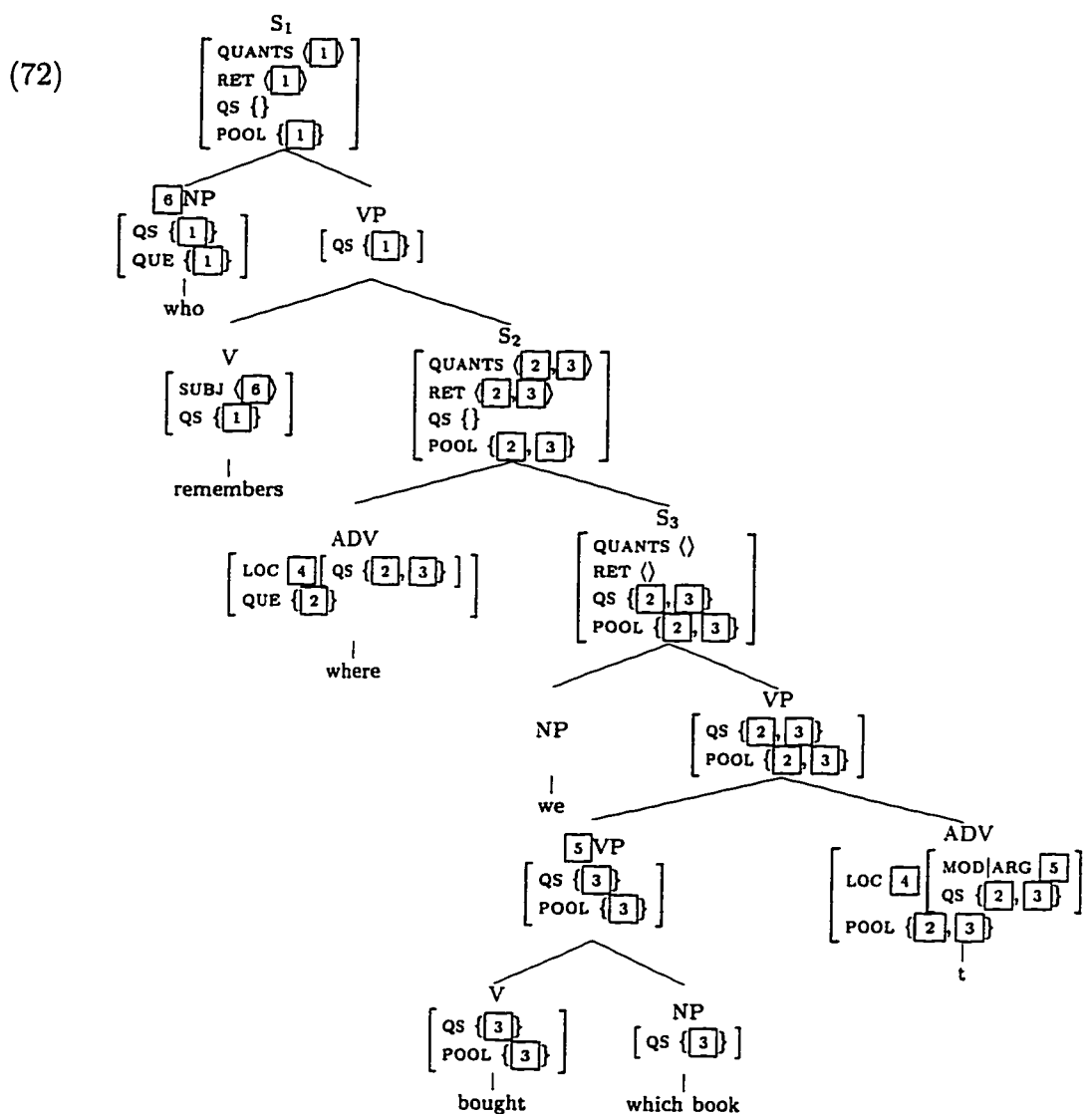


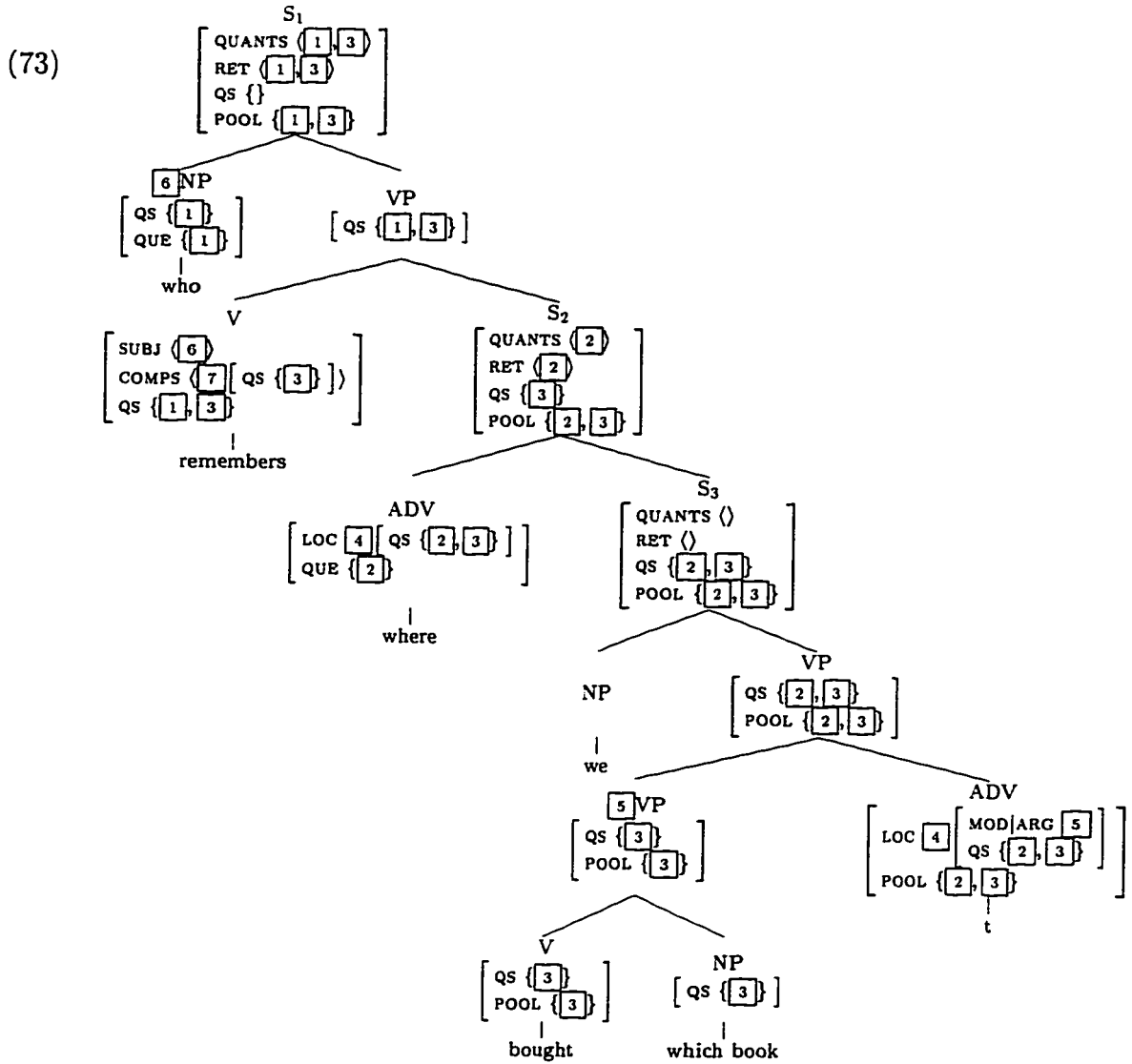
As for an in situ *wh*-phrase that does not appear as a left peripheral daughter in the phrase structure, the operator associated with the phrase can be retrieved if there is another *wh*-phrase in the structure that is a left peripheral daughter. Thus the well-known ambiguous example from Baker (1970) in (71) is accounted for by two possible nodes for the retrieval of the in-situ *wh*-phrase *which book*.

(71) A: Who remembers where we bought which book?

- B: a. John and Martha remember where we bought which book.
 b. John remembers where we bought the physics book and Martha
 and Ted remember where we bought *The Wizard of Oz*.

The possible answers in (a) and (b) represents embedded scope and matrix scope of *which book*, respectively, which are analyzed in (72) and (73):





For a *wh*-word like *where*, the following lexical entry is assumed:

(74) *where*

$$\left[\begin{array}{l} \text{LOC} \left[\dots | \text{MOD} | \text{ARG } 3 \left[\text{QS } 2 \right] \right] \\ \text{QS } \{1\} \cup 2 \\ \text{POOL } \{1\} \cup 2 \\ \text{QUE } \{1\} \end{array} \right]$$

In (72) and (73), the operator associated with *which book* is retrieved at the embedded S node and at the matrix S, respectively, which is licensed by the retrieval of the QUE

member of the left peripheral daughter at such nodes.¹⁸

So far we have dealt with only one-word *wh*-phrases. When a *wh*-word is pied-piped, its QUE value must be inherited to a larger constituent in order to enable the *wh*-constituent to license operator retrieval. Thus in the following examples, the left peripheral phrases *whose friend*, *whose sister's friend*, *how tall* and *how fast* should have nonempty QUE, while *friends of whom* and *friends of which student* should not.

(75) Whose friend did Mary invite?

(76) Whose sister's friend did you visit?

(77) *Friends of whom did Mary invite?

(78) *Friends of which student did Mary visit?

(79) How tall is he?

(80) How fast does he run?

Moreover, pied piping is possible in certain kinds of verbal gerunds, viz. gerunds with possessive subjects:

(81) Whose meeting the woman bothers you?

(82) *Who meeting the woman bothers you?

¹⁸Bob Levine pointed out to me that there are examples like (i) that indicate that we need to allow a subject gap, since in (i), the parastic gap in the adjunct is licensed by the subject gap.

(i) He is the kind of guy that [every time you ask _ to do something] [_ makes up some implausible excuse].

Thus he suggests that *wh*-subject interrogatives (e.g. *Who left?*) have an option of being represented by a head-filler structure as well as by a head-subject structure. Our account of the asymmetry between subject *wh*-phrases and filler *wh*-phrases (cf. (61) and (59)) is compatible with this view as well, since as long as *wh*-subject interrogatives can be represented by a head-subject phrase, it is possible that the *wh*-operator associated with *wh*-subject is not retrieved at the phrase, by (65).

In Pollard & Yoo (to appear), possessive ‘subjects’ of verbal gerunds as in (81) are treated as specifiers, while NP subjects of verbal gerunds as in (82) are assumed to be real subjects (i.e. selected by the SUBJ feature).¹⁹

Therefore, we posit the generalization that in a given phrase, the QUE value is inherited from its specifier daughter. One exception occurs in PPs, wherein QUE is inherited from the complement NP of the P.

(83) About which woman were you speaking?

Accordingly, following Pollard & Yoo, we assume that pied-piping in English is governed by the following constraint on QUE inheritance:

(84) Constraint on Interrogative Pied Piping (for English)

In a headed phrase,

a. if the HEAD value is of sort *preposition*, the QUE value is inherited from the complement daughter’s QUE.²⁰

b. otherwise, the QUE value is inherited only from the specifier daughter’s QUE.²¹

¹⁹See Malouf (1996) for the same position and supporting arguments.

²⁰This seems to be limited to relatively formal registers.

²¹Bob Kasper pointed out to me that QUE inheritance in the following examples can be potential problems, since the subject NPs in these examples do not have a specifier daughter:

(i) Who bought a book?

(ii) Which of your friends bought a book?

There are two possible ways to handle these examples. The first approach is to make alternative assumptions about the structure of NPs in (i) and (ii). While assuming a unary projection for the NP *who* in (i) will prohibit the QUE value from being inherited from the lexical head *who* onto the NP, we can make a move to eliminate such a unary structure, adopting proposals by Abeillé & Godard 1997 and Bratt 1990 for French. If this line of approach is adopted, *who* in (i) could be analyzed as a word which is not projected to a phrase and yet distinguished from ordinary words in terms of the value of a certain feature (e.g. the features ‘WEIGHT’ in Abeillé & Godard, ‘PHRASE’ in Bratt, or ‘NPCOMP’ in Hinrichs & Nakazawa 1994). On the other hand, in (ii), following the proposal

Now let us reconsider (11), which is repeated in (85):

- (85) [_{S1} Who remembers [_{S2} [_{NP1} whose_i recordings of [_{NP2} which Beethoven symphony]_j]] Mary prefers]?

In our analysis, the QUE value of NP1 is inherited from its specifier daughter *whose* by (84). And since the NP1 is a filler, the member of the QUE value must be contained in the retrieved *wh*-operators. Thus the operator associated with *whose* can only have embedded scope. On the other hand, the operator associated with *which Beethoven symphony* can be retrieved either at the embedded or at the matrix clause, since either node has a left peripheral daughter with a nonempty QUE. Therefore, ambiguity of the given example is explained without overgenerating an unavailable reading.²²

Another thing that we should account for is that English does not allow more than one *wh*-filler in a clause. Thus the following (86) is not acceptable.

- (86) *Which book, to whom did Mary give?

We assume that the following constraint holds for a language that does not allow multiple *wh*-movement:

by Nerbonne *et al.* (1989), the *which* phrase can be analyzed as an NP that bears an empty head, with a specifier *which*. Then the QUE value will be inherited from *which* in the usual manner.

The other possible way of handling these examples is to assume that the words *who* and *which* are heads of the NPs, and to modify the pied piping constraint such that within NPs, QUE inheritance is possible from the head daughter in case there is no specifier daughter. In the absence of fully developed analysis based on the former option, we are indeterminate at this point as to which of the two options are more desirable.

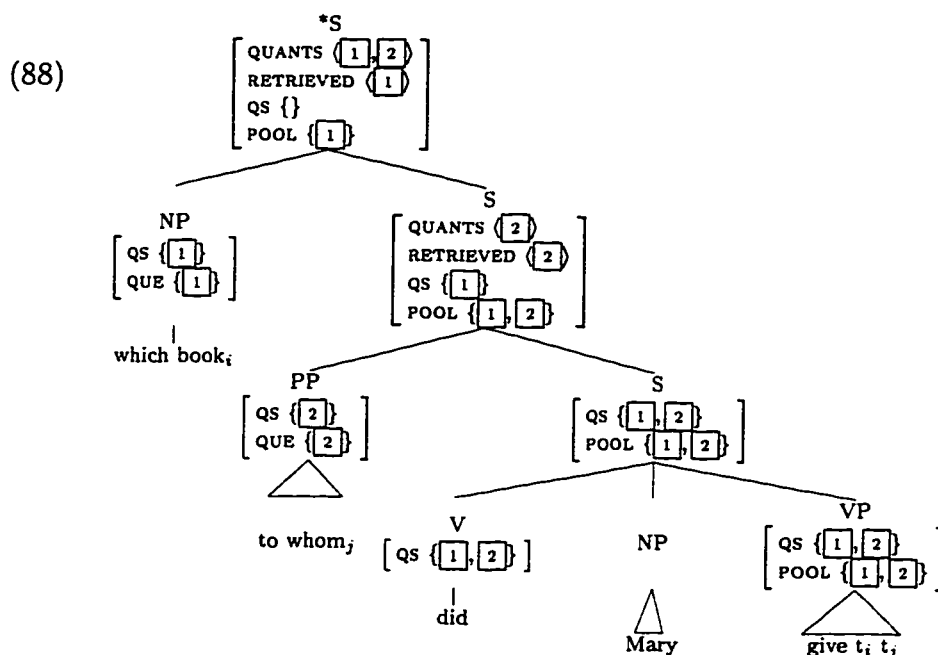
²²Malouf (p.c.) pointed out that the following (i), which is ambiguous in the same way as (ii), may pose a problem on our analysis:

- (i) Who remembers which newspaper exposing a scandal ruined which politician?
(ii) Who remembers which newspaper's exposing a scandal ruined which politician?

We are not entirely sure why pied-piping of the NP subject is allowed in the gerund in (i), but it could be that when the NP subject is a *which*- or *whose*- phrase, the verbal gerund can be interpreted as a reduced relative, which improves the acceptability. On the other hand, such a reading is not available with *who* or *what*.

$$(87) \quad [\text{RETRIEVED} \langle \text{wh-op}, \dots \rangle] \rightarrow [\text{HEAD-DTR} [\text{QUANTS } \text{list}(\neg \text{wh-op})]]$$

Therefore, (86) is blocked as in (88):



4.4 *Wh*-scope in some other syntactic *wh*-movement languages

In the previous section, we examined English interrogatives, wherein at most one *wh*-phrase can be displaced to the initial position of a clause. In this section, we will examine some other types of syntactic *wh*-movement languages, especially some languages wherein syntactic *wh*-fronting is optional, and some other languages in which fronting of more than one *wh*-phrase is possible. Examples from French and Iraqi Arabic are shown to illustrate the pattern of optional *wh*-movement, and ones from Romanian and Bulgarian are examined to deal with multiple *wh*-movement. Romanian and Bulgarian forms a subclass of a multiple *wh*-movement languages, in

that multiple *wh*-movement out of a clause is possible.²³

In many languages involving *wh*-fronting, whether it is single, multiple, or optional, the fronted position of a *wh*-phrase indicates its scope, exhibiting a syntax-semantics correlation. On the other hand, as McDaniel (1989) shows, in some languages *wh*-phrases can be fronted only “partially”, i.e. fronted to a lower clause than its scope. This type of partial *wh*-movement can occur either in an ordinary (single) *wh*-movement language (e.g. German) or in a language that allows multiple *wh*-fronting (e.g. Romani). We will briefly look at these phenomena as well.

It should be noted that I do not intend to provide a comprehensive theory of interrogatives for each of these languages, since this is not possible without a precise account of related morphological/syntactic characteristics of the given languages. Rather, based on data (and some generalizations) that appear in the literature, I will show how the theory of interrogative scope that is presented in the previous section can be extended to the account of interrogative scope in languages that exhibit different patterns of syntactic *wh*-movement.

4.4.1 Optional *wh*-movement

It is well known that in some languages like French, displacement of *wh*-phrases is only optional in formation of questions. The following examples from Rizzi (1991) illustrate this:

(89) a. Elle a rencontré qui?

‘(Lit.) She has met who?’

²³According to Rudin (1988), Serbo-Croatian, Polish and Czech belong to another subclass of multiple *wh*-movement languages, wherein multiple *wh*-extraction out of a clause is not allowed. See Penn (1997) for HPSG analysis of Serbo-Croatian interrogatives.

b. Qui_i a-t-elle rencontré t_i?

‘Who has she met?’

Iraqi Arabic is another language exhibiting this property. (Cf. Wahba 1991)

(90) a. Mona shaafat meno?

‘(Lit.) Mona saw whom?’

b. Meno_i shaafat Mona t_i?

who saw Mona

‘Who did Mona see?’ (Johnson & Lappin (to appear))

Unlike English type languages which require *wh*-fronting, these languages do not require that the left peripheral daughter of an *wh*-interrogative have nonempty QUE value. Therefore, the property of optional *wh*-movement can be accounted for by modifying the syntactic licensing condition for interrogative retrieval as in (91):²⁴

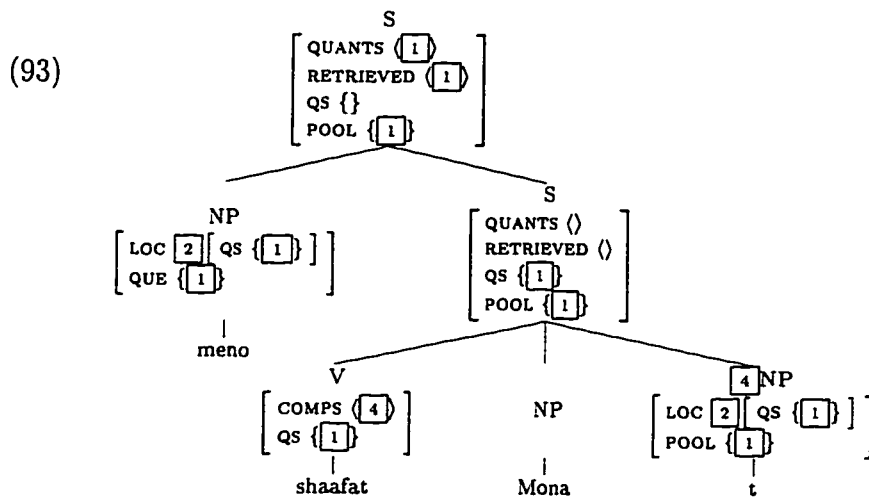
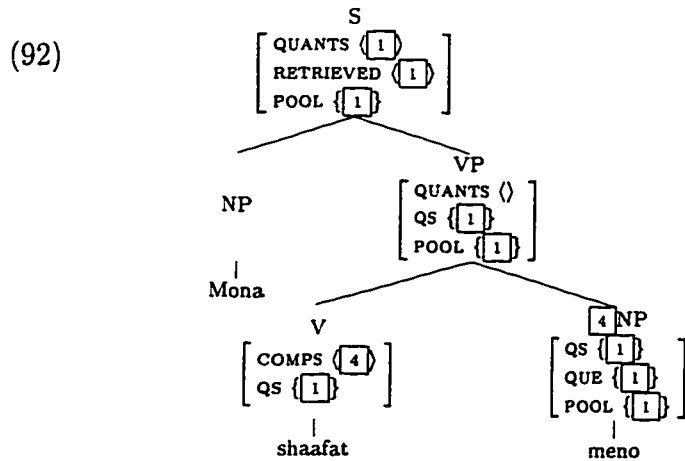
(91) Syntactic Licensing Constraint on *Wh*-Retrieval (for optional *wh*-movement languages)

a. At any node, if a left peripheral daughter has a nonempty QUE value, then retrieval of *wh*-operators must include the QUE value.

b. At any filler-head node, if the filler has nonempty QUE value, then its member must belong to the nodes’s RETRIEVED value.

Given (91), both options in (90) can be generated as in (92) and (93):

²⁴Clause (b) of the constraint (91) is the same as (65b), and thus requires retrieval of the QUE value of a filler, whenever it is nonempty. As in (65a), the (91a) does not require retrieval of left peripheral daughter’s QUE, even if it is nonempty.



The in-situ option is restricted in both languages, however. In French, while matrix questions allow the in-situ option, embedded questions do not:

(94) a. *Je ne sais pas [elle a rencontré qui].

‘(Lit.) I don’t know she has met who.’

b. Je ne sais pas [qui_i elle a rencontré t_i]

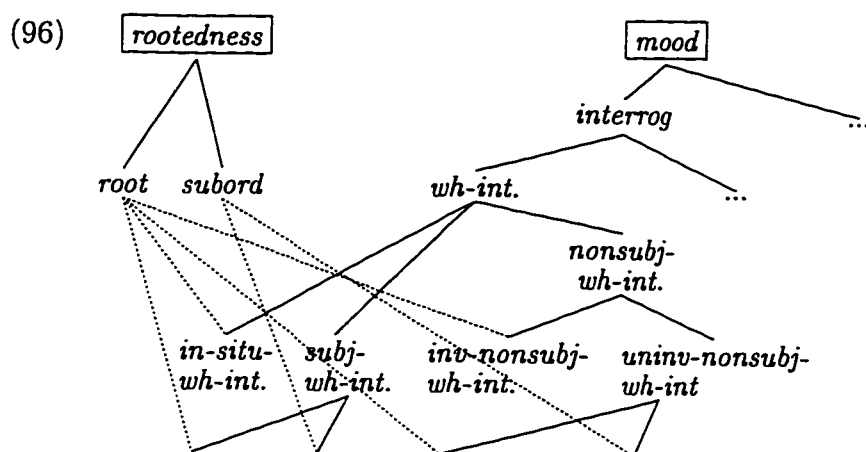
‘I don’t know who she has met.’ (Rizzi 1991)

On the other hand, *in-situ wh*-phrases are allowed in a noninterrogative embedded clause:

(95) Je sais très bien qui pense qu'il aime qui.

'I know very well who thinks that he loves who.' (Kayne 1984:26)

In order to explain this, we assume an additional subtype of *wh-int*, i.e. *in-situ-wh-int* which is also a subtype of *root*, but not a subtype of *subord*. This is shown in the partial type hierarchy of *clause* for French:²⁵



Moreover we assume that French has a constraint on QUE inheritance such that in a phrase whose HEAD value is of sort *verb*, the QUE value is inherited from the left peripheral daughter's QUE.²⁶ Thus, an S with a *wh*-subject or a *wh*-filler will be marked as [QUE {□}].²⁷ Then clauses of type *in-situ-wh-int.*, e.g. (89a), are the ones that have the empty QUE value. This is enforced by the following constraint (97). The constraint on its supertype *wh-int.* is the same as (36), which can be taken as universal. It is repeated in (98) for convenience.

²⁵ Another kind of *wh*-interrogatives in French beginning with *Qu'est ce que/qui ...* is not taken into accounts here.

²⁶ This is essentially the same as what Kathol proposes for German. As we will see in 4.4.2, it is crucial in Kathol's analysis of German partial *wh*-movement for an S to have a nonempty QUE value.

²⁷ This contrasts to English wherein the QUE value in such a phrase is inherited only from the specifier daughter, not from any left peripheral daughter. Unlike English, French does not have a verbal gerund construction corresponding to (81).

(97) (For French) *in-situ-wh-int.* $\rightarrow \left[\begin{array}{l} \dots | \text{HEAD} | \text{INV} - \\ \dots | \text{QUE} \{ \} \end{array} \right]$

(98) *wh-int.* $\rightarrow \left[\dots | \text{CONT} | \text{MODE } wh \right]$

In (97), the $[\text{INV} -]$ specification is to account for the fact that auxiliary inversion does not take place when matrix *wh*-interrogatives take the in-situ option (Rizzi 1991).²⁸ Compare the following unacceptable example with (89a):

(99) *A-t elle rencontré qui?
'(Lit.) Has she met who?'

On the other hand, in Iraqi Arabic, in-situ *wh*-phrases are not permitted at all in a finite embedded clause (whether it is a question or not), while they can occur in matrix questions and in nonfinite VP complements of a verb. (Wahba 1991, Johnson & Lappin (to appear))²⁹

(100) a. *Mona tsawwarat Ali ishtara sheno?

'(Lit.) Mona thought Ali bought what?'

b. Sheno_i tsawwarat Mona Ali ishtara t_i?
what thought Mona Ali bought
'What did Mona think Ali bought?'

²⁸As in English, French embedded questions with a filler *wh*-phrase (as well as embedded questions with a subject *wh*-phrase) do not involve inversion.

(i) *Je ne sais pas [qui_i a-t elle rencontré t_i?]
'(Lit.) I don't know who has she met.'

On the other hand, in a matrix question, inversion may or may not occur when it involves a filler *wh*-phrase (Rizzi 1991). This is accounted for by specifying the type *inv-nonsubj-wh-int.*, which is required to be $[\text{INV} +]$ by (ii), is also a subtype of *root*, but not a subtype of *subord*, as in (96).

(ii) *inv-nonsubj-wh-int.* $\rightarrow \left[\dots | \text{HEAD} | \text{INV} + \right]$

The other subtypes of *wh-int.* in (96), i.e. *subj-wh-int.* and *uninv-nonsubj-wh-int.* are required to be $[\text{INV} -]$, and can be subtypes of either *root* or *subord*. See Kim & Sag 1996 for arguments against head-movement approach for inversion in English and French interrogatives.

²⁹The Iraqi Arabic examples here are from Johnson & Lappin.

(101) *Meno tsawwar Ali xaraj weyya meno?

‘Who thought Ali left with whom?’

(102) a. Mona raadat tijbir Su’ad tisa’ad meno?

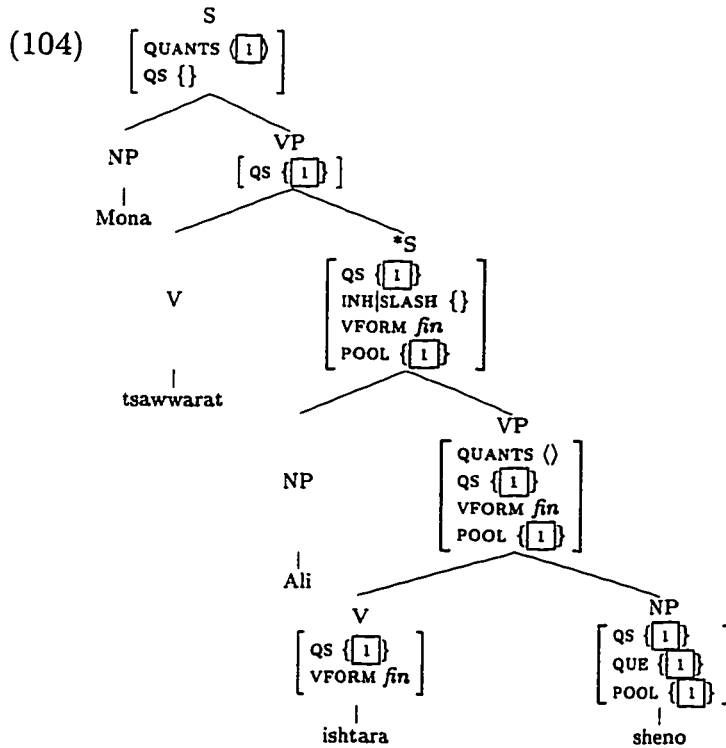
‘(Lit.) Mona wanted to force Su’ad to help who?’

b. Meno_i raadat Mona tijbir Su’ad tisa’ad t_i?
 who wanted Mona to force Su’ad to help
 ‘Who did Mona want to force Su’ad to help?’

In our theory, this means that an interrogative operator in QSTORE can be inherited from a finite embedded clause only when the operator is associated with a displaced *wh*-phrase. This can be stated as the following constraint (103):

$$(103) S[fn, QS \{\boxed{1} wh-op, \dots\}] \rightarrow [INH|SLASH \{[QS \{\boxed{1}, \dots\}]\}]$$

Accordingly, the examples (100a) and (101) are blocked by (103). The following analysis of (100a) illustrates this:



4.4.2 Multiple *wh*-movement and partial *wh*-movement

It is known that in Bulgarian, all of the *wh*-phrases must be fronted to a clause that can be interpreted as a question, which may involve multiple *wh*-extraction out of a clause. Thus *wh-in-situ* does not occur. This is shown in the following examples from Rudin (1988):

- (105) a. *Koj_i kŭde_j misliš [če e otišŭl t_i t_j]?
 who where think-2s that has gone
 ‘Who do you think went where?’
 b. **Koj_i misliš [če e otišŭl t_i kŭde]?
 who think-2s that has gone where
 c. **Kŭde_j misliš [če koj_i e otišŭl t_j]?
 where think-2s that who has gone
 d. **Koj_i misliš [kŭde_j (če) e otišŭl t_i t_j]?
 who think-2s where that has gone
 e. **Kŭde_j misliš [koj_i (če) e otišŭl t_i t_j]?
 where think-2s who that has gone*****

The same pattern holds for Romanian, in that all *wh*-phrases are required to be fronted as in (106). *Wh*-phrases that are left *in situ* or fronted to a nonquestion clause are not allowed.

- (106) a. *Cine_i ce_j [(crezi că) t_i a văzut t_j]?
 who what (think-2s that) has seen
 ‘Who (do you think) saw what?’ (Comorovski 1996:2)
 b. *Cine_i cui_j ce_k ziceai că t_i i_j -a promis t_k t_j?
 who to-whom what said-2s that to-him has promised
 ‘Who did you say promised what to whom?’ (Comorovski 1986:171)**

In 4.3, the constraint (87) is posited in English to block multiple *wh*-fronting to a clause. Obviously, such a constraint must be absent in multiple *wh*-movement languages in order to permit multiple occurrence of *wh*-fillers. On the other hand, in

the account of *wh*-retrieval, the same licensing constraint (65) (which is repeated as (107) below) can be used in these languages.

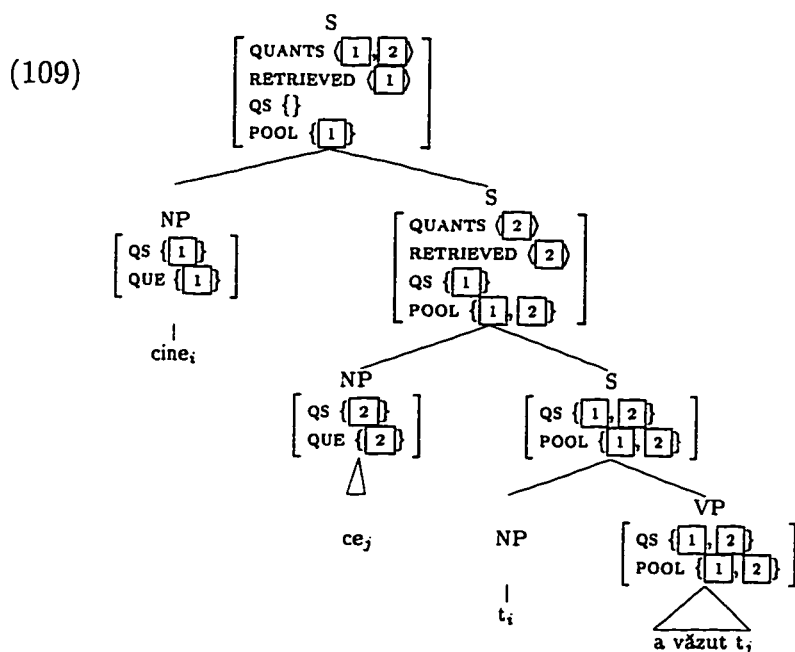
(107) Syntactic Licensing Constraint on *Wh*-Retrieval (for “English-like”, nonoptional and nonpartial syntactic *wh*-movement languages)

- a. At any node, retrieval, if any, of *wh*-operators must include the member of the left peripheral daughter’s QUE value.
- b. At any filler-head node, if the filler has nonempty QUE value, then its member must belong to the node’s RETRIEVED value.

So far nothing guarantees *wh*-fronting of all *wh*-phrases in these languages. This is ensured by an independent constraint (108):

$$(108) \left[\begin{array}{l} \text{QUANTS } \langle \boxed{1} wh, \boxed{2} wh, \dots \rangle \\ \text{RETRIEVED } \langle \boxed{1}, \dots \rangle \end{array} \right] \rightarrow \left[\text{HEAD-DTR } \left[\text{RETRIEVED } \langle \boxed{2}, \dots \rangle \right] \right]$$

Accordingly, (106a) is analyzed as in (109):



On the other hand, (105b-e) are blocked by the constraint (108), since while the matrix S should be $\left[\text{QUANTS } \langle \boxed{1}\text{wh}, \boxed{2}\text{wh} \rangle, \text{RET } \langle \boxed{1} \rangle \right]$, its head daughter has an empty RETRIEVED list.

As is discussed in McDaniel (1989), some multiple *wh*-movement languages like Romani allow partial *wh*-movement. Following McDaniel, I will use the term “partial *wh*-movement” to refer to cases in which a *wh*-phrase is displaced to the initial position of a clause that is lower than the clause over which the *wh*-phrase takes scope. First, Romani shows characteristics of multiple *wh*-movement language as in (110):

(110) a. $\text{Ko}_i \text{ kas}_j \text{ t}_i \text{ dikh}\check{\text{ľ}}\text{a t}_j?$

Lit. ‘Who whom saw?’

b. $\text{Kaj}_i \text{ kas}_j \text{ mislin } [\text{so o Dem}\grave{\text{ı}}\text{ri dikh}\check{\text{ľ}}\text{a t}_j \text{ t}_i]?$

Lit. ‘Where whom do you think that Demir saw?’

c. $\text{Ko}_i \text{ kas}_j \text{ t}_i \text{ mislinol } [\text{so o Dem}\grave{\text{ı}}\text{ri } \acute{\text{c}}\text{umin}\acute{\text{ľ}}\text{a t}_j]?$

Lit. ‘Who whom thinks that Demir kissed?’ (McDaniel 1989:590)

On the other hand, unlike Bulgarian or Romanian type multiple *wh*-movement languages, Romani allows *in situ wh*-phrases in multiple questions:

(111) a. $\text{Ko dikh}\check{\text{ľ}}\text{a kas?}$

‘Who saw whom?’

b. $\text{Kaj}_i \text{ mislin } [\text{so o Dem}\grave{\text{ı}}\text{ri dikh}\check{\text{ľ}}\text{a kas t}_i]?$

‘Where do you think that Demir saw whom?’

c. $\text{Ko mislinol } [\text{so o Dem}\grave{\text{ı}}\text{ri } \acute{\text{c}}\text{umin}\acute{\text{ľ}}\text{a kas}]?$

‘Who thinks that Demir kissed whom?’ (McDaniel 1989:589)

These basic facts can be simply explained by not positing any further constraints such as (87) and (108).

What is interesting in Romani is that two (or more) *wh*-phrases that take the same scope can appear in different left peripheral positions, as the following examples from McDaniel (1989:590) show:

- (112) a. *Kaj_i mislin [kas_j o Demìri dikhĭa t_j t_i]?*

Lit. 'Where do you think whom Demir saw?'

- b. *Ko mislinol [kas_j o Demìri ċuminĵa t_j]?*

Lit. 'Who thinks whom Demir kissed?'

Unlike in other kinds of syntactic *wh*-movement languages that we have seen so far, the embedded clauses in (112), which are complements of the verb 'think', take the syntactic form of an interrogative, although semantically they are not questions.

When there is no *wh*-phrase in the initial (or left periphery) position of a clause at which *wh*-retrieval takes place, then a scope marker *so* must appear in that position.³⁰

- (113) *SO o Demìri mislinol kas_i i Arĭfa dikhĭa t_i?*

Lit. 'WHAT does Demir think whom Arifa saw?'

The same kind of partial *wh*-movement construction that employs a scope marker is found in German (McDaniel 1989, Kathol 1995). In German, *was* 'what' is used as the scope marker as in (114):

- (114) *WAS glaubt Hans [[mit wem]_i Jakob jetzt t_i spricht]?*

Lit. 'WHAT does Hans believe with whom Jakob is now talking?'

³⁰In Romani *so* is homophonous with the complementizer. The scope marker is written in upper case in the examples here.

Then this kind of ‘expletive scope marking construction’ (in Kathol’s terms) in (113) and (114) shares the common property with the examples in (112) in that *wh*-fronting to a lower position than its scope is permitted. As McDaniel notes, cases like (112) are possible in German only in some dialects.

Given these facts, the constraint on *wh*-retrieval in (65), which is for English type *wh*-movement languages should be only partially true for Romani or German, which allows partial *wh*-movement: only the clause (a) of the constraint (65) holds for these languages.³¹

(115) Syntactic Licensing Constraint on *Wh*-Retrieval (for languages allowing partial *wh*-movement)

At any node, retrieval, if any, of *wh*-operators must include the member of the left peripheral daughter’s QUE value.

In Romani, given the selectional restrictions of verbs as we described in section 4.2, the constraint (115) alone can explain the distribution of *wh*-phrases and their scope (except for the expletive scope marking example in (113), which we will consider shortly). As it is shown in (110-112), *wh*-fronting is basically free as long as at least one *wh*-phrase is located at the left periphery of a clause that is interpreted as a question. In German, however, the additional constraint (87) is needed as in English, in order to block examples with multiple *wh*-phrases in a clause initial position.

The expletive scope marking examples in (113) and (114) require further explanation. As the retrieval of an interrogative operator at a phrase requires its left-peripheral daughter to have nonempty QUE value, the scope markers in these examples can be assumed to bear a nonempty QUE value. Kathol (1995) proposes that

³¹This was pointed out to me by Kathol (p.c.)

bridge verbs like *glauben* or *denken* in German allows a “syntactic” interrogative clause (which is marked by a nonempty QUE) as its complement, and when it has such a complement, it has in its INH|SLASH an expletive element that has the same CONT value as the as yet unretrieved interrogative operator that marks the complement clause as syntactically interrogative (See Kathol for detailed analysis):

$$(116) \text{ glauben/meinen/denken (Kathol 1995:212)}$$

$$\left[\begin{array}{l} \dots | \text{SUBCAT} \langle [], S \left[\begin{array}{l} \dots | \text{QUE} \{ [1] \} \\ \dots | \text{QUANTS } list(\neg wh) \\ \dots | \text{QS} \{ \dots, [1], \dots \} \end{array} \right] \rangle \\ \dots | \text{INH|SLASH} \left\{ \left[\begin{array}{l} \text{CONT } [1] \\ \text{HEAD } expl \end{array} \right] \right\} \end{array} \right]$$

Such an analysis can be adopted for Romani, but another possibility should be allowed for the lexical specification of those bridge verbs, in order to explain the examples in (112).³²

$$(117) \text{ a. } \left[\begin{array}{l} \text{COMPS} \langle S \left[\text{QUE} \{ [1] \}, \text{QS} \{ [1], \dots \} \right] \rangle \\ \text{INH|SLASH} \left\{ \left[\begin{array}{l} \text{CONT } [1] \\ \text{HEAD } expl \end{array} \right] \right\} \end{array} \right]$$

$$\text{ b. } \left[\begin{array}{l} \text{COMPS} \langle S \left[\text{QUE} \{ [1] \}, \text{QS} \{ [1], \dots \} \right] \rangle \\ \text{INH|SLASH } set(non-expl) \end{array} \right]$$

Therefore, given the verbs *mislin/mislinol* ‘think’ in (112) and (113) that have a complement $S[\text{QUE} \{ [1] \}, \text{QS} \{ [1], .. \}]$, different SLASH values can be instantiated. In (112a), the SLASH value of the verb contains a nonexpletive element which is structure-shared with the LOCAL value of the filler *kaj*, while in (112b), the SLASH value is an empty set. Both values are instantiations of (117b).³³ On the other hand, the feature values in (117a) is instantiated in the verb of (113), with the SLASH containing an expletive element that corresponds to *SO*.

³²As in French and German, we assume that in Romani, the QUE value of a phrase whose HEAD value is of sort *verb* is inherited from the left peripheral daughter’s QUE.

³³Here, *set(non-expl)* is a shorthand for a set of local structures whose HEAD value is not *expl*.

4.4.3 Conclusion

In this section, we have examined some other patterns of syntactic *wh*-movement. For the languages that we looked at (viz. English, French, Iraqi Arabic, Romanian, Bulgarian, Romani, and German), we provide three versions of syntactic licensing constraints for *wh*-retrieval which are slightly different from each other. Those for the optional *wh*-movement languages (French, Iraqi Arabic) are given in (91), and those for the languages that allow partial *wh*-movement (German, Romani) are given in (115). Although multiple *wh*-movement languages Bulgarian and Romanian are syntactically distinct from English, a single *wh*-movement language, they turn out to be subject to the same constraint (107) as far as syntactic licensing of *wh*-retrieval goes.

The differences between single *wh*-movement languages like English and multiple *wh*-movement languages like Bulgarian and Romanian are accounted for by independent constraints on multiple filler-head structures. We proposed the constraint (87) for English, and (108) for Bulgarian and Romanian. Among optional *wh*-movement languages, Iraqi Arabic is subject to the constraint (103) due to its idiosyncratic restriction on the distribution of in-situ *wh*-phrases. The restriction on *wh*-in-situ questions in French is accounted for in terms of the type hierarchy in (96) (and the constraint (97)).

We don't claim that this section provides an exhaustive classification of syntactic *wh*-movement languages. However, our hope is that the discussion here will serve as grounds for extending our theory for various *wh*-scope phenomena in syntactic *wh*-movement languages.

CHAPTER 5

WH-IN-SITU AND SCOPING

5.1 Issues on *wh*-in-situ

5.1.1 LF *wh*-movement and the pied piping hypothesis

In transformational approaches, it has been widely assumed that scope of in-situ *wh*-phrases is determined by *wh*-movement of *wh*-phrases at LF. Since the influential work of Huang (1982), all languages, either *wh*-movement languages or *wh*-in-situ languages, have been assumed to have parallel structures at the level of LF. The following comparison of English and Chinese examples illustrates this:

- (1) [What_{*i*} did [Mary eat t_{*i*}]]? (SS, LF)
- (2) a. Mary chi-le sheme? (SS)
Mary ate what
'What did Mary eat?'
b. [shemei_{*i*} [Mary chi-le t_{*i*}]] (LF)

Although this approach allows uniform representation of interrogatives at an abstract level, a fundamental problem for such an approach has been to explain why LF *wh*-movement differs from SS *wh*-movement in various ways in many languages, given that the mechanism of Move- α is supposed to obey universal constraints, Subjacency and the ECP (Empty Category Principle).

One of the major differences that has been noted concerns island constraints. The following examples from Huang (1982) show that LF *wh*-movement freely violates island conditions such as the Complex NP Constraint (CNPC) (in (3-4)), and the *Wh*-Island Constraint (in (5-6)) in both English and Chinese:

- (3) a. Who likes books that criticize who?
 b. In order to foil this plot, we must find out which agent has bats that are trained to kill which senator.
- (4) Ni mai-le [[shei xie] de shu]?
 you buy-ASP who write DE book
 ‘Who is the x such that you bought books that x wrote?’
- (5) Who remembered where we bought what? (ambiguous)
- (6) Ni xiang-zhidao [shei mai-le sheme]
 you wonder who buy-ASP what
 a. ‘Who is the person x such that you wonder what x bought?’
 b. ‘What is the thing x such that you wonder who bought x?’
 c. ‘You wonder who bought what.’

Moreover, the Condition on Extraction Domain (CED) is also not observed for LF *wh*-movement:¹

- (7) Who thinks that pictures of who are on sale?
- (8) Ni renwei [shei de hua zui piaoliang]?
 you think who ’s picture most pretty
 ‘Who is the person x such that you think that pictures of x are most pretty?’
- (9) Who got jealous because I spoke to who?
- (10) Ni [yinwei wo shuo-le shenme] er bu gaoxing?
 you because I said what then not happy
 ‘What is the thing x such that you are unhappy because I said x?’

¹Examples (7-10) are taken from Fiengo *et al.* (1988).

Based on Chinese and English facts, Huang claims that Subjacency and the CED are not relevant constraints on LF movement, though the ECP is. Thus this approach denies that Subjacency is always a diagnostic of genuine movement, while failing to explain why LF movement is different from SS movement with respect to Subjacency, given that both are instances of Move- α .

In contrast with Huang's conclusion, Nishigauchi (1990), Choe (1987), and Pesetsky (1987) maintain that LF movement as well as SS movement are constrained by Subjacency. According to them, apparent lack of Subjacency violations at LF is due to LF pied-piping of a [+wh] constituent, not to the absence of Subjacency at LF. Consider the following Japanese and Korean examples which involve good CNPC violations:

- (11) a. Kimi-wa [[dare-ga kai-ta] hon]-o yomi-masi-ta-ka?
 you-TOP who-NOM write-PST book-ACC read-PST-Q
 Lit. 'You read a book that who wrote?'
 b. Ne-nun [[nwuka ssu-n] chayk]-ul ilk-ess-ni?
 you-TOP who write-REL book-ACC read-PST-Q
 Lit. 'You read a book that who wrote?'

Nishigauchi and Choe independently propose that in (11), what is moved at LF is the whole complex NP, not just the *wh*-phrase contained in it. In Nishigauchi, a specific mechanism of pied-piping is discussed, and the LF of (11a,b) is represented as in (12):

- (12) [S ..t_j..[COMP Q [NP [_{S'} [S ..t_i] WH_i] N']_j]]

Nishigauchi argues that in languages such as Chinese, Japanese, and Korean that have prenominal relative clauses, a *wh*-phrase inside a relative clause *S'*(=CP) moves to the SPEC of the lower *S'*, thus percolating its [+wh] feature to the *S'* and its

embedding complex NP.² Then, in (12), the whole NP_j, which is marked [+wh] via feature percolation, moves to the SPEC of the higher S' (=CP), whose head is Q.

Such an LF pied-piping hypothesis poses a number of problems. First, since Nishigauchi claims that such an analysis holds for languages with prenominal relative clauses (RCs), wherein RCs are analyzed as specifiers of NPs, the lack of LF Subjacency violations in English (as in (3,5,7,9)), which has postnominal RCs is left unexplained. Even if the LF pied-piping hypothesis is uniformly assumed in all languages, it must be explained why and how LF pied-piping is different from syntactic pied-piping. For example, unlike (3), pied-piping in (13) should be still prohibited in English (cf. Fiengo *et al.*).

(13) a. *A book that who wrote did Mary read?

b. *I wonder a book that who wrote Mary read.

Second, it is taken to be supporting evidence for the LF pied-piping hypothesis that the preferred answer for a pied piping question is the one which copies the whole island, as in (14); however, as Fiengo *et al.* show for Chinese in (15), this is not always the case.

(14) A: Taroo-ga nani-o te-ni ireta koto-o sonnani okotteru no?
 Taroo-NOM what-ACC obtain fact-ACC so-much be-angry Q
 Lit. 'You are angry about the fact that Taroo obtained what?'

B: a. ??Hon-desu.

book-is

'It's (the) book.'

b. Hono te-ni ireta koto-desu.

book obtain fact-is

'It's the fact that Taroo obtained the book.'

²The feature [+wh] is assumed to be percolated from a SPEC to its maximal projection. However, for this effect, in (12), it is stipulated that relative clauses in these languages are specifiers of the complex NP.

- (15) A: [Shei kan zheben shu] zui heshi?
 who read this book most appropriate
 Lit. 'That who read this book is most appropriate?'
 B: a. *Zhangsan kan zheben shu.
 Zhangsan read this book
 'That Zhangsan read this book.'
 b. Zhangsan.

For questions involving a CED violation, a natural answer is the simple one that specifies only the value of the *wh*-phrase. This is further illustrated in Korean examples (16):

- (16) A: Yenhi-ka_i [pro_i nwukwu-lul manna-ss-killay] celi hwana-ss-ni?
 Yenhi-NOM who-ACC meet-PST-because so angry-PST-Q
 Lit. 'Yenhi got so angry because she met whom?'
 B: a. ?*Chelswu-lul manna-ss-killay.
 Chelswu-ACC meet-PST-because
 'Because she met Chelswu.'
 b. Chelswu-(yo).

Third, there is empirical evidence that the LF pied-piping hypothesis is fundamentally flawed. Contrary to the prediction made by the hypothesis, viz. that a *wh*-phrase contained in an island must take its scope within the island, there are a number of cases in which such a *wh*-phrase takes scope outside of the island. Consider the following (17):

- (17) Ne-nun [Mary-ka [[nwuka ssu-n] chayk-ul] ilk-ko iss-ta-ko]
 you-TOP Mary-NOM who write-REL book-ACC read is-DC-COMP
 sayngkakha-ni?
 think-Q
 'You think Mary is reading a book that who wrote?'

Example (17) contains a propositional attitude verb *sayngkakha*- 'think', and by virtue of this, it exhibits a *de re/de dicto* ambiguity. In the *de dicto* reading 'For

which person *x* do you think that there exists a book *y* such that Mary is reading *y* that *x* wrote?', the *wh*-operator takes matrix scope, while the existential quantifier associated with the complex NP takes embedded scope. Thus it must be the case that the *wh*-phrase is outside of the complex NP at LF (cf. Yoo 1995).³

Based on such counterexamples and counterarguments, we conclude that the LF pied-piping hypothesis is untenable.⁴ Consequently, the claim that construal of in-situ *wh*-phrases is subject to island constraints is also considered deeply problematic.

5.1.2 *Wh*-phrases in embedded questions

It has been sometimes claimed that Japanese exhibits *wh*-island effects. Nishigauchi firmly holds this position and takes it to be evidence for Subjacency as constraining LF movement.

- (18) *Sato-kun-wa [Suzuki-kun-ga nani-o tabe-ta ka-dooka]
 Sato -TOP Suzuki -NOM what-ACC eat-PST whether
 oboe-te-imasu -ka
 remember-is Q
 NOT 'For which *x*, *x* a thing, does Sato remember whether Suzuki ate *x*?'
 (Nishigauchi 1990:31)

- (19) Tanaka-kun-wa [dare-ga nani-o tabe-ta ka] oboe-te-imasu -ka
 Tanaka-TOP who-NOM what-ACC eat-PST Q remember-is Q
 'Does Tanaka remember who ate what?' (Nishigauchi 1990:33)

³Fiengo *et al.* present other cases, such as (i), wherein *wh*-scope is separated from the scope of the existential complex NP.

(i) Meige ren dou mai-le [yiben [shei xie de] shu]?
 every man all bought one who write REL book
 Lit. 'Everybody bought a book that who wrote?'

Example (i) has the reading 'Who is the person *x* such that everyone bought one book or another that *x* wrote?', in which the scope order is 'who' » 'everyone' » 'a book that *x* wrote'.

⁴See Kuno (1990) for arguments against LF pied-piping with respect to Japanese weak crossover facts.

Although Nishigauchi argues for the presence of *wh*-island constraint in Japanese, he notes that *wh*-island violation examples can be improved in certain cases. Nishigauchi points out that in (19), the wide scope reading of *dare-ga*, i.e. ‘For which *x*, *x* a person, does Tanaka remember what *x* ate?’ can be obtained when it is pronounced with a marked intonation, with a heavy stress on the *wh*-phrase *dare-ka*. In (19), the matrix scope reading of *nani-o*, i.e. ‘For which *x*, *x* a thing, does Tanaka remember who ate *x*?’ is also possible if the two *wh*-phrases in the embedded clause are scrambled in order (thus *nani-o* being the first *wh*-phrase in the embedded clause). Nishigauchi argues that both heavy stress (or marked intonation) and scrambled word order have to do with focus assignment, and that such *wh*-island violations are due to the fact that focus assignment is insensitive to island constraints.

The argument that *wh*-island violations can be exempted due to scrambled word order is not convincing, however, especially in a transformational approach wherein scrambling is accounted for by syntactic movement. Moreover, in (19), it is not surprising at all (rather more or less expected) that in order for one of the *wh*-phrases to get the matrix reading, it should be associated with a marked intonation with a heavy stress, since equal (non)stress on both *wh*-phrases in a clause typically indicates the same scope for both *wh*-phrases.⁵ Therefore, there is room for arguing that *wh*-island violations in Japanese are actually possible.

In Watanabe (1992), a more sophisticated set of data is presented. Consider the following:

⁵See footnote 12 in Watanabe (1992) for a reviewer’s comment that in Japanese, “in order for the multiple questions to be properly construed, both *wh*-phrases must be destressed”.

(20) ??John-wa [Mary-ga nani-no katta ka dooka] Tom-ni tazuneta-no?
 John-TOP Mary-NOM what-ACC bought whether Tom-DAT asked-Q
 ‘What did John ask Tom whether Mary bought t?’

(21) John-wa [Mary-ga nani-no katta ka dooka] dare-ni tazuneta-no?
 John-TOP Mary-NOM what-ACC bought whether who-DAT asked-Q
 ‘What did John ask t whether Mary bought?’

Watanabe assimilates the contrast between (20) and (21) to the contrast between SS and LF movement in English, which is illustrated in (22).⁶

(22) a. ??What did John ask Tom whether Mary bought t?

b. Who did John ask t whether Mary bought what? (Watanabe 1992)

In order to explain the assumed contrast between (20) and (21), Watanabe proposes that invisible S-Structure movement of *wh*-operators occur in Japanese interrogatives. As is shown in the schematic representation (23), Op in Spec of CP is moved from the IP internal *wh*-phrase:

(23) [_{CP}[_{IP} ... *wh*-phrase_{*i*} ...][_C ka] Op_{*i*}]

He also proposes the Two-level Movement Hypothesis in order to guarantee that one and only one Op occupies the Spec of [+wh] Comp at SS.

(24) the Two-level Movement Hypothesis (Watanabe 1992)

One and only one *wh*-phrase per [+wh] Comp is affected at the first level of movement, which is subject to Subjacency and is responsible for the antecedent-government from Comp. All the other *wh*-phrases in multiple questions move subsequently at the second level, which is immune to Subjacency and does not result in antecedent-government from Comp.

⁶Robert Kasper and Carl Pollard each pointed out to me, however, that both (22a) and (22b) are equally acceptable to them.

According to Watanabe, since the first level in (24) is identified as SS, in (20), the SS movement of *nani-no* triggers a *wh*-island violation. By contrast, in (21), what is moved at SS is the Op from the matrix *wh*-phrase, which does not involve a Subjacency violation.

However, Watanabe's analysis raises theoretical and empirical problems. First, it is not clear how an operator is moved from a *wh*-phrase, as presented in (23). The structure prior to the invisible operator movement is never explained. Second given (23) and (24), examples such as (11a) pose a serious problem, since the SS movement of the (only) interrogative operator will violate Subjacency. Pied-piping of the whole complex NP (as in (12), but at SS) is not a possible option in (11a), since (12) cannot be an SS representation. Moreover, the pied-piping hypothesis itself has fundamental flaws, as we saw in 5.1.1.

Third, as Watanabe notes himself, there is no explanation why ordinary scrambling in Japanese, which is also analyzed via SS movement, does not exhibit *wh*-island effects.

- (25) Sono hon-o; John-ga [dare-ga t_i katta ka] siritagatteiru.
 that book-ACC John-NOM who-NOM bought Q know-want
 John wants to know who bought that book.'

This not only undermines his argument for invisible SS movement, but also makes us wonder whether the *wh*-island effect claimed in (20) is a grammatically significant one.

Fourth, although Watanabe requires that "the *wh*-phrase that is moved first cannot c-command the other *wh*-phrase at SS which takes the same scope",⁷ it is not clear

⁷This is called an *anti-superiority* effect in Watanabe, and is proposed to account for the contrast in (i) and (ii):

whether this is always the case. In Evans (1996), the following example is considered acceptable, compared to (20):

- (26) Dare-ga John-ga nani-o katta ka-dooka shiritagatte-imasu ka?
 who-NOM John-NOM what-ACC bought Q-yes/no want-to-know Q
 'Who wants to know whether or not John bought what?'

In (26), as *dare-ga* c-commands *nani-o*, the *wh*-phrase that is moved first should be the embedded *nani-o*; accordingly, (26) should have the same status as (20), according to Watanabe's theory.⁸

To summarize, Nishigauchi and Watanabe claim that *wh*-island effects are exhibited in Japanese, and take this to be evidence/motivation for their movement analyses for *wh*-phrases in Japanese. However, as we have seen so far, their analyses raise problems, especially in that Subjacency effects are not uniformly or systematically exhibited in Japanese *wh*-scoping.

By contrast, following Huang, other authors such as Lasnik & Saito (1992) assume that the *wh*-island constraint is not relevant to LF movement. Thus the following (27) is not regarded as a *wh*-island constraint violation in either Lasnik & Saito or Takahashi (1993):⁹

- (i) ?Kimi-wa nani-o naze katta no?
 you-TOP what-ACC why bought Q
 'Why did you buy what?'
 (ii)*Kimi-wa naze nani-o katta no?
 you-TOP why what-ACC bought Q
 'What did you buy why?' (Watanabe 1992:265)

Korean speakers that I consulted with find Korean examples corresponding to (ii) fine, with a slight pause between the two *wh*-phrases.

⁸Watanabe considers (26) and (20) equally marginal. However, he also notes that an anonymous reviewer and some other speakers (to whom the reviewer asked judgments) find (26) as acceptable as (21).

⁹In (27), the particle *no* is also used as a question marker in Japanese, but unlike *ka* it cannot be used for an embedded question.

- (27) John-wa [Mary-ga nani-o katta ka-dooka] siritagatte-iru no
 John-TOP Mary-NOM what-ACC bought whether want-to-know Q
 Lit. 'What does John want to know whether Mary bought?'

Moreover, Takahashi considers the following (28) to be ambiguous, contrary to Nishigauchi:¹⁰

- (28) John-wa [Mary-ga nani-o tabeta ka] siritagatteiru no
 John-TOP Mary-NOM what-ACC ate Q want-to-know Q
 'Does John want to know what Mary ate?' or
 'What does John want to know whether Mary ate?'

In sum, we have seen that there are different assessments of data with respect to *wh*-island effects in Japanese. We are not in a position to make any empirical judgment on the data; however, given the discrepancies discussed above, it seems implausible to consider them evidence for a movement approach, or for any particular constraint on the construal of in-situ *wh*-phrases. In the discussions to follow, we will look at some corresponding Korean examples.

Choe (1985) notes that Korean question markers such as *-nya* and *-nunci* do not always function as scope markers for a *wh*-phrase. Consider the following examples from Choe:

- (29) [Nwu(kwu)ka ka-nunci](-lul) alko-siph-ni?
 who-NOM go-Q-ACC know-want-Q
 'Do you want to know who is going?' or
 'For which person x, do you want to know whether x is going?'
- (30) [Nwu(kwu)ka Mia-lul manna-ss-nya]-ko Hia-ka mul-ess-ni?
 who-NOM Mia-acc meet-PST-Q-COMP Hia-NOM ask-PST-Q
 'Did Hia ask who met Mia?'
 'For which person x, did hia ask whether x met Mia?'

¹⁰Evans also treats (28) as an ambiguous example that does not involve Subjacency violation. However, interestingly, he considers (27) (with the matrix question marker *ka* instead of *no*) to be degraded, and analyze (28) differently from (27).

In fact, there are many more types of examples exhibiting this kind of ambiguity, although there may be a preferred reading depending on the context in which they are used.¹¹ Contrary to the *wh*-island condition, the following example (31) has a matrix *wh*-question reading as the preferred reading when the speaker is answering inquiries about a list of students that passed an entrance exam:

- (31) [Nwu(kwu)ka hapkyekhay-ss-nunci](-lul) alko-siph-usi-pnikka?
 who-NOM pass-PST-Q-ACC know-want-HON -Q
 ‘Do you want to know who passed? or
 ‘For which person x, do you want to know whether x passed?’

Such a *wh*-island violation is also possible when more than one *wh*-phrase is involved. Consider the following:

- (32) A: Halapeci-kkeyse myet salam-ey tayhayse-nun [encey cheum
 grandfather-NOM(hon.) some people-to about-TOP when first
 manna-ss-nunci]-lul kiekhako kyey-si-e.
 meet-PST-Q-ACC remember is(hon.)-HON-MOOD(informal)
 ‘As for some people, grandpa remembers when he met them for the first time.’
 B: Kulay? Halapeci-kkeyse [encey nwukwu-lul cheum
 really grandfather-NOM(hon.) when whom-ACC first
 manna-ss-nunci]-lul kiekha-si-nuntay?
 meet-PST-Q-ACC remember-HON-MOOD(informal)
 ‘Really? For which person x, does grandpa remember when he met x for the first time?’

Based on these kind of examples, we conclude that the *wh*-island condition does not exist as a grammatical constraint in Korean.¹²

¹¹It should be noted that Pesetsky’s notion of ‘D-linking’ is not relevant here, since *wh*-island violations may occur whether the involved *wh*-phrase is D-linked or non-D-linked in his terms.

¹²Comparing Korean examples with Japanese ones, one interesting thing to note is that most Japanese examples that are claimed to involve a *wh*-island violation have embedded questions ending with *ka-dooka* ‘whether’. Unlike *ka*, which marks either *wh*- or polar questions, *ka-dooka* can mark only an embedded polar questions.

5.1.3 Does the ECP motivate LF *wh*-movement?

In Huang, the main evidence for LF movement of in-situ *wh*-phrases lies with the relevance of the ECP (Empty Category Principle). He observes that while LF movement is not subject to Subjacency (see examples in 5.1.1), certain *wh*-words ‘why’ and ‘how’ cannot appear within a complex NP in Chinese.

- (33) [[Shei xie] de shu] zui youqu?
who write DE book most interesting
Lit. ‘Books that wrote are most interesting?’
- (34) [[Ta taolun sheme] de shu] zui youqu?
he discuss what DE book most interesting
Lit. ‘Books in which he discusses what are most interesting?’
- (35) [[Ta zai nali pai] de dianying] zui hao?
he at where film DE movie most good
Lit. ‘Movies that he filmed where are the best?’
- (36) [[Ta (zai) shemeshihou pai] de dianying] zui hao?
he at when film DE movie most good
Lit. ‘Movies that he filmed when are the best?’
- (37) *[[Ta weisheme xie] de shu] zui youqu?
he why write DE book most interesting
Lit. ‘Books that he wrote why are most interesting?’
- (38) *[[Ta zeme xie] de shu] zui youqu?
he how write DE book most interesting
Lit. ‘Books that he wrote how are most interesting?’

- (i)*Boku-wa [dare-ga kuru ka-dooka] sir-i-mas -en.
I-TOP who-NOM come whether know not
Lit. ‘I don’t know whether who is coming.’

In this connection, it is interesting that in Evans, the choice between *ka* and *ka-dooka* is assumed to lead to different grammaticality judgments. (See footnote 10.) Thus, while the status of a *ka-dooka* clause as a *wh*-island itself is still uncertain, we can conjecture that degraded judgments may be relevant to the presence of a *wh*-phrase and *ka-dooka* in the same clause.

On the other hand, question markers used in Korean embedded questions are all compatible with either polar or *wh*- questions.

Huang argues that the contrast between (33-36) and (37-38) is not due to a purely semantic distinction among *wh*-words, since the following examples with the paraphrased forms of ‘why’ and ‘how’ are well-formed:

- (39) [[Ta wei-le sheme yuanyin xie] de shu] zui youqu?
 he for what reason write DE book most interesting
 Lit. ‘Books that he wrote for what reason are most interesting?’
- (40) [[Ta yong sheme xie] de shu] zui youqu?
 he with what write DE book most interesting
 Lit. ‘Books that he wrote with what are most interesting?’

Rather it is claimed that the distinction between ‘who’, ‘what’, ‘when’, ‘where’ and ‘why’, ‘how’ is that between argument and adjunct (or between NP and non-NP).¹³ According to Huang, (37-38) violate the ECP, since the trace of LF movement of the adjunct PPs is neither lexically governed nor governed by its antecedent.¹⁴

Likewise Lasnik & Saito (1984) argue that the contrast exhibited in the Japanese example (41) is typical of the complement/noncomplement asymmetry due to the ECP.

- (41) a. [[Hanako-ga [Taroo-ga nani-o te-ni ireta tte] itta]
 Hanako-NOM Taroo-NOM what-ACC obtained COMP said
 kota]-o sonnani okotteru no
 fact-ACC so-much be-angry Q
 Lit. ‘What are you so angry about the fact that Hanako said that Taroo obtained *t*?’

¹³Huang assumes that ‘where’ and ‘when’ are dominated by NP in the position [_{PP} P [_{NP} ..]], where P may be phonetically unrealized. By contrast, *weisheme* ‘why’ and *zeme* ‘how’ are analyzed as non-nominal in category (viz. *weisheme* as PP or S’, and *zeme* as PP or AP).

¹⁴Huang assumes Chomsky’s (1981) formulation of the ECP in (i), wherein proper government is defined as in (ii):

(i) An empty category must be properly governed.

(ii) α properly governs β if and only if A governs B and

(a) α is a lexical category, or

(b) α is coindexed with β .

(iii) α governs β iff every maximal projection dominating α also dominates β and conversely.

- b.*[[Hanako-ga [Taroo-ga naze sore-o te-ni ireta tte] itta]
 Hanako-NOM Taroo-NOM why it-ACC obtained COMP said
 kota]-o sonnani okotteru no
 fact-ACC so-much be-angry Q
 Lit. 'Why are you so angry about the fact that Hanako said that Taroo
 obtained it *t*?'

In more recent literature, a more complicated set of data is presented with regard to Huang's argument/adjunct distinction. In Tsai (1994), it is claimed that, with respect to LF extractability, manner *zenmeyang* 'how' is different from its instrumental counterpart; and likewise, reason *weishenme* 'why' is different from its purpose counterpart.

- (42) a. Ni bijiao xihuan [[ta zenmeyang zhu] de cai]?
 you more like he how cook PNM dish
 'What is the means *x* such that you like better [the dishes [which he cooks by *x*]]?'
 b.*Ni bijiao xihuan [[ta zhu- de zenmeyang] de cai]?
 you more like he cook DE how PNM dish
 'What is the manner *x* such that you like better [the dishes [which he cooks by *x*]]?'
 (43) a. Ni bijiao xihuan [[wei(-le) shenme gongzuo] de ren]?
 you more like for what work PNM people
 'What is the purpose *x* such that you like better [the people [who work for *x*]]?'
 b.*Ni bijiao xihuan [[weishenme gongzuo] de ren]?
 you more like why work PNM people
 'What is the reason *x* such that you like better [the people [who work for *x*]]?'
 for *x*]]?

Tsai characterizes the distinction in terms of 'referentiality' (Aoun (1986), Cinque (1990) and Rizzi (1990)) in that referential elements (instrumental 'how' and purpose 'why') can be moved from islands, while nonreferential ones (manner 'how' and reason 'why') cannot.¹⁵

¹⁵However, with the notion of referentiality not precisely defined, it is not clear how to distinguish referential elements from nonreferential ones.

Tsai presents another generalization that so called nominal islands are relevant to LF extractability in Chinese. According to Tsai, a [+N] clausal complement,¹⁶ sentential subjects, relatives and appositives form a nominal island at LF from which manner ‘how’ and reason ‘why’ cannot be extracted. Relevant examples from Tsai are given in (44-46), which contain a [+N] clausal complement, sentential subject and appositive, respectively:

- (44) *Ni jide [zhe -jian shi, Lisi chuli- de zenmeyang]?
 you remember this CL matter Lisi handle DE how
 ‘What is the manner x such that you remember [that Lisi handled this matter in x]?’
- (45) *[Zhe -jian shi, ta chuli- de zenmeyang] bijiao qiadang?
 this CL matter Lisi handle DE how more appropriate
 ‘What is the manner x such that it is more appropriate [for him to handle this matter in x]?’
- (46) *[[Tamen weishenme cizhi] de shuofa] bijiao kexin?
 they why resign PNM story more believable
 ‘What is the reason x such that [the story [that they resigned for x]] is more believable?’

We are not in a position to discuss empirical aspects of Tsai’s generalization on Chinese. However, given that the ECP is considered a universal principle in transformational grammar, we can see if the same generalization holds for Korean. In Korean, so-called ECP effects are much more restricted.¹⁷ Many authors (Lee 1987, Chung 1991, Moon 1991 and Song 1995) have noticed that among *wh*-phrases, only *way* ‘why’, induces unacceptability when it is contained within a complex NP:¹⁸

¹⁶Only the complements of verbs that may take ‘derived nominals, i. e. propositions which assume the form of NP’ are analyzed as [+N]. Thus verbs such as *yihan* ‘regret’, *jide* ‘remember’ and *tongyi* ‘agree’, but not *renwei* ‘think’ and *shuo* ‘say’, are assumed to take [+N] clausal complements.

¹⁷See Cole & Hermon (1994) for discussion of *wh*-in-situ in Quechua. They show that Ancash Quechua exhibits no ECP effects.

¹⁸Kuno & Takami (1993:85) also present that the following Japanese example with ‘how’ within a complex NP is acceptable:

- (47) a. Ne-nun [Swuni-ka encey kulin kulim]-ul po-ass-ni?
 you-TOP Swuni-NOM when drew painting-ACC see-PAST-Q
 Lit. 'You saw [paintings [that Swuni drew when]]?'
 b. Ne-nun [Swuni-ka etieyse kulin kulim]-ul po-ass-ni?
 you-TOP Swuni-NOM where drew painting-ACC see-PAST-Q
 Lit. 'You saw [paintings [that Swuni drew where]]?'
 c. Ne-nun [Swuni-ka ettehkey kulin kulim]-ul po-ass-ni?
 you-TOP Swuni-NOM how drew painting-ACC see-PAST-Q
 Lit. 'You saw [paintings [that Swuni drew how]]?'
 d. *Ne-nun [Swuni-ka way kulin kulim]-ul po-ass-ni?
 you-TOP Swuni-NOM why drew painting-ACC see-PAST-Q
 Lit. 'You saw [paintings [that Swuni drew why]]?' (Chung 1991:241)

Tsai's instrument/manner distinction is not relevant here, since in (47c), answers for both readings ((48a) for the manner reading and (48b) for the instrument reading) are possible in appropriate contexts:

- (48) a. (Olay-tongan) chakunchakun kulin kulim.
 long-while methodically drew painting
 'A painting that she drew methodically (for a long time).'
 b. Mwulkam-kwa khureyyong-ulo kulin kulim.
 paint-CONJ crayon-with drew painting
 'A painting that she drew with paint and crayons.'

The manner reading of *ettehkey* is more natural in the following examples:

- (49) A: Ne-nun [[i kok-ul ettehkey yencwuha-nun] phianist]-ka
 you-TOP this music-ACC how play-PN pianist-nom
 cohu-ni?
 like-Q
 'What is the manner x such that you like [a pianist [that play this music in x]]?'
 B: Wuaha-ko maykkulepkey.
 graceful-CONJ smoothly
 Gracefully and smoothly.

- (i) [[Taroo-ga kimi-o doo toriatukatta] koto]-acc sonnani okotte iru no ka?
 Taroo-NOM you-ACC how treated fact-ACC so much angry are Q
 Lit. 'How are you so angry about the fact that Taro treated you t?'

- (50) A: Ne-nun [[pap-ul ettehkey mek-nun] salam]-i ceyil silh-uni?
 you-TOP meal-ACC how eat-PN person-NOM most dislike-Q
 ‘What is the manner x such that you dislikes [a person [that eats his meal in x]] most?’
 B: Keykelslepkey.
 ‘Devouringly.’

Examples (47c), (49) and (50) are problematic for the standard ECP account that adjuncts (nonnominal categories) cannot be extracted out of an island. The *wh*-word *ettehkey*, which is derived from the stative verb *etteh*- ‘be how’ with the verbal affix *-key*, is commonly assumed to be an adverb (or a stative verb in some constructions), and there is no indication that it is a nominal in category. Unlike *encey* ‘when’ and *eti(-ey)* ‘where’, which could be analyzed as a NP with an optional postposition *-ey*, as in Huang’s analysis of Chinese ‘when’ and ‘where’, *ettehkey* does not combine with any postpositional element.

On the other hand, as shown in (47d), *way* ‘why’ contrasts with all other *wh*-phrases with respect to its construal. The following (51-52) further exemplify this:

- (51) a.*Minho-nun [[ku-lul way kosoha-n] salam]-ul chac-ko iss-ni?
 Minho-TOP he-ACC why accuse-REL person-ACC look-for be-PST-Q
 ‘What is the cause x such that Minho is looking for [a person [that accused him for x]]?’
 b.*Minho-nun [[ku-lul way chac-ko iss-nun] salam]-ul
 Minho-TOP he-ACC why look-for is-REL person-ACC
 phihay tani-ni?
 avoid -Q
 ‘What is the cause x such that Minho is avoiding [a person [that is looking for him for x]]?’
- (52) a.*Ne-nun [[Minho-ka way cikcang-ul kumantu-ess-ta-nun] sosik]-ul
 you-TOP Minho-NOM why job-ACC quit-PST-DC-APP news-ACC
 tul-ess-ni?
 hear-PST-Q
 ‘What is the cause x such that you heard [news [that Minho quit his job for x]]?’

- b. *Ne-nun [[Minho-ka way ttena-ss-ta-nun] sasil]-ul al-key
 you-TOP Minho-NOM why ttena-PST-DC-APP fact-ACC know-COMP
 toy-ess-ni?
 become-PST-Q
 ‘What is the cause x such that you became aware [the fact [that Minho
 had left for x]]?’

Although these facts resemble the complex NP cases for which relevance of the ECP is claimed (e.g. (37) and (38)), there is some evidence that an ECP account (such as Huang’s, Lasnik & Saito’s and Tsai’s) is problematic.¹⁹ First, this kind of unacceptability often does not arise when *way* is contained with an embedded question as in (53) or an adjunct clause as in (54):

- (53) Ne-nun [Minho-ka way (sihem-eyse) ttel-e ci-ess-nunci](-ka)
 you-TOP Minho-NOM why exam-in fail become-PST-Q-sc nom
 kwungkumha-ni?
 wonder-Q
 ‘What is the cause x such that you wonder [if Minho failed (in the exam)
 for x]]?’
- (54) a. Ne-nun [Minho-ka way ttena-se] kipwun-i enccanh-ni?
 you-TOP Minho-NOM why leave-because feeling-NOM bad-Q
 ‘What is the cause x such that you feel bad [because Minho left
 for x]]?’
- b. [Minho-ka way ttena-ss-killay] salam-tul-i i solan-i-ni?
 Minho-NOM why leave-PST-because people-PL- NOM this fuss-be-Q
 ‘What is the cause x such that people make this fuss [because Minho left
 for x]]?’
- c. Ne-nun [Minho-ka ne-lul way coh-a ha-myen] coh-keyss-ni?
 you-TOP Minho-NOM you-ACC why like do-if good-PRESUMP-Q
 ‘What is the cause x such that you will feel good [if Minho likes you for x]]?’

¹⁹See Kuno & Takami 1993 (pp. 81-85) for some arguments against the ECP account of Lasnik & Saito (1984, 1992) with respect to Japanese examples.

- d. Ne-nun [Minho-lul way mos manna-ko] (ilehkey kunyang)
 you-TOP Minho-ACC why cannot meet-CONJ this-way just
 tol-a o-ass-ni?²⁰
 come-back-PST-Q
 ‘What is the cause x such that you (just) came back (this way) [after you
 couldn’t meet Minho for x]?’

Examples in (53) and (54) pose a problem for the standard ECP account, since such an account predicts that LF movement of *way* out of a *wh*-island or an adjunct clause is prohibited because antecedent government is blocked.

On the other hand, it is interesting to note that *way* in an adjunct clause that has a complex NP structure is still hard to construe.

- (55)?*Ne-nun [[Minho-ka way ttena-n] hwu]-ey kipwun-i
 you-TOP Minho-NOM why leave-REL afterward-at feeling-NOM
 enccanh-ass-ni?
 bad-PST-Q
 ‘What is the cause x such that you felt bad [after Minho left for x]?’

Second, even when *way* is embedded in a complement clause, construal of *way* exhibits contrasts, depending on the form of the clausal complement. In Korean, a sentential complement of verbs may take either a form with *-ko*, a complementizer element, or a ‘complex nominal form’ with *-(nu)n kes*. Some verbs such as *sayngkakha-* ‘think’, *chwuchukha-* ‘guess’, *kancwuha-* ‘consider’ and *malha-* ‘tell’ take only the *-ko* form of complements, and some other verbs such as *ic-* ‘forget’, *pwuinha-* ‘deny’, *hwuhoyha-* ‘regret’ and *molu-* ‘not know’ take only the *-(nu)n kes* form:

- (56) a. Ku-nun [Yenhi-ka ttena-ss-ta-ko] sayngkakhay-ss-ta.
 he-TOP Yenhi-NOM leave-PST-DC-COMP think-PST-DC
 ‘He thought that Yenhi left.’
 b.*Ku-nun [Yenhi-ka ttena-ss-ta-nun] kes-ul sayngkakhay-ss-ta.
 he-TOP Yenhi-NOM leave-PST-APP thing-ACC think-PST-DC
 ‘He thought that Yenhi left.’

- (57) a. *Ku-nun [Yenhi-ka ttena-ss-ta-ko] pwuinhay-ss-ta.
 he-TOP Yenhi-NOM leave-PST-DC-COMP deny-PST-DC
 'He denied that Yenhi left.'
- b. Ku-nun [Yenhi-ka ttena-ss-ta-nun] kes-ul pwuinhay-ss-ta.
 he-TOP Yenhi-NOM leave-PST-APP thing-ACC deny-PST-DC
 'He denied that Yenhi left.'

On the other hand, many verbs such as *mit-* 'believe', *hwaksinha-* 'strongly believe', *cwucangha-* 'maintain', *tanenha-* 'assert', *incengha-* 'admit', *kangcoha-* 'emphasize', *alko-iss-* 'be aware' and *kiekha-* 'remember' may take either form of sentential complement:

- (58) a. Ku-nun [Yenhi-ka ttena-ss-ta-ko] mit-nun-ta.
 he-TOP Yenhi-NOM leave-PST-DC-COMP believe-NONPST-DC
 'He believes that Yenhi left.'
- b. Ku-nun [[Yenhi-ka ttena-ss-ta-nun] kes]-ul mit-nun-ta.
 he-TOP Yenhi-NOM leave-PST-APP thing-ACC believe-NONPST-DC
 'He believes that Yenhi left.'
- (59) a. Ku-nun [Yenhi-ka ttena-ss-ta-ko] kiekha-n-ta.
 he-TOP Yenhi-NOM leave-PST-DC-COMP remember-NONPST-DC
 'He remembers that Yenhi left.'
- b. Ku-nun [[Yenhi-ka ttena-ss-ta-nun] kes]-ul kiekha-n-ta.
 he-TOP Yenhi-NOM leave-PST-APP thing-ACC remember-NONPST-DC
 'He remembers that Yenhi left.'

Matrix construal of embedded *way* is possible for the first group of verbs that only take a *-ko* form, but not the second group of verbs that only take a *-(nu)n kes* form:

- (60) Ku-nun [Yenhi-ka way ttena-ss-ta-ko] sayngkakha-ni?
 he-TOP Yenhi-NOM why leave-PST-DC-COMP think-Q
 'For what cause x, he thought that Yenhi left for x?'
- (61) *Ku-nun [[Yenhi-ka way ttena-ss-ta-nun] kes]-ul pwuinha-ni?
 he-TOP Yenhi-NOM why leave-PST-APP thing-ACC deny-Q
 'For what cause x, he denied that Yenhi left for x?'

Interestingly, for the third group of verbs, contrasts are exhibited depending on the form of sentential complements:

- (62) a. Ku-nun [Yenhi-ka way ttena-ss-ta-ko] mit-ni?
 he-TOP Yenhi-NOM why leave-PST-DC-COMP believe-Q
 'For what cause x, he believes that Yenhi left for x?'
 b. ?*Ku-nun [[Yenhi-ka way ttena-ss-ta-nun] kes]-ul mit-ni?
 he-TOP Yenhi-NOM why leave-PST-APP thing-ACC believe-Q
 'For what cause x, he believes that Yenhi left for x?'
- (63) a. Ku-nun [Yenhi-ka way ttena-ss-ta-ko] kiekha-ni?
 he-TOP Yenhi-NOM why leave-PST-DC-COMP remember-Q
 'For what cause x, he remembers that Yenhi left for x?'
 b. ?*Ku-nun [[Yenhi-ka way ttena-ss-ta-nun] kes]-ul kiekha-ni?
 he-TOP Yenhi-NOM why leave-PST-APP thing-ACC remember-Q
 'For what cause x, he remembers that Yenhi left for x?'

Moreover, sentential subjects with *(nu)n kes* form also exhibit difficulty in the matrix construal of *way*:

- (64) ?*[Yenhi-ka way casalhay-ss-ta-nun kes]-i meynghpaykha-ni?
 Yenhi-NOM why suicide-PST-DC-APP thing-NOM apparent-Q
 'For what cause x, it is apparent that Yenhi suicided for x?'
- (65) ?*[Ku cangkwan-i way mwullena-ss-ta-nun kes]-i
 the minister-NOM why resign-PST-DC-APP thing-NOM
 sinmwun-ey na-ss-ni?
 newspaper-in appear-PST-Q
 'For what cause x, it appeared in the newspaper that the minister resigned for x?'

Thus the contrast cannot be attributed to the differences between matrix verbs as in Tsai (i.e. verbs with nominal ([+N]) complement vs. verbs with nonnominal complements), but rather to the form of the complement itself.²¹

It should be noted that Tsai's reason/purpose distinction does not seem to play a role in Korean, since acceptability of the above examples is not affected by a reason/purpose reading of *way*. One more thing that should be taken into consideration

²¹Therefore, it also poses a problem on Song's (1995) proposal that Cattell's (1978) distinction between volunteered stance verbs and non-stance verbs are responsible in the availability of the matrix reading of *way* in Korean.

is that, just as in Chinese, the paraphrased form of *way*, viz. *mwusun iyu-lo* ‘for what reason’ does not exhibit the same kind of restrictions as *way*. The following examples illustrate this:

- (66) Minho-nun [[ku-lul mwusun iyu-lo kosoha-n] salam]-ul chass-ko
 Minho-TOP he-ACC what reason-for accuse-REL person-ACC look-for
 iss-ni?
 be-PST-Q
 ‘What is the reason x such that Minho is looking for [a person [that accused him for x]]?’
- (67) Ne-nun [[Minho-ka mwusun iyu-lo cikcang-ul kumantu-ess-ta-nun]
 you-TOP Minho-NOM what reason-for job-ACC quit-PST-DC-APP
 sosik]-ul tul-ess-ni?
 news-ACC hear-PST-Q
 ‘What is the reason x such that you heard [news [that Minho quit his job for x]]?’
- (68) Ku-nun [[Yenhi-ka mwusun iyu-lo ttena-ss-ta-nun] kes]-ul
 he-TOP Yenhi-NOM what reason-for leave-PST-APP thing-ACC
 pwuinha-ni?
 deny-Q
 ‘For what reason x, he denied that Yenhi left for x?’
- (69) Ku-nun [[Yenhi-ka mwusun iyu-lo ttena-ss-ta-nun] kes]-ul
 he-TOP Yenhi-NOM what reason-for leave-PST-APP thing-ACC
 mit-ni?
 believe-Q
 ‘For what reason x, he believes that Yenhi left for x?’
- (70) [Yenhi-ka mwusun iyu-lo casahay-ss-ta-nun kes]-i
 Yenhi-NOM what reason-for suicide-PST-DC-APP thing-NOM
 meynghaykha-ni?
 apparent-Q
 ‘For what reason x, it is apparent that Yenhi committed suicide for x?’

Given the examples that we have considered so far, we may hypothesize that what prevents *way* construal is a ‘complex nominal’ form of the embedded clause in which *way* is contained. Here a ‘complex nominal’ form refers to a structure involving a

nominal associated with a clause whose head verb ends with a prenominal ending $-(nu)n$. As this form appears in relative or appositive clauses, and nominal forms of sentential complements or subjects in Korean, it resembles Tsai's notion of nominal island, except that the nominality of a complement is determined by its own form rather than by the verb that subcategorizes for the complement.

However, there are at least two problems with this syntactic view. First, unlike the aforementioned examples containing a prenominal ending $-(nu)n$, examples with another prenominal ending $-(u)l$ seem to improve as the following (71) and (72) show:²²

- (71) Manhun salam-tul-i [[Minho-ka way ttena-l] kes]-ulo
 many people-PL-NOM Minho-NOM why leave-REL thing-as
 yeysangha-ni?
 expect-Q
 'For what cause x, do many people expect that Minho will leave for x?'
- (72) [[Ney-ka keki-ey way ka-ss-ul] ttay] pi-ka nayli-ess-ni?
 you-NOM there-at why go-PST-REL time rain-NOM come-down-PST-Q
 'For what cause x, it rained [when you went there for x]?'

If we take a purely syntactic approach in which *way* construal out of a 'complex nominal' form of a clause is prohibited, then examples like (71) and (72) cannot be explained since they also involve the same kind of structure.

Moreover, when *way* is contained in a clause ending with a nominalizer $-(u)m$, matrix construal of *way* is prohibited in general, even if there is no complex nominal structure involved.

²²Prenominal endings of verbs that are relevant here can be classified into two categories. Ones that appears in (51) constitute so-called relativizers *-un*, *-nun* and *-ul* that are attached to a bound verb stem (roughly referring to past time, present time and future time, respectively, with respect to reference time). The others that are used in (61-65) are attached to a free verb stem that contains tense and mood markers, and are found in appositive clauses or in noun complement clauses. (See Kim 1994 for further details of this distinction.)

- (73) *Ku-nun [Yenhi-ka way ttena-ss-um]-ul pwuinha-ni?
 he-TOP Yenhi-NOM why leave-PST-NML-ACC deny-Q
 ‘For what cause x, he denied that Yenhi left for x?’

Given these problems with a syntactic account, another possible approach is to make a semantic distinction among embedded clauses and try to isolate a semantic characteristic of the embedded clauses out of which *way* construal is prohibited. In this connection, Nam (1986) argues that when a verb takes a *-(nu)n kes* form or *-(u)m* form of embedded clause, the embedded clause is presupposed as a truth, unlike cases with a *-(u)l kes* or *-ki* (which is another nominalizer) form of complement. If this kind of distinction is assumed, then unacceptability of examples such as (61), (62b), (64) and (73) can be explained in terms of a factive island effect. However, a problem in this case is that examples involving relative clauses (e.g. (51)) or some noun complement clauses (e.g. (52a)) receive no accounts, since these clauses cannot be regarded as factive islands. Thus at this point, it seems difficult to provide a simple, unified solution as to when matrix construal of embedded *way* is prohibited. In any case, we have shown that the ECP fails to account for many of the facts presented here, and thus conclude that the ECP cannot be evidence for the existence of LF *wh*-movement in Korean.

5.2 *Wh*-scope in *wh*-in-situ languages

5.2.1 Quantifier storage and scope of *wh*-in-situ

In this section, we will consider how we can account for interrogative scope in *wh*-in-situ languages, based on our theory of operator scope developed in chapter 3-4. As we discussed in 4.1.2, we assume that the scope of a *wh*-phrase is determined by storage and retrieval of the interrogative operator associated with the *wh*-phrase. Unlike

syntactic *wh*-movement languages that require syntactic licensing for *wh*-retrieval, *wh*-scope of *wh*-in-situ languages is not determined by a left peripheral position of *wh*-phrases. In the discussion of syntactic *wh*-movement languages, the QUE feature played an important role in *wh*-retrieval, in that the nonempty QUE value of a left peripheral daughter licenses retrieval of a *wh*-operator, and in that inheritance of QUE can mark a clause as a syntactic question. Since such a syntactic licensing is not relevant in *wh*-in-situ languages, and pied-piping of *wh*-phrases does not exist in these languages, we can simply ignore the QUE feature. That is, we assume that the QUE feature is not employed in *wh*-in-situ languages.

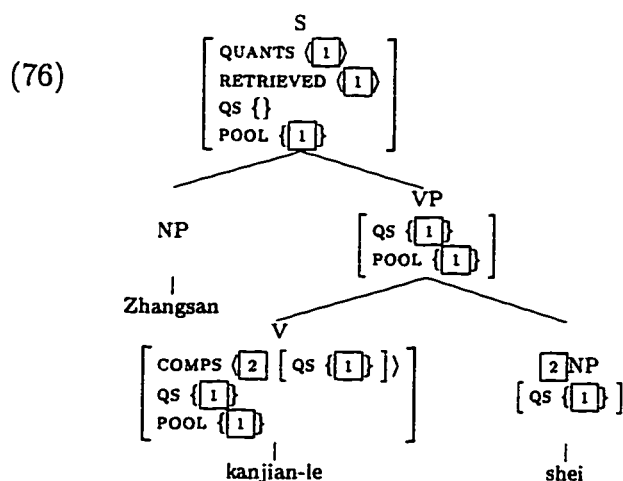
In some languages such as Chinese, *wh*-questions may be formed without employing any morphological or syntactic device. Consider the following Chinese example:

- (74) Zhangsan kanjian-le shei?
 Zhangsan see-ASP who
 'Who did Zhangsan see?'

The *wh*-question in (74) is exactly parallel to a declarative sentence in (75) that contains a QP in the place of the *wh*-phrase:

- (75) Zhangsan kanjian-le yige nuren.
 Zhangsan see-ASP one woman
 'Zhangsan saw a woman.'

Thus for Chinese-type *wh*-questions, it is not necessary to posit an additional constraint for *wh*-retrieval. As the operator associated with the phrase *shei* is stored in the QSTORE and POOL of the phrase, its inheritance and retrieval will be governed by the constraints proposed in chapter 3, but no others. Thus in our theory, the scope of the *wh*-phrase *shei* in (74) and that of the QP *yige nuren* (75) are determined in the same way.



Although *wh*-retrieval is governed by the same constraints as quantifier retrieval, when a *wh*-phrase is contained in a embedded clause, the possibility of *wh*-retrieval is restricted by the selectional restrictions of matrix verbs. In (77), *wh*-retrieval can occur only in the embedded clause since the matrix verb ‘ask’ requires that the CONT of its complement S be [MODE *question*]. (See 4.2 for selectional requirements of verbs.) On the other hand, in (78), retrieval at the matrix clause is the only possibility, since retrieval at the embedded clause will violate the selectional restriction of the verb ‘believe’.

- (77) [Zhangsan wen wo [shei mai-le shu]].
 Zhangsan ask I who buy-ASP book
 ‘Zhangsan asked who bought books.’ (Huang 1982:254)

- (78) [Zhangsan xiangxin [shei mai-le shu]]?
 Zhangsan believe who buy-ASP book
 ‘Who does Zhangsan believe bought books?’ (Huang 1982:254)

On the other hand, when a matrix verb can take either a declarative or interrogative clause, a *wh*-phrase in an embedded clause is expected to take either matrix or embedded scope. This prediction is born out as we can see in (79):

- (79) [Zhangsan zhidao [shei mai-le shu]](?)
 Zhangsan know who buy-ASP book
 a. 'Who does Zhangsan know bought books?'
 b. 'Zhangsan knows who bought books.' (Huang 1982:254)

Moreover, when more than one *wh*-phrase is contained in an embedded clause, a sentence becomes multiply ambiguous.

- (80) Ni xiang-zhidao [shei mai-le sheme](?)
 you wonder who buy-ASP what
 a. 'Who is the person x such that you wonder what x bought?'
 b. 'What is the thing x such that you wonder who bought x?'
 c. 'You wonder who bought what.' (Huang 1982:479)

Example (80) shows that either interrogative operator can have matrix or embedded scope as long as the selectional requirement of 'wonder' is satisfied. Thus it is possible for only one operator to be retrieved in the embedded clause while the other is retrieved in the matrix clause (in (80a,b)); alternatively, both operators can be retrieved in the embedded clause yielding (80c).

In some other languages such as Japanese and Korean, interrogative sentences are indicated by question markers. Thus while the Chinese example (79) can be interpreted either as a declarative or a question, in Japanese, embedded or matrix construal of a *wh*-phrase is determined by the presence of a question marker as in the following example:²³

- (81) a. Sinbun-wa [dare-ga erab-are-ta ka] tutae-te-i-mas -en.
 newspapers-TOP who-NOM elected-was Q report-is not
 'Newspapers do not report who was elected.'

²³ As Nishigauchi (1990:18) notes, in the matrix question in colloquial speech, the question marker *ka* may be replaced by a particle *no*, or even omitted altogether.

(i) Dare-ga kuru (no)?
 who-NOM come
 'Who's coming?'

- b. Sinbun-wa [dare-ga erab-are-ta to] tutae-te-i-masu -ka.
 newspapers-TOP who-NOM elected-was that report-is Q
 ‘Who do the newspapers report t was elected?’ (Nishigauchi 1990:9)

Therefore, in this type of languages, retrieval of *wh*-operators should be restricted only to clauses containing a question marker. In stating the relevant constraints, we see no reason to assume that question markers in various languages are a head of a single abstract category. Rather we assume that the exact form of the constraint can vary in accordance with how question markers are analyzed morphologically/syntactically in the language in question.

As for Japanese question markers, it seems to be controversial whether they are complementizers or verbal inflections. We do not propose a precise constraint for Japanese here, since the status of its question markers is not clear to us; however, if they are actually complementizers as is commonly assumed, then we would propose that *wh*-retrieval in Japanese is constrained by the interrogativity feature of a clause (or CP) that is inherited from its complementizer.²⁴ In the next section, we will look at some facts which suggest that Korean question markers are better analyzed as verbal inflections.

5.2.2 Question markers and *wh*-scope in Korean

In Korean, question markers play a central role in determining *wh*-scope. In transformational approaches, such question markers are typically analyzed as the head of a functional category (IP, CP, or M(ood)P, depending on analyses). Within traditional

²⁴See Johnson & Lappin (to appear) for the assumption that all languages employ a *wh*-complementizer (Q) whose SUBCAT and TO-BIND value specifications vary among languages. Under this approach, while languages with a question marker have a nonnull Q, many other languages without one (e.g. English) have a null head Q. See section 5.2.2 for some problems with assuming Korean question markers to be a head of a functional category.

grammars or within nonderivational frameworks, by contrast, they are usually treated as verbal suffixes.²⁵ Consider the following:

(82) Ne-nun [nwuka ttena-ss-ta-ko] al-ko iss-ni?
 you-TOP who left-PST-DC-COMP know is-Q
 'Who do you know left?'

(83) Ku-nun [nwuka ttena-ss-nunci] al-ko iss-ta.
 he-TOP who left-PST-Q know is-DC
 'He knows who left.'

Although the verb *al-ko iss* 'know' in (82-83) may take either a declarative or interrogative complement clause, in (82) only the matrix reading of the *wh*-phrase is possible, while in (83) only the embedded reading is available. Thus example (83) cannot be interpreted as '*Who does he know left?*'

Unlike the Japanese question marker *-ka*, whose status as either a verbal affix or a complementizer is controversial, there are some solid indications that question markers in Korean are actually verbal suffixes. Most of all, Korean question markers are in complementary distribution with other mood markers such as *-ta* (declarative), *-la* (imperative) and *-ca* (propositive). In addition, in embedded contexts, these mood markers can be followed by *-ko* which is generally analyzed as a complementizer.

(84) Nwuka ttena-ss-nya / Nwuka ttena-ss-ni?
 who leave-PST-Q who leave-PST-Q
 'Who left?'

(85) Ku-nun [nwuka ttena-ss-nya-ko] mwul-ess-ta.
 he-TOP who leave-PST-Q-COMP ask-PST-DC
 'He asked who left.'

(86) Yenhi-ka ttena-ss-ta.
 Yenhi-NOM leave-PST-DC
 'Who left?'

²⁵See Cho & Sells 1995 and Kim 1994, among others, for some arguments in favor of a lexical approach over a syntactic approach for various verbal endings in Korean.

- (87) Ku-nun [Yenhi-ka ttena-ss-ta-ko] sayngkakha-yss-ta.
 he-TOP Yenhi-NOM leave-PST-DC-COMP think-PST-DC
 'He thought that Yenhi left.'
- (88) Ttena-la!
 leave-IMP
 'Leave!'
- (89) Ku-nun Yenhi-eykey ttena-la-ko cisiha-yss-ta.
 he-TOP Yenhi-to leave-IMP-COMP order-PST-DC
 'He ordered Yenhi to leave.'
- (90) (Wuli) Ttena-ca.
 we leave-PROP
 'Let's leave.'
- (91) Ku-nun ttena-ca-ko ceyanha-yss-ta.
 he-TOP leave-PROP-COMP suggest-PST-DC
 'He proposed to leave.'

In a transformational approach that treats a mood marker and a complementizer element as heads of separate functional categories, examples like (85) are puzzling with regard to selectional properties of matrix verbs, since the selection is not local in manner (cf. Kim 1991). Namely, the verbs have to select an XP headed by the mood marker which is inside the CP headed by the complementizer.

In Korean, different forms of question markers in matrix sentences are employed largely based on pragmatic factors such as social relationship between the speaker and the addressee and style of speech, which is also nontypical for functional elements like complementizers. Although various forms of question markers can be used in both matrix and embedded clauses, some forms are highly restricted to either matrix or embedded clause except in certain speaker/addressee relationships. Moreover, question marker forms and their usages vary considerably depending on dialects. In standard Korean (the dialect of Seoul speakers), verbal endings such as *-(s)upnikka*, -

na, *-nya*, *-ni*, *-(n)unci*, *-(n)unka*, *-ci*, *-e*, and *-eyo* mark a question.²⁶ ²⁷ Among these endings, *-e*, and *-eyo* (with their phonological variants *-a* and *-ayo*, respectively) are used in an informal style, and serve as general mood markers that may indicate declarative, interrogative, or imperative.²⁸ The following examples in (92) illustrate such usage of *-e*. Different interpretations come from the context and intonations associated with the sentences.

- (92) a. *Minho-ka o-ass-e.*
 Minho-NOM come-PST-DC(informal)
 ‘Minho came.’
 b. *Minho-ka o-ass-e?*
 Minho-NOM come-PST-Q(informal)
 ‘Did Minho come?’
 c. *Ppalli chiwu-e!*
 quickly clean-up-IMP(informal)
 ‘Clean up quickly!’

In embedded questions, the ending *-(n)unci* is the most common, although *-(n)unka* or *-na* can be used in its place. The ending *-nya* is also used in embedded questions, but somewhat restrictively. When the complementizer *ko* is used in an embedded clause, only a subset of verbs taking interrogative complements can have the question marker *nya* for the complement.

- (93) a. *Yenhi-nun [nwuka ttena-ss-nunci]-(lul) mwul/ttaci-ess-ta.*
 Yenhi-TOP who leave-PST-Q-ACC ask/inquire-PST-DC
 ‘Yenhi asked/inquired who left.’

²⁶The alternations between *-nunci* & *unci* and *-nunka* & *unka* are determined by the stem. The forms *-unci* and *unka* are used after a nonpast stem form of an adjectival verb, psych verb or copula, while *-nunci* and *nunka* are used in other cases (i.e. after a nonadjectival verb stem or after a past form of adjectival, psych or copula verb stem).

²⁷Other question markers *-ulkka* and *-ullay* are associated with additional meanings. The marker *-ulkka* usually expresses the speaker’s uncertainty or presumption about the content of the question, and *-ullay* is used in polar questions to ask the addressee’s volition.

²⁸The form *-eyo* is a combination of *-e* and a discourse particle *-yo* that is used to express politeness or respect toward the addressee.

- b. Yenhi-nun [nwuka ttena-ss-nya-ko] mwul/ttaci-ess-ta.
Yenhi-TOP who leave-PST-Q-COMP ask/inquire-PST-DC
'Yenhi asked/inquired who left.'
- c. Yenhi-nun [nwuka ttena-ss-nya]-(lul) mwul/ttaci-ess-ta.
Yenhi-TOP who leave-PST-Q-ACC ask/inquire-PST-DC
'Yenhi asked/inquired who left.'
- d.*Yenhi-nun [nwuka ttena-ss-ta-ko] mwul/ttaci-ess-ta.
Yenhi-TOP who leave-PST-DC-COMP ask/inquire-PST-DC
'Yenhi asked/inquired who left.'
- (94) a. Na-nun [nwuka ttena-ss-nunci]-(ka) kwungkumha-ta.
I-TOP who leave-PST-Q-ACC wonder-DC
'I wonder who left.'
- b.*Na-nun [nwuka ttena-ss-nya-ko] kwungkumha-ta.
I-TOP who leave-PST-Q-COMP wonder-DC
'I wonder who left.'
- c. Na-nun [nwuka ttena-ss-nya]-ka kwungkumha-ta.
I-TOP who leave-PST-Q-NOM wonder-DC
'I wonder who left.'
- d.*Na-nun [nwuka ttena-ss-ta-ko] kwungkumha-ta.
I-TOP who leave-PST-DC-COMP wonder-DC
'I wonder who left.'
- (95) a. Yenhi-nun [nwuka ttena-ss-nunci]-(lul) a(l)/kiekha-n-ta.
Yenhi-TOP who leave-PST-Q-ACC know/remember-NONPST-DC
'Yenhi knows/remembers who left.'
- b.*Yenhi-nun [nwuka ttena-ss-nya-ko] a(l)/kiekha-n-ta.
Yenhi-TOP who leave-PST-Q-COMP know/remember-NONPST-DC
'Yenhi knows/remembers who left.'
- c. Yenhi-nun [nwuka ttena-ss-nya]-lul a(l)/kiekha-n-ta.
Yenhi-TOP who leave-PST-Q-ACC know/remember-NONPST-DC
'Yenhi knows/remembers who left.'
- d.*Yenhi-nun [nwuka ttena-ss-ta-ko] a(l)/kiekha-n-ta.
Yenhi-TOP who leave-PST-DC-COMP know/remember-NONPST-DC
'Yenhi knows/remembers who left.'
- e. Yenhi-nun [Minho-ka ttena-ss-ta-ko] a(l)/kiekha-n-ta.
Yenhi-TOP Minho-NOM leave-PST-DC-COMP know/remember-NONPST-DC
'Yenhi knows/remembers Minho left.'

One might suspect that the foregoing contrast arises from a requirement that embedded clauses followed by *-ko* be quoted sentences, the matrix verbs being reportorial; however, *-ko* cannot be always analyzed as a quotation ending, given various verbs that go with *-ko* marked complement clauses (e.g. *al-* ‘know’ and *kiekha-* ‘remember’). In embedded questions, there is difference between an indirect question marked by *-ko* and a quoted question, which is typically marked by *-lako* or *-hako* as in (96b,c):

- (96) a. Na-nun sensayng-nim-kkey [Minho-ka ttena-ss-nya]-ko yeccwue po-ass-ta.
 I-TOP teacher-HON-to Minho-NOM leave-PST-Q-COMP ask(hon.) try-PST-DC
 ‘I asked the teacher whether Minho left.’
 b#Na-nun sensayng-nim-kkey [Minho-ka ttena-ss-nya]-lako yeccwue po-ass-ta.
 I-TOP teacher-HON-to Minho-NOM leave-PST-Q-QUOT ask(hon.) try-PST-DC
 ‘I asked the teacher whether Minho left.’
 c. Na-nun sensayng-nim-kkey [Minho-ka ttena-ss-upnikka]-lako yeccwue po-ass-ta.
 I-TOP teacher-HON-to Minho-NOM go-PST-Q-QUOT ask(hon.) try-PST-DC
 ‘I asked the teacher whether Minho left.’

Example (96b) is not appropriate because of the wrong selection of the question marker in the quoted question: since the question is asked to a teacher, a respected (honored) person, the question marker should be an honorific form *-upnikka* as in (96c). On the other hand, in the indirect question in (96a), such an anomaly does not occur. Therefore, I will assume that *-ko* in (93b) as well as in other examples is a complementizer ending rather than a quotation ending.

In the examples that we have seen so far, the mood marker *-ta* is used only for declarative sentences, but not for questions. However, in embedded questions selected by verbs such as *malha-* ‘tell’, *kopaykha-* ‘confess’, *silthoha-* ‘confess’, *pokoha-* ‘report’ and *palkhi-* ‘reveal’, which can be characterized as report verbs, the marker *-ta* can be used as in (97d):

- (97) a. Yenhi-nun [nwuka o-ass-ess-nunci]-(lul) malhay/palkhi-ess-ta.
 Yenhi-TOP who come-PST-PST-Q-ACC tell/reveal-NONPST-DC
 'Yenhi told/revealed who had come.'
- b. *Yenhi-nun [nwuka o-ass-ess-nya-ko] malhay/palkhi-ess-ta.
 Yenhi-TOP who come-PST-PST-Q-COMP tell/reveal-NONPST-DC
 'Yenhi told/revealed who had come.'
- c. Yenhi-nun [nwuka o-ass-ess-nya]-lul malhay/palkhi-ess-ta.
 Yenhi-TOP who come-PST-PST-Q-ACC tell/reveal-NONPST-DC
 'Yenhi told/revealed who had come.'
- d. Yenhi-nun (tutie) [nwuka o-ass-ess-ta-ko]
 Yenhi-TOP at last who come-PST-PST-DC-COMP
 malhay/palkhi-ess-ta.
 tell/reveal-NONPST-DC
 'Yenhi (at last) told/revealed who had come.'
- e. Yenhi-nun [Minho-ka o-ass-ess-ta-ko] malhay/palkhi-ess-ta.
 Yenhi-TOP Minho-NOM come-PST-PST-DC-COMP tell/reveal-NONPST-DC
 'Yenhi told/revealed Minho had come.'

Embedded questions selected by this class of verbs are RI (resolving answer interrogative) complements, which are distinguished from QI (question interrogatives). Thus in (97d), the embedded clause is interpreted as RI.²⁹ Yet it should be noted that not all RI complements can have the marker *-ta*. As is shown in (95d), RI complements selected by verbs such as *al* 'know', *kiekha-* 'remember' and *kkaytat-* 'realize' cannot have the marker *-ta*. Thus the contrast should be accounted for by selectional properties of verbs. On the other hand, in QI (question interrogative) complements or in matrix questions, *-ta* is never used.

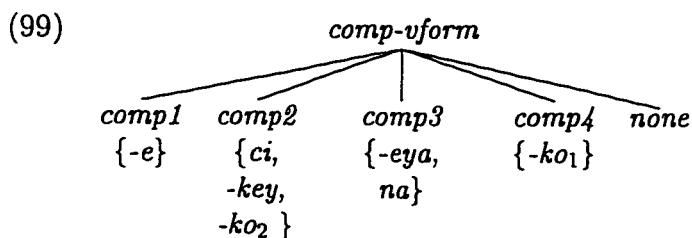
We now consider how to formalize the generalization that an interrogative clause is licensed by the presence of a question marker in the head verb. In order to represent Korean verb forms more effectively, I assume two VFORM attributes, M-VFORM and

²⁹The embedded clause in (97d) can also be interpreted as a declarative in which *nwuka* is used as an indefinite NP 'someone', not a *wh*-phrase.

C-VFORM as HEAD features as in (98):³⁰

$$(98) \quad \left[\text{HEAD} | \text{VFORM} \begin{bmatrix} \text{M-VFORM } \textit{mood-iform} \\ \text{C-VFORM } \textit{comp-iform} \end{bmatrix} \right]$$

The C-VFORM values represent verbal suffixes that are used when a verb or its projection is selected by a higher verb (e.g. auxiliary verbs, control verbs, or verbs with sentential complements) and further classified according to the stem they combine with. As shown in Chung (1995) and Kim (1994), it is useful to represent these affixes via VFORM values since a selecting verb requires a particular affix for the selected verb or VP.³¹ Essentially following Kim 1994, we assume the following sort hierarchy for *comp-iform*:³²



The complementizer ending *ko* in above examples is represented by the value *comp₄* (or *ko₁*) in (99).

³⁰This diverges from Kim 1994, wherein only complementizer affixes are represented as VFORM values. As we have seen, it is important to identify question markers (which are a kind of mood marker) in explaining semantic distinctions between declaratives and interrogatives and corresponding selectional restrictions in Korean.

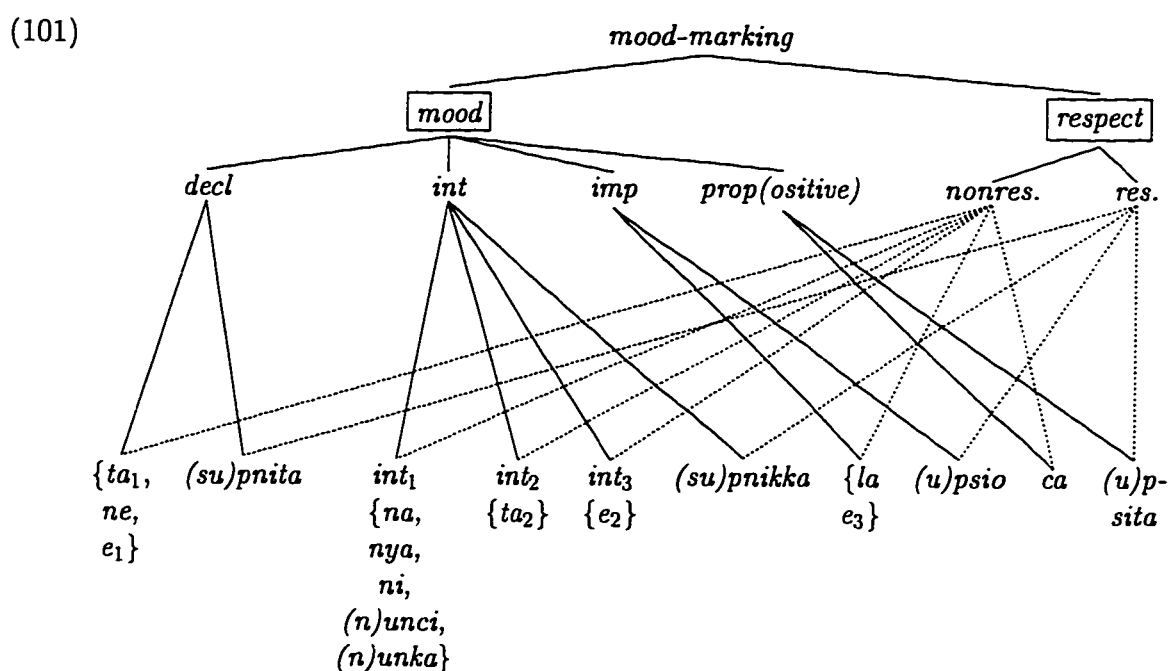
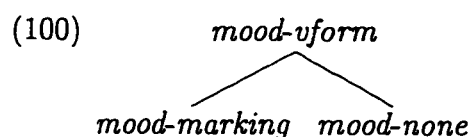
³¹Thus, for example, it accounts for the following (i):

(i) Ku-nun sakwa-lul mek-ci/*e/*ko/*eya anh-ass-ta.
 he-TOP apple-ACC eat-COMP don't-PST-DC
 'He didn't eat an apple.

³²The distinction of four subtypes of *comp-iform* is based on the kind of stem that they can be attached to. Given the basic template of Korean verbal morphology in (i), the maximally inflected stem that *comp₁*, *comp₂*, *comp₃*, and *comp₄* can respectively combine with is a passive/causative form, honorific form, tensed form, and mood-marked form (Kim 1994).

(i) Vroot - (Passive/Causative) - (Honorific) - (Tense) - Mood

We assume that various mood markers are also verbal suffixes in Korean (Cho & Sells 1995 and Kim 1994, among others), and are represented as M-VFORM values of verbs.



In (101), different mood markers are cross-classified with nonres.(nonrespect) vs. res.(respect) distinction, in order to reflect that the level of respect expressed towards the addressee determines the form of mood markers. Although the degree of respect can be graded into several different levels, a simplified distinction between [+Respect] and [-Respect] in Suh (1984) is adopted here.

In chapter 4, we posited the following constraints for interrogative clauses:

(102) *interrog* → [...|CONT|MODE *question*]

(103) *yes/no-int.* → [...|CONT|MODE *polar*]

$$(104) \text{ } wh\text{-}int. \rightarrow [\dots|CONT|MODE \text{ } wh]$$

$$(105) [\dots|MODE \text{ } wh] \leftrightarrow [\dots|ISSUE|QUANTS \langle ..wh\text{-}op.. \rangle]$$

In addition to these constraints, we assume that the following (106) holds for Korean:³³

(106) (For Korean)

$$[MODE \text{ } question] \rightarrow [M\text{-}VFORM \text{ } int]$$

In (101), the sort int_2 (ta_2) is posited as a subsort of int in order to account for examples like (97d). As the use of ta in a question is limited to an embedded clause (that is selected by a certain group of verbs), the following constraint needs to be added:

$$(107) \text{ } root\text{-}int. \rightarrow [M\text{-}FORM \neg int_2]$$

Let us now consider the examples in (93)-(97). The complementizer *ko* is assumed to be a verbal ending (Cho & Sells 1995 and Kim 1994), and represented by the C-VFORM value ko_1 ($comp_4$). Among various mood markers, only certain forms can be used with the complementizer in an embedded clause. For example, in an embedded question, question markers *na*, *ni*, *nunci* and *nunka* are not used with *ko*:

- (108) Yenhi-nun [nwuka ttena-ss-nya/*na/*ni/*nunci/*nunka-ko]
 Yenhi-TOP who leave-PST-Q-COMP
 mwul/ttaci-ess-ta.
 ask-PST-DC
 ‘Yenhi asked/inquired who left.’

³³Likewise, other MODE values in the CONTENT are associated with appropriate M-VFORM values by (i) and (ii):

$$(i) [MODE \text{ } assertion] \rightarrow [M\text{-}VFORM \text{ } decl]$$

$$(ii) [MODE \text{ } command] \rightarrow [M\text{-}VFORM \text{ } imp \vee prop]$$

This restriction is captured by the following (109):

$$(109) \left[\text{C-VFORM } comp_4 \right] \rightarrow \left[\text{M-VFORM } ta_1 \vee nya \vee ta_2 \vee la \vee ca \right]$$

The selectional restrictions exhibited in (93)-(97) are represented in the lexical entries of verbs.

(110) *mwut*- ‘ask’

$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{M-VFORM } int_1 \\ \text{C-VFORM } ko_1 \vee none \\ \text{CONT } \boxed{2} [\text{MODE } question] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} ask \notin RI \\ ER \boxed{1} \\ SOA-ARG \boxed{2} \end{array} \right] \end{array} \right]$$

(111) *kwungkumha*- ‘wonder’

$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{M-VFORM } int_1 \\ \text{C-VFORM } none \\ \text{CONT } \boxed{2} [\text{MODE } question] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} wonder \notin RI \\ ER \boxed{1} \\ SOA-ARG \boxed{2} \end{array} \right] \end{array} \right]$$

(112) *kiekha*- ‘remember’

a.
$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{C-VFORM } ko_1 \\ \text{CONT } \boxed{2} [\text{MODE } assertion] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} remember \\ ER \boxed{1} \\ SOA-ARG \boxed{2} \end{array} \right] \end{array} \right]$$

b.
$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{M-VFORM } int_1 \\ \text{C-VFORM } none \\ \text{CONT } \boxed{2} [\text{MODE } question] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} remember \in RI \\ ER \boxed{1} \\ SOA-ARG \boxed{2} \end{array} \right] \end{array} \right]$$

(113) *malha-* ‘tell’

- a.
$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{C-VFORM } ko_1 \\ \text{CONT } [2] [\text{MODE } \textit{assertion}] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} \textit{tell} \\ \text{ER } [1] \\ \text{SOA-ARG } [2] \end{array} \right] \end{array} \right]$$
- b.
$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{M-VFORM } int_1 \\ \text{C-VFORM } none \\ \text{CONT } [2] [\text{MODE } \textit{question}] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} \textit{tell} \in RI \\ \text{ER } [1] \\ \text{SOA-ARG } [2] \end{array} \right] \end{array} \right]$$
- c.
$$\left[\begin{array}{l} \text{COMPS } \langle \text{S} \left[\begin{array}{l} \text{M-VFORM } int_2 \\ \text{C-VFORM } ko_1 \\ \text{CONT } [2] [\text{MODE } \textit{question}] \end{array} \right] \rangle \\ \text{CONT|NUC } \left[\begin{array}{l} \textit{tell} \in RI \\ \text{ER } [1] \\ \text{SOA-ARG } [2] \end{array} \right] \end{array} \right]$$

5.2.3 Ambiguity between a quantifier and *wh*-reading

It is well known that *wh*-phrases in Korean such as *nwukwu* ‘who’, *mwues* ‘what’, *encey* ‘when’, *eti(ey)* and *ettehkey* can also be interpreted as indefinite NPs meaning ‘someone’, ‘something’, ‘sometime’, ‘somewhere’ and ‘somehow’, respectively.³⁴ The following (114) exemplifies this:

- (114) *Minho-ka nwuku-lul manna-ss-ta.*
 Minho-NOM someone-ACC meet-PST-DC
 ‘Minho met someone.’

Moreover, we have seen that interrogative endings in Korean may license either polar or *wh*-questions. Thus when these words are used in a sentence with an in-

³⁴However, when the ending *-nka* is attached to these words (e.g. *nwukunka*, *mwuenka*, and *enceynka*), only indefinite NP meanings are available.

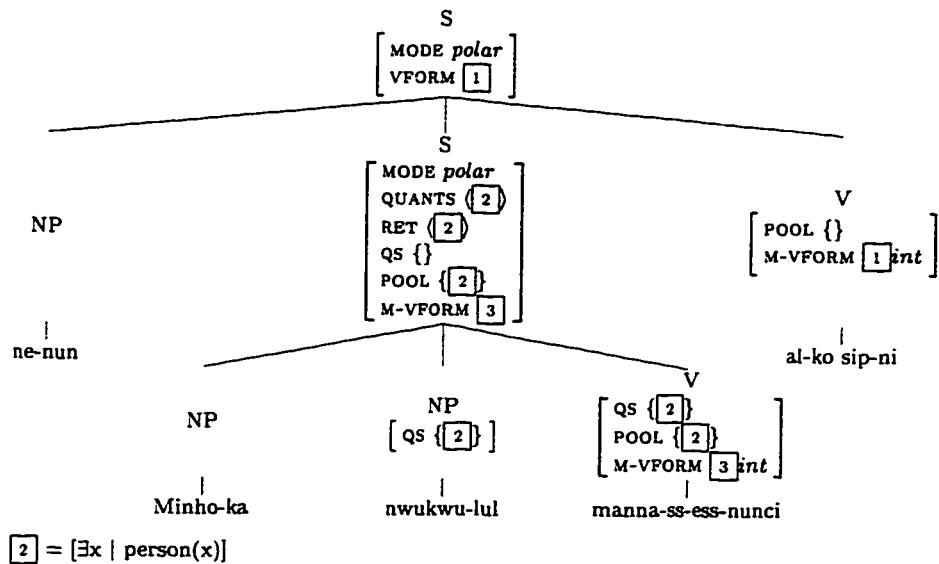
interrogative ending, it yields an ambiguity between a polar question and *wh*-question interpretation as in (115)-(116):

- (115) *Minho-ka nwuku-lul manna-ss-ni?*
 Minho-NOM someone-ACC meet-PST-Q
 a. 'Did Minho meet someone?'
 b. 'Who did Minho meet?'
- (116) *Na-nun [Minho-ka ecey nwukwu-lul manna-ss-ess-nunci]-(lul)*
 I-TOP Minho-NOM yesterday who-ACC meet-PST-PST-Q-ACC
al-ko sip-ta.
 know want-DC
 a. 'I want to know whether Minho met someone yesterday.'
 b. 'I want to know who Minho met yesterday.'
- (117) *Ne-nun [Minho-ka (ecey) nwukwu-lul manna-ss-ess-nunci]-(lul)*
 you-TOP Minho-NOM yesterday who-ACC meet-PST-PST-Q-ACC
al-ko sip-ni?
 know want-Q
 a. 'Do you want to know whether Minho met someone (yesterday)?'
 b. 'Do you want to know who Minho met (yesterday)?'
 c. Lit. 'Who do you want to know whether Minho met (yesterday)?'

In our theory, such ambiguities can be represented straightforwardly. In (117), when the phrase *nwukwu* is interpreted as an indefinite NP, the existential quantifier associated with it will be stored and retrieved in the usual manner. As both embedded and matrix clauses have interrogative verb form, their *CONT|MODE* is *interrogative*, more specifically *polar*. The value cannot be *wh*, due to the constraint (105). Thus the reading in (117a) is analyzed as in (118):³⁵

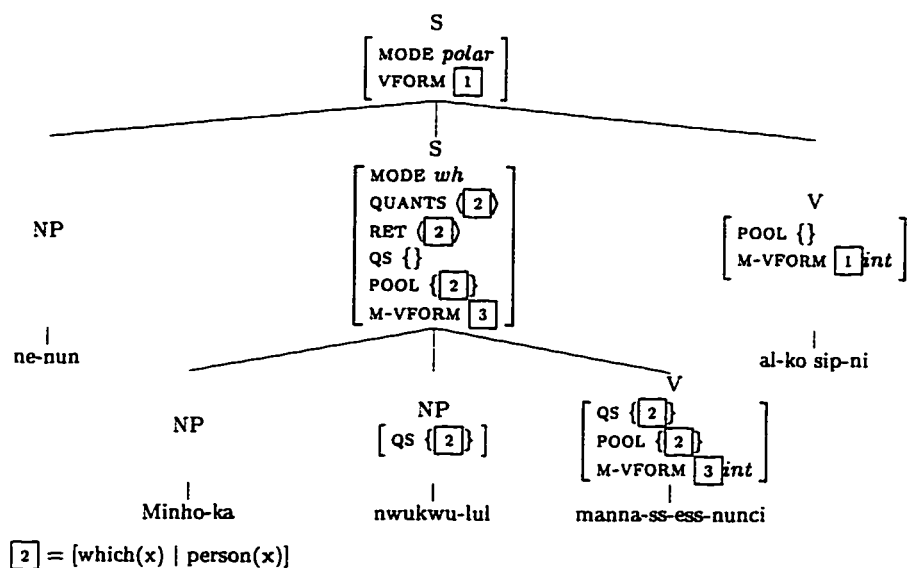
³⁵In (118) the existential quantifier can be retrieved at the higher S to yield a wide scope reading. While this reading is hard to get in this particular example, it seems to be obtained more easily with *enu* 'which' phrase such as *enu yehaksayng* 'which female student'.

(118) narrow scope with an indefinite NP reading

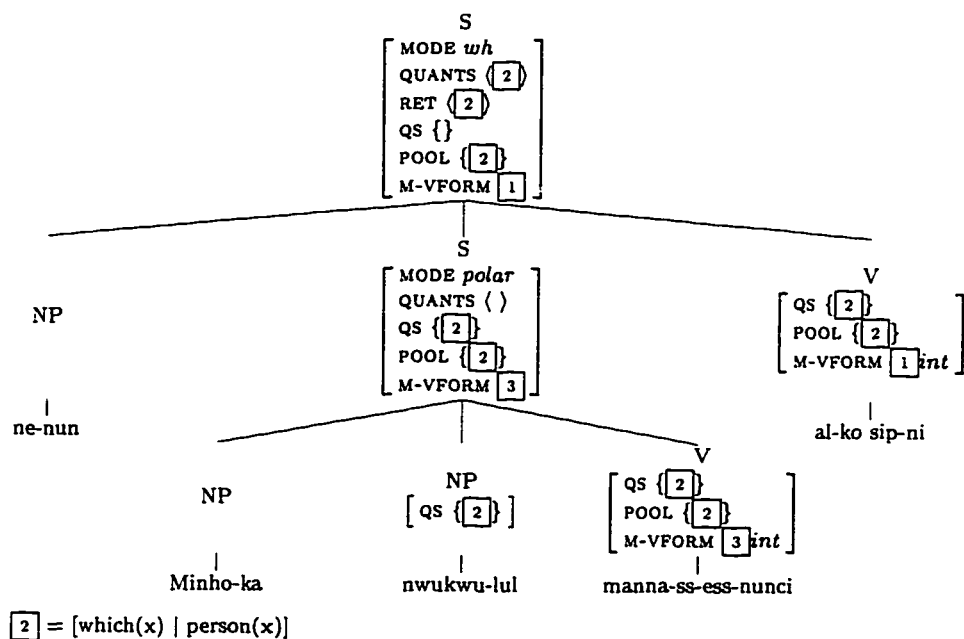


On the other hand, when the phrase *nwukwu* is interpreted as a *wh*-phrase, there are two possibilities. When the *wh*-phrase takes narrow scope, the CONT|MODE of the embedded clause is *wh* and that of the matrix clause is *polar*, again being governed by (105). When the *wh*-phrase take wide scope, the CONT|MODE of the matrix clause will be *wh*. These two readings, (117b) and (117c), are analyzed in (119) and (120), respectively.

(119) narrow scope with the *wh*-reading



(120) wide scope with the *wh*-reading



CHAPTER 6

QUANTIFIERS IN CONSTITUENT QUESTIONS

6.1 Amount *Wh*-Phrases

Amount *wh*-phrases such as *how many cars* exhibit an interesting scope ambiguity that does not occur with other *wh*-phrases. When an ordinary *wh*-phrase such as *which car* is fronted from a semantically opaque context, the resulting *wh*-question does not exhibit a scope ambiguity as long as there are no other quantificational elements or operators. This contrasts with the example with an ordinary QP in (2):

- (1) a. Which car does Mary think Bill likes?
b. ‘For what car *x* does Mary think Bill likes *x*?’
- (2) a. Mary thinks Bill likes a sports car.
b. There exists a sports car *x* that Mary thinks Bill likes. (*de re*)
c. Mary thinks there exists a sports car *x* that Bill likes. (*de dicto*)

On the other hand, the same type of example with an amount *wh*-phrase exhibits *de re/de dicto* ambiguity as in (3):¹

¹This example was first brought into my attention by Carl Pollard. I owe him much of the following discussions of this example.

- (3) a. How many books does Mary think Bill read?
 b. ‘For what number n do there exist n books that Mary thinks Bill read?’
 c. ‘For what number n does Mary think there exist n books that Bill read?’

In the *de re* reading in (3b), there is a specific group of books whose cardinality is n such that Kim thinks that Bill read the books in that group, and the speaker wonders what the number n is. On the other hand, in the *de dicto* reading in (3c), Mary thinks that Bill read n books although she doesn’t necessarily know what particular (group of) books Bill read, and the speaker asks about the number n .

The same ambiguity occurs in the corresponding Korean example.

- (4) a. Mary-nun [Bill-i myech kwen-uy chayk-ul
 Mary-TOP Bill-NOM how many volume-GEN book-ACC
 ilk-ess-ta-ko sayngkakha-ni?
 read-PST-DC-COMP think-Q
 ‘How many books does Mary think Bill read?’
 b. ‘For what number n do there exist n books that Mary thinks Bill read?’
 c. ‘For what number n does Mary think there exist n books that Bill read?’

In Fiengo *et al.* (1988), the same kind of scope property of *how many* phrases is pointed out in the following examples:

- (5) How many students has every professor taught? (Fiengo *et al.* 1988:86)
 (6) How many students does every professor believe he has taught? (Fiengo *et al.* 1988:87)

Fiengo *et al.* note that in these examples, “the NP *how many students* actually contains two operators: a [+wh] operator ranging over numbers (e.g. 1, ..., n), and a

[-wh] existential quantifier ranging over individual students". They argue that the two operators must be distinguished, since *every professor* may have scope between the [+wh] operator and the [-wh] existential quantifier, i.e. scope narrower than the [+wh] operator and wider than the existential quantifier. Both (5) and (6) can be answered with a number, say 76. With this answer, the natural reading in (5) is that every professor has each taught 76 students, but not the same 76 students for each professor, and the one in (6) is the *de dicto* reading that every professor believes that there are 76 students that he has taught.² Based on this observation, they suggest the following (7) for the LF representation of the relevant reading in (6):

- (7) (For which x: x a number)(For every y: y a professor)(y believes that (for x-many z: z a student)(y has taught z))

They observe that in this case, the quantifier ranging over individual students takes narrower scope than the syntactic position that it occurs, and argue that in a theory wherein scope is defined in terms of a c-commanding domain, this provides evidence for a quantifier lowering operation such as May's (1977).

Actually, examples (5) and (6) have other readings wherein *every professor* takes scope over the *wh*-phrase *how many students*. This kind of reading will be discussed in 6.2. The reading that we are interested in here is perhaps more natural in (8) and the corresponding Korean example (9).

- (8) How many correct answers must everyone get in order to pass?

²A less natural reading will be, of course, that there is a specific group of 76 students that every professor (believes that he) has taught.

- (9) Hapkyekha -lyemyen nwukwuna (ceketo) myech kay-uy
 pass -in-order-to everyone at-least how-many item-GEN
 tap-ul macchwu-eya ha-ni?
 answer-ACC get should-do-Q
 ‘How many correct answers should everyone get (at least) in order to pass?’

In (8) and (9), the most natural reading is that there is a certain (minimum) number, say 19, such that every examinee must get that number of correct answers. Under normal circumstances, each examinee will have correct answers for a different subgroup of questions in the exam. Thus the universal quantifier takes scope between the *wh*-operator and the existential quantifier associated with *correct answers*.³

Although Fiengo *et al.*’s observation that *how many* phrases involve two operators gives us a correct characterization of the scope properties in these examples, it is questionable whether a detailed analysis can be worked out based on their suggestion described above. Presumably, one may consider the lowering movement of *students* at LF, as in (10); however, it is not clear how the LF in (9) can be acquired by quantifier lowering.⁴

- (10) [[How many e_1]₂ [every professor₃ [e_3 believes [that [students₁ [he₃ has taught e_2]]]]]]]

³It should be noted that this reading of (9) constitute a counterexample for the claim that a *wh*-phrase cannot take scope over a c-commanding QP (Hoji 1985, Kim 1991, Lasnik & Saito 1992, and Aoun & Li 1993), since only the *wh*-operator part of the *wh*-phrase outscopes the QP. This shows that operator scope interaction cannot be constrained by simply stating a condition between two (or more) phrases in the surface structure.

⁴Actually, the LF form in (7) itself is questionable, since it introduces a quantifier whose determiner contains a variable.

Crucially, in a structure like (10), the empty category e_1 is problematic, since it violates the ECP (and the PCC in May 1985).^{5 6}

Pollard (p.c.) independently observes that decomposition of quantifiers associated with *how many* phrases (viz. into a *wh*-operator and an existential quantifier) is necessary in order to explain the ambiguity in (3). Pollard (1989) shows that such a decomposition analysis is also motivated by scope properties of comparative cardinality NPs (e.g. *more than five students*), and discusses how decomposed quantifiers can be logically represented.

Pollard (1989) begins with the assumption that collective and mass entities and quantifiers are contained in the model as individuals representing quantities.⁷ He observes that under this assumption, the usual generalized cardinality quantifiers can be realized as existential quantifiers, as in (11) and (12):⁸

(11) a. Five men sneezed.

b. $[(\exists x (\text{men}(x) \ \& \ \text{meas}(x) \geq 5)) \text{ sneeze}(x)]$

(12) a. Five men met.

b. $[(\exists x (\text{men}(x) \ \& \ \text{meas}(x) \geq 5)) \text{ met}(x)]$

In (11b) and (12b), 'meas' is a unary function symbol that is used to represent the measures of quantities. Thus for example, if x is a group of five men, then

⁵In May 1985, *students* may first adjoin to the *how many* phrase in the COMP and then lowered, but this also violates the PCC.

⁶In that the empty category left behind by the lowering is an \bar{A} position, this case is different from lowering in raising verb constructions discussed in May (1977, 1985). May 1985 argues that the empty category created by lowering in a raising construction is an expletive.

⁷In that collective and mass entities are treated as individuals, not sets of individuals, this assumption resembles Link (1983). In addition to these entities, Pollard assumes that "degrees" (e.g. 3 feet, two liters) are also contained in the model.

⁸See also Kadmon (1985) for the proposal that noun phrases with numeral quantifiers (e.g. *four chairs*, *three fish*) can be treated as a singular indefinites.

$meas(x)$ denotes the integer 5. Unlike in (12a), *five men* in (11a) receives a distributive interpretation, and we can assume that this is a consequence of the meaning of a distributive predicate itself. (See Roberts (1990:94) for discussions in favor of this view.)

Pollard further proposes that a more complex example like (13a), which can be rendered as (13b) using an existential group quantifier, be represented as in (13c) using two existential quantifiers that range over an integer scalar and a group, respectively:⁹

- (13) a. More than five consultants work.
 b. $[(\exists x (\text{consultants}(x) \ \& \ \text{meas}(x) > 5)) \ \text{work}(x)]$
 c. $[(\exists n (n > 5)) [(\exists y (\text{consultants}(y) \ \& \ \text{meas}(y) \geq n)) \ \text{work}(y)]]$

Carl Pollard (in his p.c. with Shalom Lappin, Nov. 12, 1996) argues that this kind of decomposition is also motivated by examples like the following:

- (14) a. Mary wants to read a prime number of books.
 b. ‘There is a group of books x of prime cardinality such that Mary wants to read x .’
 c. ‘Mary would like it to be the case that there is a group of books x of prime cardinality such that she reads x .’

⁹Pollard finds a motivation for such a double quantifier analysis in the following ‘comparative subdeletion’ example:

(i) John believes that more consultants work than (consultants) actually do work.

Example (i) has, among others, a reading, ‘there is a specific number n which exceeds the number of actual working consultants, and John believes that n consultants work’, which is represented as follows:

(ii) $[(\exists n [(\forall m [(\exists x (\text{consultants}(x) \ \& \ \text{meas}(x) \geq m)) \ \text{work}(x)]) \ n > m]) \ \text{believe}(j, [(\exists y (\text{consultants}(y) \ \& \ \text{meas}(y) \geq n)) \ \text{work}(y)])]$.

- d. 'There is a prime number n such that Mary would like it to be the case that there is a group of books x of cardinality n such that she reads x .'

The reading that we are interested in is the one in (14d), and in order to get this reading, the cardinality quantifier part must be separated from the existential (group) quantifier. This can be represented as (15), by positing two existential quantifiers.¹⁰

$$(15) \quad [(\exists n (\text{prime}'(n))) \text{want}'(m) [(\exists x (\text{books}'(x) \ \& \ |x| = n)) \text{read}'(m, x)]]$$

The reading (15) can be obtained, for example, when there is a specific number (say 7) such that Mary set a goal to read that many books (even without realizing that the number is a prime number), but she does not have any specific group of books in mind. Thus the cardinality quantifier gets a *de re* interpretation while the group quantifier gets a *de dicto* interpretation.

Concomitantly, the two readings of (3) can be represented as follows, employing two operators, i.e. a *wh*-operator ranging over a number and an existential quantifier ranging over a group:

- (16) a How many books does Mary think Bill read?

$$b. \quad [(\text{which } n (\text{number}'(n))) [(\exists x (\text{books}'(x) \ \& \ |x| = n)) \text{think}'(m, ([\text{read}'(b, x)]))]]$$

$$c. \quad [(\text{which } n (\text{number}'(n))) \text{think}'(m, ([(\exists x (\text{books}'(x) \ \& \ |x| = n)) \text{read}'(b, x)]))]$$

It should be noted that the ambiguity in (16) is similar to the *de re/de dicto* ambiguity observed for the following (17):

- (17) a Mary thinks Bill read 5 books.

¹⁰As our discussion is limited to cardinality quantifiers, instead of the more inclusive functional symbol 'meas', we hereafter use the notation '|x|' to represent the cardinality of x .

b. $[(\exists x (\text{books}'(x) \ \& \ |x| = 5)) \text{think}'(m, ([\text{read}'(b,x)]))]$

c. $[\text{think}'(m, ([(\exists x (\text{books}'(x) \ \& \ |x| = 5)) \text{read}'(b,x)]))]$

Likewise, the *de dicto* reading of (6) can be represented as in (18):¹¹

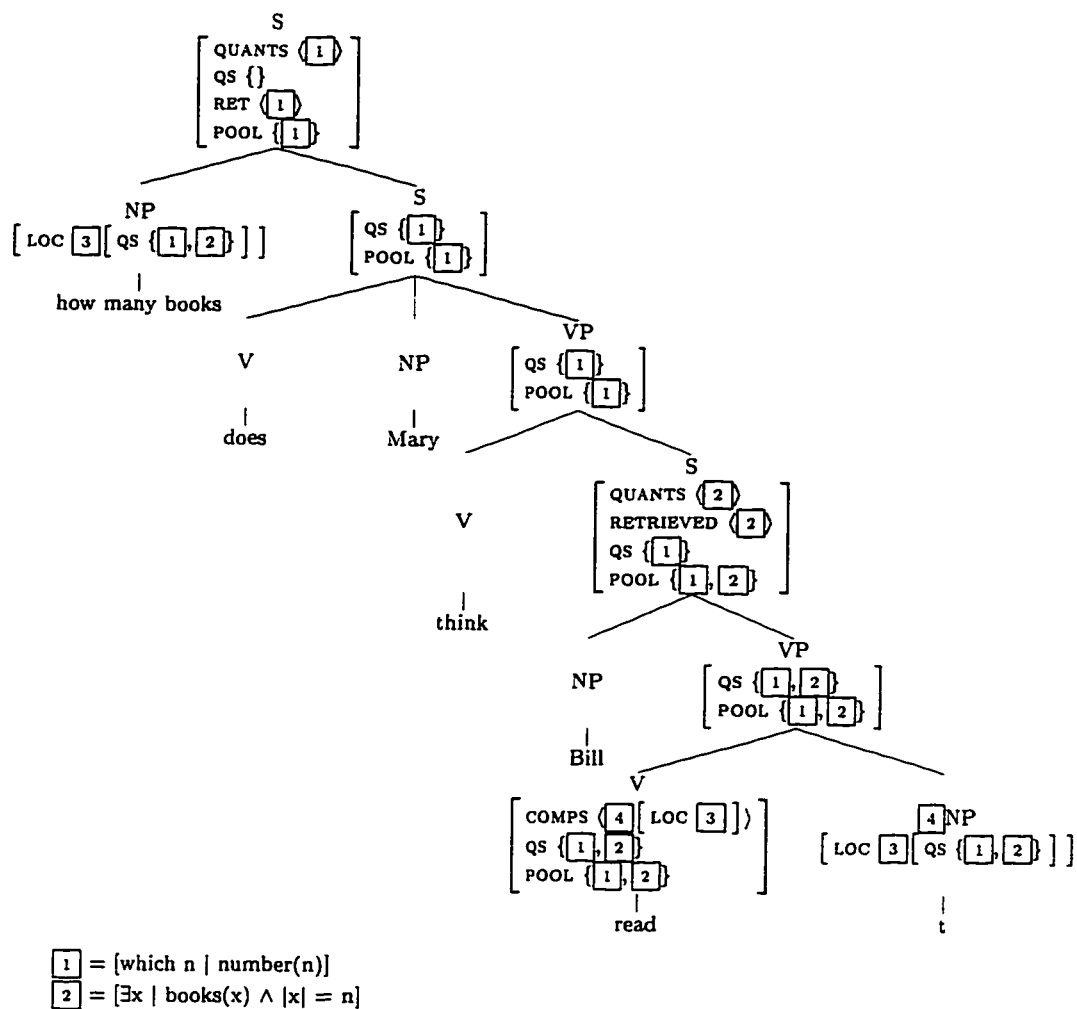
(18) a. How many students does every professor believe that he has taught?

b. $[(\text{which } n (\text{number}'(n))) (\forall y (\text{professor}'(y)) \text{believe}'(y, ([(\exists x (\text{students}(x) \ \& \ |x| = n)) \text{has-taught}'(y,x)])))]$

Let us now consider how the readings in the above examples are generated in our theory. We have seen that these examples may involve a syntax-semantics mismatch, in that the existential (group) quantifier may take a narrower scope than its syntactic position. We have also pointed out that this poses a problem for a movement-based analysis. By contrast, in our theory, no additional mechanism is needed in order to achieve the desired quantifier lowering effect. This is because we assume that quantifiers associated with an argument also appear in the POOL of the lexical head that “selects” the argument. (Cf. 3.2.1 and 3.2.3.) Therefore, the two operators originating from *how many* phrases appear in the POOL and QSTORE of the lower verbs in (16a) and (18a). Then the narrow scope readings in (16c) and (18b) are achieved by retrieving the existential quantifier at the lower clause and the *wh*-operator at the higher clause. The following (19) is a diagram representing the narrow scope reading of (16c):

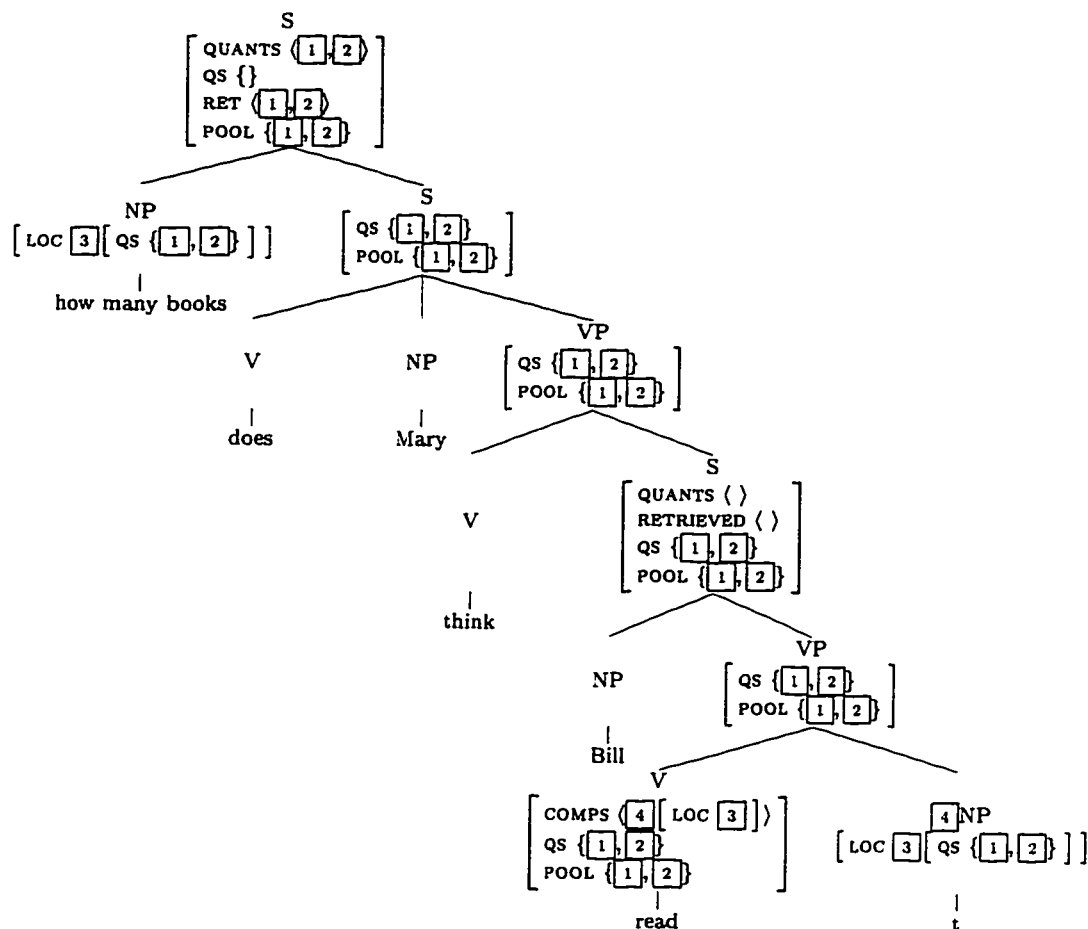
¹¹In (16a) and (18a), the reading wherein the existential quantifier have wide scope over the *wh*-operator is not logically possible, since it will contain an unbound variable. In our theory, this is prohibited by the Quantifier Binding Condition (cf. Chapter 3).

(19) Narrow scope reading



On the other hand, the wide scope reading in (16b) is obtained by retrieving both the *wh*-operator and the existential quantifier at the higher clause, as in (20):

(20) Wide scope reading



6.2 Remarks on *Wh*/Quantifier Scope Interaction

In the previous section, we discussed examples like (5) and (6) wherein the *wh*-operator takes wide scope over the universal quantifier. In our analysis, this is indicated in the CONT, by the order of the operators in the QUANTS list. The following examples also have readings that involve such order of operator retrieval :

(21) What movie does every kid (in the class) like?

(22) a. *Lion King*.

b. Sally likes the *Little Mermaid*, Tom likes *Aladdin*,...

When the *wh*-operator takes scope over the universal quantifier, its CONT value is represented as (23), and (21) is interpreted as a question asking the identity of the movie that all the kids in the class like. Thus it can be answered by (22a).

$$(23) \left[\begin{array}{l} \text{prop-obj} \\ \text{MODE } wh \\ \text{ISSUE} \left[\begin{array}{l} \text{psoa} \\ \text{QUANTS} \left\langle \begin{array}{l} \boxed{2} \left[\begin{array}{l} \text{quantifier} \\ \text{DET } which \\ \dots | \text{IND } \boxed{1} \end{array} \right] , \begin{array}{l} \boxed{4} \left[\begin{array}{l} \text{quantifier} \\ \text{DET } forall \\ \dots | \text{IND } \boxed{3} \end{array} \right] \end{array} \right\rangle \\ \text{NUC} \left[\begin{array}{l} \text{like} \\ \text{LIKER } \boxed{3} \\ \text{LIKED } \boxed{1} \end{array} \right] \end{array} \right] \end{array} \right]$$

In our theory, since the order of operator retrieval from the POOL is basically free at a given node, there is another CONT value available for (21), wherein the universal quantifier takes scope over the *wh*-operator.

$$(24) \left[\begin{array}{l} \text{prop-obj} \\ \text{MODE } wh \\ \text{ISSUE} \left[\begin{array}{l} \text{psoa} \\ \text{QUANTS} \left\langle \begin{array}{l} \boxed{4} \left[\begin{array}{l} \text{quantifier} \\ \text{DET } forall \\ \dots | \text{IND } \boxed{3} \end{array} \right] , \begin{array}{l} \boxed{2} \left[\begin{array}{l} \text{quantifier} \\ \text{DET } which \\ \dots | \text{IND } \boxed{1} \end{array} \right] \end{array} \right\rangle \\ \text{NUC} \left[\begin{array}{l} \text{like} \\ \text{LIKER } \boxed{3} \\ \text{LIKED } \boxed{1} \end{array} \right] \end{array} \right] \end{array} \right]$$

In (24), the mode value is *wh*, but the universal quantifier has wide scope over a *wh*-operator, thus yielding a “family of questions” interpretation in May’s (1985) terms. The CONT value (24) for the question (21) leads to the other type of answer as in (22b).

Likewise, our theory predicts that the following example (25a) is ambiguous, thus both answers in (25b,c) being felicitous:

- (25) a. Who recommended every candidate?
b. The chairman did.
c. Prof. Rayner recommended Sally, Prof. Curry recommended John ...

May (1985) claims that in the following set of examples, which is parallel to the pair of (21) and (25a), only (26) has a “family of questions” interpretation, and that the wide scope of the universal quantifier in (27) must be prohibited on syntactic grounds.

- (26) What did everyone buy for Max?
(27) Who bought everything for Max?

The existence of such an asymmetry has been accepted in much subsequent literature, and various syntactic conditions have been imposed in order to explain it. In May (1985), the condition that is responsible is the Path Containment Condition of Pesetsky (1982), which May proposes to replace the ECP. In Aoun & Li (1993), it is the Minimal Binding Requirement that blocks the wide scope of a quantifier over a *wh*-subject.¹² In Chierchia (1993), it is explained as an instance of weak crossover.

However, contrary to May’s claim, when more examples are considered in various contexts, we find cases where examples of the latter kind are equally ambiguous. Thus we will suggest that it is not appropriate to posit any kind of syntactic constraint for this much discussed phenomenon.

¹²The Minimal Binding Requirement (Aoun & Li 1993:11)
Variables must be bound by the most local potential \bar{A} -binder.

Actually, the status of the examples (26) and (27) with respect to operator scope ambiguity has not been without some disagreements. One kind of objection involves the claim that the two readings in (26) is not a consequence of scope ambiguity; the other kind involves some potential counterexamples on the nonambiguity of (27). We will briefly review the former cases first.

Williams (1986) claims that the (seemingly) wide scope interpretation of *everyone* in (26) is not due to quantification. Rather he argues that it is due to the possible nonquantificational “group” interpretation of *everyone/everybody*, just as the non-quantificational pronominal NPs in (28a,b) can yield a “pair-list answer” in (28c).¹³

- (28) a. Who did they dance with?
 b. Who danced with them?
 c. John danced with Mary, Same danced with Sue, ...

Williams explains that the family of questions reading is not possible in (27) since *everyone/everybody* may receive a group interpretation only in a subject position, but not in an object position. He presents example (29) as supporting evidence, arguing that when a *every* N phrase, which does not have a group reading, is involved, no ambiguity is exhibited:

- (29) Who did every girl dance with?

¹³By contrast, May (1985) argues that examples with plural pronouns show the same asymmetry as the one between (26) and (27). That is, *Who did they see at the Wimbledon finals?*, but not *Who saw them at the Wimbledon finals?* possesses the family-of-questions interpretation. May treats plural pronouns (or the plurality feature) as (a kind of universal) quantifiers that undergoes LF movement. Such empirical claim on the asymmetry and the view that plural pronouns are quantifiers are specifically objected to in Krifka (1992), which argues that definite plural NPs, both pronouns and full NPs, do not act as quantifiers with respect to *wh*-phrases.

In reply to Williams, May (1988) presents some detailed counterarguments. Crucially, May (1988) points out the claim that *wh*/quantifier interactions are limited to the cases with *everyone/everybody* cannot be maintained, given the numerous instances of the latter type found in the literature. The following (30) is one from Engdahl (1986):

- (30) a. Which book did every author recommend?
 b. *War and Peace*.
 c. Bellow recommended *Herzog* and Heller recommended *Catch-22*.

Lasnik & Saito (1992) also argue that the ambiguity in (26) is not due to relative scope of operators. In contrast with Williams, however, they claim that the putative “narrow scope reading” of *everyone* in (26) results from the group interpretation of *everyone*, while the family of questions reading comes when *everyone* is interpreted as a universal quantifier that takes wide scope over the *wh*-phrase. Such a claim is problematic for the same reason as aforementioned Williams’ claim is; as in (30), a narrow scope reading of the QP is possible with a *every* N phrase as well, which does not have a group interpretation.

Moreover, even with *everyone*, Lasnik & Saito’s argument is problematic, when we consider the following (31):

- (31) What recipe can everyone find in a French cookbook?

Example (31) has a reading wherein *everyone* takes scope narrower than *what recipe* but wider than *a French cookbook*. That is, it is possible that each person finds the recipe of the same French dish, say quiche, but in a different French cookbook. If

everyone is interpreted as a (individual denoting) group, as Lasnik & Saito claims, then it cannot be interpreted as taking wide scope over *a French cookbook*.¹⁴

On the other hand, regarding the nonambiguity assumed in examples like (27), there have been some discussions of potential counterexamples. First of all, it has been recognized that with an *each* phrase, wide scope over a *wh*-subject is obtained much more easily. Williams (1986) observes that either of the following examples is ambiguous:

- (32) a. Who did each boy dance with?
b. Who danced with each boy?

In order to explain this, May (1985, 1988) assumes that *each* is inherently focused and thus, unlike other universal quantifiers, undergoes a different type of adjunction at LF, viz. adjunction to S'.

However, Williams (1988) points out some problems with such analysis. While the S'-adjunction analysis accounts for the wide scope of the universal quantifier in *Who bought each thing for Max?*, S'-adjunction of the *each* phrase in *What did each person buy for Max* violates the PCC (Path Containment Condition). As Williams points out, a violation of the PCC also occurs in a biclausal sentence like (33), in which the universal quantifier undergoes adjunction to matrix S' in order to get maximally wide scope.

- (33) Someone or other knows who each murderer murdered.

¹⁴Both Williams (1988) and Lasnik & Saito pursue the idea that operator scope interaction is constrained by some "rigidity condition" such as those of Huang (1982) and Hoji (1985). The claim that (26) does not involve scope ambiguity is directly relevant to positing such a rigidity condition.

Thus May's explanation of the ambiguous status of (32b) is not successful. In a theory that allows either order in operator scope, this example need not be treated exceptionally.

Another case involves complex sentences with an embedded question. The universal quantifier can take scope over the *wh*-operator in (34).

(34) She told me who inspected every school.

Another ambiguous example of the same kind is given in (35).

(35) Before we can pay the subcontractors, we need to know who did everything.

Regarding the wide scope reading of the universal quantifier in (34), May (1985) claims that when *every school* has wider scope than *who*, it also has wider scope than the matrix predicate. Thus he claims that the embedded question lacks a family of questions interpretation.

While it is true that the universal quantifier can have a matrix scope in (34), it is questionable whether its wide scope within the embedded clause is really prohibited as May maintains. Groenendijk & Stokhof (1982) observe that in examples such as *Bill knows whom everyone knows*, wherein the matrix verb is "extensional" (e.g. *tell*, *know*), the two wide scope readings of the universal quantifier are equivalent.¹⁵ That is, the reading in which the universal quantifier takes wide scope over the matrix extensional predicate is truth-conditionally equivalent to the reading in which the

¹⁵They use the term "extensional" to refer to predicates operating on the denotations of their complements (i.e. propositions, in their theory). Those predicates are distinguished from "intensional" ones (e.g. *ask*, *wonder*, *guess*, and *depend on*) that operate on the sense of the complement.

universal quantifier takes wide scope over only the *wh*-phrase. Therefore, May's claim that only the former reading is possible in (34) is not well supported.¹⁶

Moreover, there seem to be cases wherein the wide scope reading of the universal quantifier is hard to ascribe to its having wide scope over the matrix predicate. Consider (36).

(36) Bill wondered who donated every book in the library.

According to Gronendijk & Stokhof, *wonder* is an "intensional" predicate, and the reading in which the universal quantifier outscopes both the matrix predicate and the *wh*-phrase is distinct from the one wherein it outscopes only the *wh*-phrase. (See also Karttunen & Peters 1980.) Moreover, May's argument cannot go through when we consider the following exchange:

(37) A: We need to pay the subcontractors.

B: OK, who did everything?

In the second sentence of (37), the universal quantifier is interpreted as having wide scope, even though it is not in an embedded context. Therefore, in (34) and (35), wide scope of the *every* phrase should be permitted within the embedded clause.

In other cases, it has been noted that some examples parallel to (27) have both readings. Chierchia (1993) recognizes that a pair-list answer such as (38b) is available for (38a) when, for example, there is a party and each student has brought a dish.

(38) a. Who put everything on the platter?

¹⁶By the same reason, May's claim that *John told me which school everybody inspected*, in contrast with (34), may have only the family of questions construal (but not the maximal wide scope of the universal quantifier) is problematic. See also (33), for which the PCC makes a wrong prediction.

- b. Bill, the chicken salad, Frank, the chow mein;... (Chierchia 1993:183)

However, Chierchia claims that the availability of a pair-list answer in structures like (38a) is due to the property of *who/whom* that can be semantically plural. Thus the reading that yields a pair-list answer in (38a) is made parallel to the interpretation of the following (39):¹⁷

- (39) The kids brought everything for the party. Bill brought the paper cups, John the beer,...

Chierchia claims that once the effects of plurality are factored out, the subject-object asymmetry that May discusses still remains, as in the following pair of examples with *which* N:

- (40) a. Which student put everything on the platter?
b. (Not) Bill, the chicken salad; Frank, the chow mein;... (Chierchia 1993:184)
- (41) a. Which dish did every student bring?
b. Bill brought the chicken salad; Frank brought the chow mein;... (Chierchia 1993:184)

According to Chierchia, the same asymmetry emerges when the singular interpretation of *who/what* is forced by a bound variable pronoun.

- (42) a. Who_i put everything on his_i platter?
b. (Not) John, the chicken salad; Bill, the chow mein;... (Chierchia 1993:184)

¹⁷However, a specific mechanism as to how to yield such interpretations is not given.

- (43) a. What_i did everyone return to its_i owner?
 b. Bill returned the screwdriver to its owner; John returned the cat to its owner;... (Chierchia 1993:184)

While it is true that *who/what* is tolerant for plurality, and it might play a role in yielding a pair-list answer, we doubt that this is the main force behind the family of questions reading of examples such as (38). Contrary to Chierchia's claim, it seems possible that a subject *which* N is outscoped by a universal quantifier. The following example is from Karttunen & Peters (1980), and has a reading wherein the embedded question has a family of questions interpretation.

- (44) Bill wonders which professor recommends each candidate.

If the plurality factor is solely responsible, then it cannot be explained why this example with a singular *wh*-subject allows a family of questions interpretation. The embedded question in (44) is not different from (40) in that it contains a universal quantifier and a *which* phrase.¹⁸ A wide scope interpretation of the universal quantifier seems also available in the following question, which can be asked in a faculty meeting situation:

- (45) Which professor advises every student that we're going to put up for the fellowship?

¹⁸In this connection, it should be noted that Karttunen & Peters (1980) argue that the following pair of examples have the same range of (denotational) meaning, and do not regard them as expressing different questions. (See May (1985:50-52) for discussion.)

- (i) Which customer is each clerk now serving?
 (ii) Which clerk is now serving each customer?

They argue, on the other hand, that these two questions are associated with distinct conversational implicatures, so it is odd to use the question (ii) in a situation such as a supermarket, where 1:1 clerk-to-customer relationship is normal. According to them, this is because the question (ii), which, with a universally quantified phrase in the object position, presumably presupposes one-to-many relationship, thus implicating that one clerk is serving all the customers.

Some cases with subject *who* that is interpreted as singular also exhibit availability of a family of questions interpretation. Suppose, for example, that a workshop is being organized by graduate students, and student speakers coming from other cities are staying at one or other local students' places. A sign-up sheet has been circulated so that for each outside student some local student can volunteer hosting. Then, the following (46) can be uttered:

(46) Let's find out *who_i* is putting every student up at *his_i* place.

In this situation, the wide scope reading of the universal quantifier seems possible.¹⁹

Consider also the following (47):

(47) Mary wondered [[*which of her clients_i*] had the most of [*every stock_j*] in *his_i* portfolio].

In (47), the *wh*-phrase is forced to get a singular interpretation, and yet the kind of answer that Mary wants is *John has the most Microsoft in his portfolio, Bill has the most Philip Morris in his portfolio, etc.*, which reflects the wide scope reading of the universal quantifier.²⁰

Thus the plurality factor cannot explain all the ambiguous cases with *wh*-subject. Then, the most natural and simple assumption that we can make is that examples like (38) actually involve a scope ambiguity, just like (26) does.

In this section, we have seen that various arguments/claims in favor of nonambiguity of (26) and (27) are problematic. Based on the discussions in this section, we

¹⁹Some speakers that I consulted with found that this reading is very difficult to get in (46) while it is more easily obtained in (45).

²⁰This example was pointed out to me by Carl Pollard (p.c.).

conclude that as in the cases with two QPs, scope ambiguity between a *wh*-operator and an ordinary quantifier should not be prohibited by a syntactic constraint.

CHAPTER 7

BEYOND A PHRASE STRUCTURE BASED THEORY OF QUANTIFIER RETRIEVAL

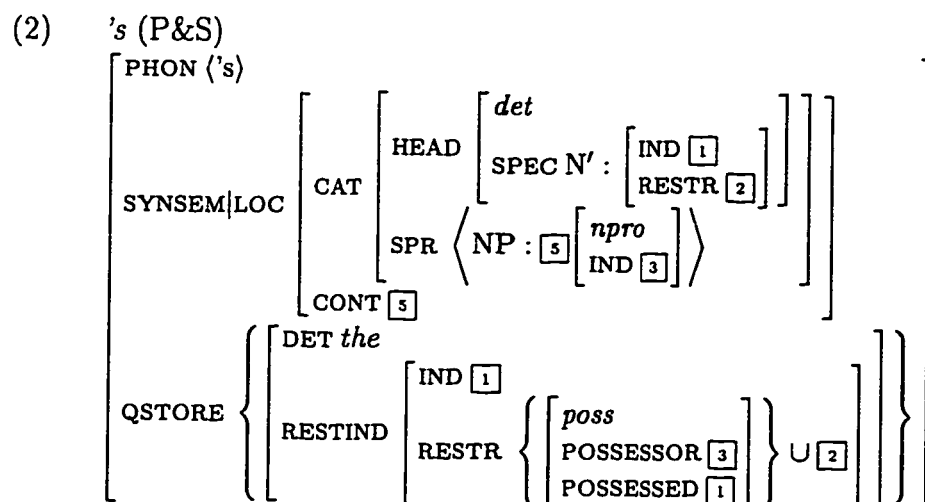
In previous chapters, we have assumed that a stored quantifier is retrieved at some phrase structural node (either at a lexical head or at a phrase), as it is proposed in chapter 3. In this chapter, we point out some cases in which certain narrow scope readings of a quantifier pose potential problems for the usual practice of quantifier retrieval at a phrase structural node, and discuss what it suggests for our theory of quantifier scope and for the direction of future research.

The first case that we are going to discuss is scope possibilities of NPs with a possessive phrase. Carpenter (1994) discusses the ambiguity of the following example:

- (1) Every kid's favorite toy broke.

In (1), there can be a toy which is every kid's favorite, or it can be that for each kid, there is a possibly different favorite toy. The former reading involves the narrow scope interpretation of the universal quantifier, and the latter, the wide scope interpretation.

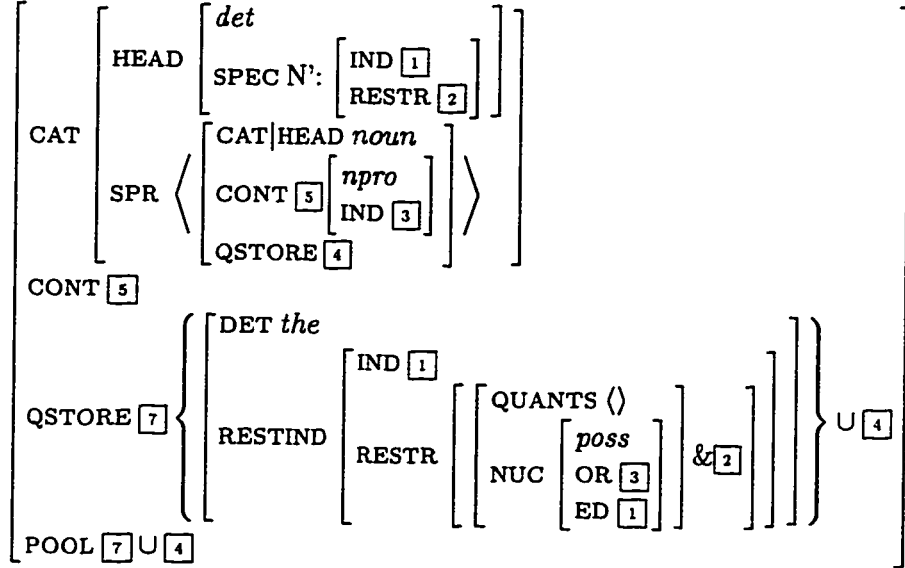
Following P&S, we assume that 's is an unsaturated determiner which subcategorizes for a nonpronominal NP as its specifier, and introduces a quantifier in its QSTORE.



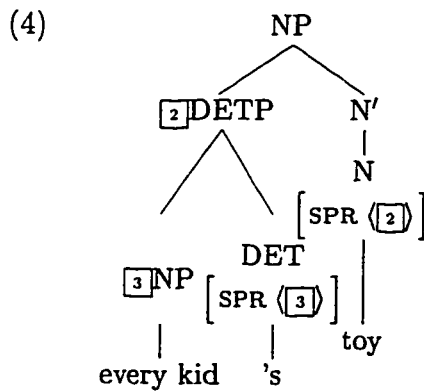
The definite quantifier in the QSTORE is assumed to capture the widely accepted generalization that an NP with a possessive determiner (e.g. *John's car*) carries a uniqueness presupposition as in an NP with a definite article.

In chapter 3, we discussed two kinds of lexical heads that are exceptions to the (default) assumption that the POOL of a lexical head is the union of the QSTORES of all of its selected arguments (cf. 3.2.1). The possessive determiner 's should belong to such nondefault cases, since it explicitly introduces a quantifier. Thus when 's subcategorizes for a QP, the QSTORE of the determiner contains both the definite quantifier associated with the N' that the determiner selects via its SPEC feature, and the quantifier(s) associated with its specifier QP. This is shown in the following LOCAL value of the modified entry of 's:

(3) 's₁ (revised entry 1)



Let us now consider the NP *every kid's toy* in (1), disregarding the adjective to avoid unnecessary complications.



Here the POOL value of 's contains two quantifiers, the definite quantifier and the universal quantifier, and it will be inherited to the determiner phrase *every kid's* and also into the head of the N' *toy* since the head selects the determiner phrase via its SPR feature. Consequently, the two quantifiers in the POOL value of 's are inherited to the NP *every kid's toy*, and they can be retrieved at a verbal node in the given sentence. When the quantifiers are retrieved at the S-level, the order is restricted

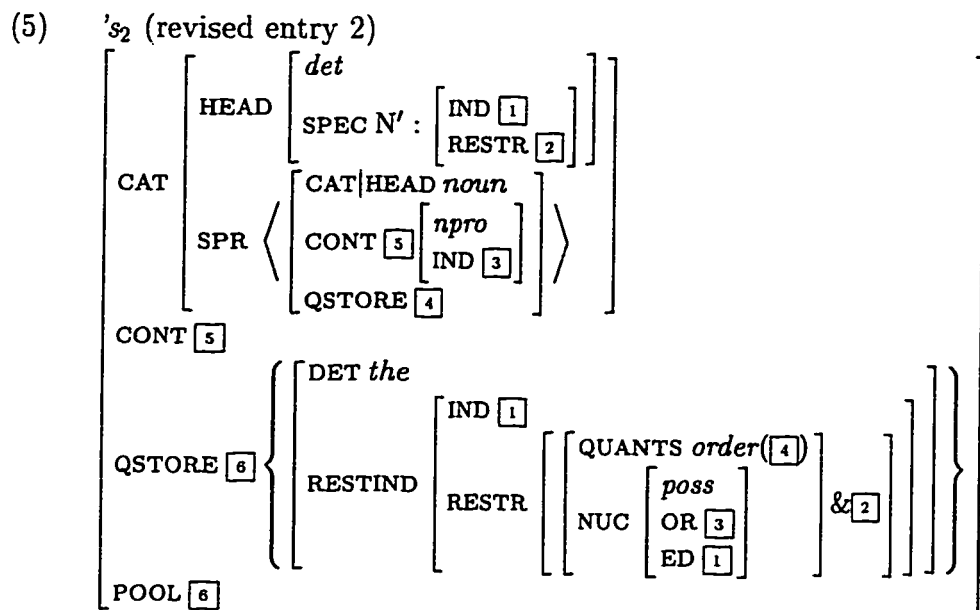
by the Quantifier Binding Condition. Thus in the QUANTS list of the S in (1), the universal quantifier must appear before the definite quantifier, yielding the wide scope reading of *every kid*.

On the other hand, the other reading of (1) involves a narrow scope interpretation of the universal quantifier within the NP, and can be roughly rendered as '(the x (toy'(x) & [($\forall y$ (kid'(y))) poss'(y,x)]) broke'(x))', again disregarding the adjective. The problem here is that we need to retrieve the universal quantifier so that it can take scope over the *qfpsoa* of *poss*, but this *qfpsoa* is not realized as any node in the phrase structure. The CONT of each node within the NP is of sort *nom-obj*, thus not appropriate for retrieval; moreover, even if the universal quantifier can be retrieved at one of the nodes, it will generate only the wide scope reading.

At this point, the only way that we can obtain the narrow scope reading seems to posit a separate lexical entry of 's wherein its QSTORE only has the definite quantifier, but already contains the universal quantifier associated with its specifier within the restriction of the definite quantifier. This second entry can be described as in (5):^{1 2}

¹Here the definite relation *order* is defined so as to make an ordered list of members out of a set.

²Since this entry differs from (3) only in the QSTORE and the POOL, this can be collapsed with (3) by using disjunctive values for the QSTORE and the POOL.



We should, however, note that this kind of dual lexical entry approach involves some problematic aspects. It not only introduces lexical ambiguity, that is otherwise unnecessary, but also contains a purely lexically encoded quantifier retrieval, which is out of step with our general approach to quantifier retrieval. Yet one justifiable side of this approach lies on our assumption that the QSTORE and POOL values of a quantifier-introducing determiner are lexically determined at any rate.

Another potential problem arises when we consider an NP with a locative adjunct PP, which we briefly mentioned in 3.3.3. Let us reconsider the example (6).

(6) John read every book on a table.

If we treat locative adjunct PPs just like other adjunct PPs like *from a Midwest city* in *a man from a Midwest city*, then the two readings of (6) can be rendered as follows:

- (7) a. $[(\forall x (\text{book}'(x) \ \& \ [(\exists y (\text{table}'(y))) \ \text{on}'(x,y)])) \ \text{read}'(j,x)]$
 b. $[(\exists y (\text{table}'(y)))[(\forall x (\text{book}'(x) \ \& \ \text{on}'(x,y))) \ \text{read}'(j,x)]]$

In this case, both readings in (7) can be generated with no problem, by retrieving the existential quantifier either at the PP (for (7a)) or at the S (for (7b)).

On the other hand, if we adopt the proposal that locative PPs refer to locations (Creary *et al.* 1989) and thus their CONT value is of sort *nom-obj* (Kasper (to apper)), then the phrase *on the table* will be assumed to refer to some location that bears an ‘on’ relation to the table, and the ambiguity of (7) can be represented as in (8):

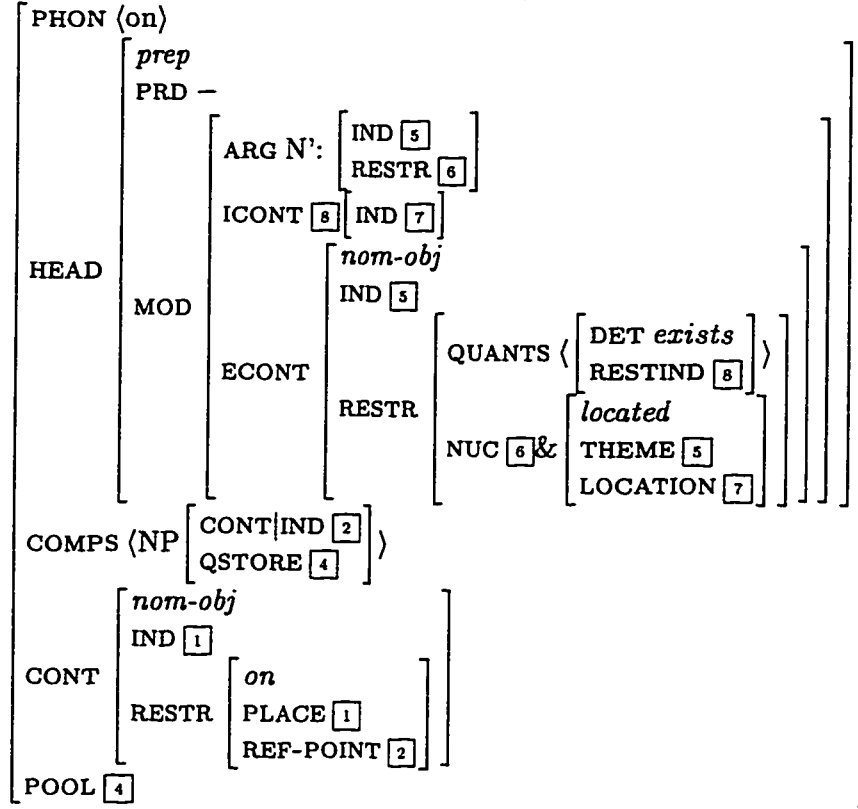
- (8) a. $[(\exists y (\text{table}'(y)))[(\forall x (\text{book}'(x) \ \& \ [(\exists l (\text{location}'(l) \ \& \ \text{on}'(l,y))) \text{located}'(x,l)])) \text{read}'(j,x)]]$
 b. $[(\forall x (\text{book}'(x) \ \& \ [(\exists y (\text{table}'(y)))[(\exists l (\text{location}'(l) \ \& \ \text{on}'(l,y))) \text{located}'(x,l)])) \text{read}'(j,x)]]^3$

In order to generate the wide scope reading of *a table* in (8a), the existential quantifier associated with the phrase needs to be stored in the QSTORE of the P, so that it can be inherited into larger phrases. On the other hand, the location existential quantifier would have to appear in the QUANTS of the MOD|ECONT|RESTR value, without ever being stored.⁴ Suppose we describe the lexical entry of *on* as in (9):

³It is crucial that $(\exists y (\text{table}'(y)))$ be contained within the restriction of the universal quantifier here, since if it takes narrow scope outside of the universal (i.e. $*[(\forall x (\text{book}'(x) \ \& \ [(\exists l (\text{location}'(l) \ \& \ \text{on}'(l,y))) \text{located}'(x,l)]))[(\exists y (\text{table}'(y))) \text{read}'(j,x)]]$), it will yield an unbound variable.

⁴If it is stored in the POOL of the P, then it can be retrieved only at a verbal node in the sentence. This will actually generate another logically possible reading ‘ $[(\exists y (\text{table}'(y)))[(\exists l (\text{location}'(l) \ \& \ \text{on}'(l,y)))[(\forall x (\text{book}'(x) \ \& \ \text{located}'(x,l))) \text{read}'(j,x)]]]$ ’.

(9) adnominal locative *on*₁ (hypothetical)



While this can generate the reading (8a), the narrow scope reading in (8b) cannot be generated with this entry, since the quantifier(s) in the POOL cannot be retrieved at the P, whose CONT is not of sort *psoa*, and can only be retrieved at the verb or its projection in (6), yielding the wide scope reading in (8a). In order to get (8b), what is needed is for both existential quantifiers to appear in the QUANTS of the *located* *psoa* (or that of the conjunctive *psoa* that includes the *located* *psoa*), yet there is no phrase structural node that corresponds to the *psoa*. Thus we can try to posit another entry and stipulate the QUANTS of the MOD|ECONT|RESTR value of *on* as follows:

- PHON {on}
- prep
PRD —
- HEAD
- MOD
- ARG N': [IND 5
RESTR 6]
- ICONT 8 [IND 7]
- nom-obj
IND 5
- ECONT
- QUANTS order([4] \cup { [DET exists
RESTIND 8] })
- RESTR
- NUC 6 & [located
THEME 5
LOCATION 7]
- COMPS {NP [CONT|IND 2]
QSTORE 4]}
- CONT 3
- nom-obj
IND 1
- RESTR
- on
PLACE 1
REF-POINT 2
- POOL {}

Another case in which phrase structure based retrieval fails to predict a narrow scope reading is the one involving intensional verbs like *seek*.

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The well-known *de re/de dicto* ambiguity in (11) poses a problem for most structural accounts of quantifier scope. In transformational approaches like May's (1985), the only LF representation available for (11) is the one that involves LF-movement of the QP, which yields the *de re* reading.⁵ Our theory as it stands can only generate the *de re* reading, since the only possible retrieval sites are the nodes V, VP, or S, and retrieval at any of these nodes will generate the wide scope interpretation.

May (1985:27-28) argues that the ambiguity of (11) is not structural in nature, and thus different from ambiguities of multiple quantifier scope. May's explanation of (11) is based on Parsons's (1980) theory of objects, wherein both actual and nonactual objects are contained in the domain of objects, and a class of so called "nuclear" properties characterizes an object, whether it is actual or nonactual. (Thus, for example, a golden mountain, a nonactual object, contains the properties of goldenness and mountainhood.) Further partitioning of the domain is made by "extranuclear" properties, of which existence is of central importance. In order to explain the differences between intensional verbs and extensional verbs, May takes the selectional restriction of verbs to be sensitive to the partitions made in terms of extranuclear properties. Thus it is assumed that a verb like *seek* can select, for its object NP, "either positively or negatively for existence", whereas a verb like *find* can "only select positively".

While this might well be an alternative way to explain the ambiguity of (11), there seem to be some examples that challenge this view. Consider the following examples from Keller (1988):

⁵May explains that obligatory LF-movement of a QP is a consequence of the θ -Criterion that prohibits QPs, which bear no semantic roles, from appearing in a argument position at LF.

(12) a. John seeks an agent of a company.

b. John seeks a company agent.

Keller observes that unlike (12b) that exhibits a normal *de re/de dicto* ambiguity, (12a) has an additional reading in which *a company* takes wide scope over the predicate *seek*, while *an agent* is under the scope of the predicate. This reading is difficult to explain by simply assuming that verbs like *seek* can ambiguously select for existence with respect to its object NP, since the property of existence of the embedded phrase *a company* will be different from that of the embedding object NP.

Cardinality NPs that involve two existential quantifiers (e.g. *a prime number of unicorns*, *no more than five unicorns*) seem to show a similar ambiguity, when used as an object of an intensional verb.

(13) John seeks no more than five unicorns for his zoo.

As we discussed in 6.1, the QP in (13) can be analyzed as involving two existential quantifiers, one ranging over numbers and the other ranging over (a group of) unicorns. Besides the usual *de re* and *de dicto* reading, (13) has another reading in which only the quantifier ranging over numbers takes wide scope over the predicate. That is, it can be the case that a specific number of unicorns are sought by John, but not a specific group of unicorns of that size.⁶ Thus this again shows that ambiguity associated with a intensional transitive verbs cannot be reduced to the selectional property of such verbs with respect to an existential property of their object NPs.

Accordingly, if we come back to the more or less general view that the ambiguity in (11) should be explained in essentially the same manner as ambiguities involving

⁶This is pointed out by Carl Pollard (in his p.c. with Shalom Lappin, Nov. 10, 1996).

multiple quantifiers are, viz. via wide scope quantification, we will face the problem of quantifier retrieval that we pointed out earlier.⁷

As is pointed out by Carl Pollard (in his p.c. with Shalom Lappin), a solution to this problem can be sought by assuming a lexically decomposed meaning of the verb *seek*. That is, the CONT of *seek* can be analyzed as ‘search to find’. On this view, the ambiguity of (11) can be represented as follows:

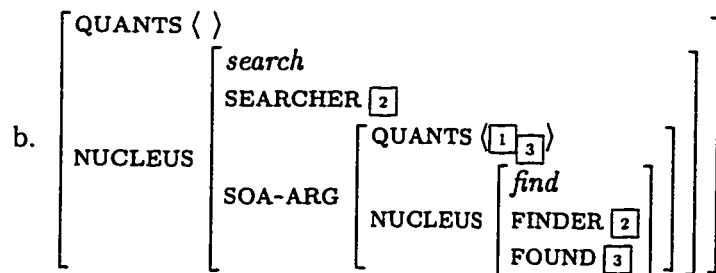
- (14) a. $[(\exists x (\text{unicorn}'(x)) \text{search}'(j, \text{find}'(j,x)))]$
 b. $[\text{search}'(j, [(\exists x (\text{unicorn}'(x)) \text{find}'(j,x))])]$

Such a lexical decomposition analysis of intensional verbs is originally due to Quine (1960), wherein opacity created by predicates like *look for* is made parallel to that of propositional attitude verbs, by paraphrasing such predicates (e.g. ‘look for’ into ‘endeavor to find’). In this connection, Dowty *et al.* (1981) show that within Montague grammar, the translations of (11) and *John tries to find a unicorn* are equivalent.

We now would like to generate the following two CONT values for (11), in which the tag $\boxed{1}$ indicates the quantifier associated with *a unicorn*:

- (15) a.
$$\left[\begin{array}{c} \text{QUANTS } \langle \boxed{1} \boxed{3} \rangle \\ \text{NUCLEUS } \left[\begin{array}{c} \text{search} \\ \text{SEARCHER } \boxed{2} \\ \text{SOA-ARG } \left[\begin{array}{c} \text{QUANTS } \langle \rangle \\ \text{NUCLEUS } \left[\begin{array}{c} \text{find} \\ \text{FINDER } \boxed{2} \\ \text{FOUND } \boxed{3} \end{array} \right] \end{array} \right] \end{array} \right] \end{array} \right]$$

⁷Bob Kasper pointed out to me that another problem may arise concerning the type of the internal argument to *seek*, since the two desired readings, i.e. $[(\exists x (\text{unicorn}'(x))) \text{seek}'(j,x)]$ and $[\text{seek}'(j,(\exists x (\text{unicorn}'(x))))]$ would involve different types of values (*index* and *psoa*, respectively) for this argument.



However, the problem here again is that the embedded *psoa find* does not have any corresponding node in the phrase structure.

Likewise, the mixed readings in (12a) and (13) can be represented as in (16) and (17), respectively, by adopting the decomposition analysis of *seek*, yet they cannot be generated by the usual method of quantifier retrieval.

(16) $[(\exists y (\text{company}'(y))) \text{search}'(j, [(\exists x (\text{agent}'(x) \ \& \ \text{of}'(x,y))) \text{find}'(j,x)])]$

(17) $[(\exists n (\text{number}'(n) \ \& \ 1 \leq n \leq 5)) \text{search}'(j, [(\exists x (\text{unicorns}'(x) \ \& \ |x|=n)) \text{find}'(j,x)])]$

Another case in which quantifier scoping is not explained in terms of phrase structural quantifier retrieval arises from Japanese causative examples. Consider the following example from Manning *et al.* (1996):

- (18) Tanaka-sensei-ga gakusei-ni san-satsu-no hon-o
 Tanaka-teacher-NOM students-DAT three-volumes-GEN book-ACC
 yom-ase-ta.
 read-CAUSE-PST
 'Tanaka-sensei caused there to be three books that the students read.' or
 'There were three books that Tanaka-sensei caused the students to read.'

Example (18) involves a scope ambiguity as to whether the quantifier takes scope narrower or wider than the causative meaning. Under the assumption that *yom-ase-ta* is a verb which contains the verb stem *yom* and the causative suffix *-ase* (see Manning *et al.* for arguments), narrow scope reading cannot be obtained in our theory.

This is because quantifier retrieval at the verb stem *yom* is not possible, since the substructure of a lexical head is not represented in the phrase structure of a given sentence.

To sum up, it seems that all the examples that we have discussed in this chapter reveal a certain limitation of the mechanism in which quantifier retrieval is strictly based on the phrase structure of the given sentence. We have seen that even retrieval at lexical heads cannot be of help in these cases, since some *psaos* within `CONT` values do not have any direct syntactic counterparts in the phrase structure.

In this connection, another relevant problem that should be noted is that of spurious ambiguity that we mentioned in Chapter 3. As our theory of quantifier retrieval directly refers to phrase structural nodes, and two or more phrase structural nodes can structure-share the same `CONT` value, it will inevitably allow more than one possible place of retrieval for the same reading.

Then what we need seems to be a mechanism of quantifier retrieval that permits a quantifier to be retrieved at any *psoa* that is contained in the `CONT` value of the given sentence, without making specific reference to phrase structural nodes. In this case, a *psoa* over which a quantifier is retrieved to take scope could even be one that appears in the restriction of another quantifier, as we have seen in the possessive NP example. If retrieval can be made directly within the `CONTENT`, then the problem of spurious ambiguity would no longer arise.

On the other hand, we face a dilemma in pursuing this line of approach, since we cannot entirely disregard phrase structure in our theory, especially due to the account of interrogative scope in syntactic *wh*-movement languages, wherein retrieval of *wh*-operators is assumed to take place at a phrase and be licensed by its left peripheral

daughter's nonempty QUE value.⁸

Therefore, what would be necessary seems to be an innovative way in which CONTENT can be related to phrase structure; however, to investigate an extension of the theory towards this direction is beyond the scope of the present research. We leave it for future research.

⁸Actually, certain recent work such as Copestake *et al.* (1995, 1997) and Dalrymple *et al.* (1995) utilize content-based scope assignment in the account of quantifier scoping. However, it remains to be investigated whether those approaches can be extended to an account of various interrogative scope phenomena.

BIBLIOGRAPHY

- ABEILLÉ, ANNE, & DANIELE GODARD. 1997. French Word Order and Lexical Weight. Unpubl. ms., University Paris 7 and CNRS, France.
- AHN, SUNG-HO. 1990. *Korean Quantification and Universal Grammar*. University of Connecticut dissertation.
- AOUN, JOSEPH. 1986. *Generalized Binding*. Dordrecht: Foris.
- , & YEN HUI LI. 1993a. *Syntax of Scope*. Cambridge, MA: MIT Press.
- , & ——. 1993b. *Wh*-elements in Situ: Syntax or LF? *Linguistic Inquiry* 24.199–238.
- , & ——. 1993c. On Some Differences between Chinese and Japanese *Wh*-Elements. *Linguistic Inquiry* 24.365–372.
- , & DOMINIQUE SPORTICHE. 1983. On the formal theory of government. *Linguistic Review* 2.211–236.
- AOUN, JOSHEP, NOBERT HORNSTEIN, & DOMINIQUE SPORTICHE. 1981. Some Aspects of Wide Scope Quantification. *Journal of Linguistic Research* 1.69–95.
- BACH, EMMON, & BARBARA PARTEE. 1980. Anaphora and Semantic Structure. In *Papers from the Parasession on Pronouns and Anaphora*, ed. by Jody Kreiman & A. Ojeda. Chicago: Chicago Linguistic Society.
- BAKER, CARL. 1970. Notes on the Description of English Questions: The Role of an Abstract Question Morpheme. *Foundations of Language* 6.197–219.
- BARBERÁ, VICENT. 1994. Spanish Embedded Interrogatives: an HPSG Analysis. Unpubl. ms., Ohio State University.
- BARWISE, JON, & ROBIN COOPER. 1981. Generalized Quantifiers and Natural Language. *Linguistics and Philosophy* 4.159–219.
- BERMAN, STEPHEN. 1991. *On the Semantics and Logical Form of WH-Clauses*. University of Massachusetts dissertation.

- BRATT, ELIZABETH. 1990. The French Causative Construction in HPSG. Unpubl. ms., Stanford University.
- CARPENTER, BOB. 1994. Quantification and Scoping: A Deductive Account. In *Proceedings of the 13th West Coast Conference on Formal Linguistics*, 533–548, San Diego.
- CATTELL, RAY. 1978. On the Source of Interrogative Adverbs. *Language* 54.61–77.
- CHENG, LISA LAI SHEN. 1991. *On the Typology of Wh-Questions*. MIT dissertation.
- CHIERCHIA, GENNARO. 1993. Questions with Quantifiers. *Natural Language Semantics* 1.181–234.
- CHO, YOUNG-MEE YU, & PETER SELLS. 1995. A Lexical Account of Inflectional Suffixes in Korean. *Journal of East Asian Linguistics* 4.119–174.
- CHOE, JAE-WOONG. 1985. Pitch-Accent and Q/Wh Words in Korean. In *Harvard Studies in Korean Linguistics I: Proceedings of the 1985 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 348–353.
- . 1987. LF Movement and Pied-Piping. *Linguistic Inquiry* 18.348–353.
- CHOMSKY, NOAM. 1973. Conditions on Transformations. In *A Festschrift for Morris Halle*, ed. by S. Anderson & P. Kiparsky. New York: Holt, Rinehart and Winston.
- . 1977. On Wh-Movement. In *Formal Syntax*, ed. by P. Culicover, T. Wasow, & A. Akmajian, 71–132. New York: Academic Press.
- . 1981. *Lectures on Government and Binding*. Dordrecht: Foris.
- . 1986. *Barriers*. Cambridge, MA: MIT Press.
- CHUNG, CHAN. 1993. Korean Auxiliary Verb Constructions Without VP-Nodes. In *Harvard Studies in Korean Linguistics V: Proceedings of the 1993 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 274–286.
- . 1995. *A Lexical Approach to Word Order Variation in Korean*. Ohio State University dissertation.
- CHUNG, TAEGOO. 1991. On Wh-Adjunct Extractions in Korean. In *Harvard Studies in Korean Linguistics IV: Proceedings of the 1991 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 241–248.
- CINQUE, GUGLIELMO. 1990. *Types of A'-Dependencies*. Cambridge, MA: MIT Press.

- COLE, PETER, & GABRIELLA HERMON. 1994. Is There LF *Wh*-Movement? *Linguistic Inquiry* 25.239–262.
- COMOROVSKI, ILEANA. 1986. Multiple *Wh* Movement in Romanian. *Linguistic Inquiry* 17.171–177.
- . 1996. *Interrogative Phrases and the Syntax-Semantics Interface*. Dordrecht: Kluwer Academic Publishers.
- COOPER, ROBIN. 1975. *Montague's Semantic Theory and Transformational Syntax*. University of Massachusetts at Amherst dissertation.
- . 1983. *Quantification and Syntactic Theory*. Dordrecht: Reidel.
- , & TERENCE PARSONS. 1976. Montague Grammar, Generative Semantics and Interpretive Semantics. In *Montague Grammar*, ed. by Barbara Partee. New York: Academic Press.
- COPESTAKE, ANN, DAN FLICKINGER, ROBERT MALOUF, SUSANNE RIEHEMANN, & IVAN A. SAG. 1995. Translation Using Minimal Recursion Semantics. In *Proceedings of the Sixth International Conference on Theoretical and Methodological Issues in Machine translation*, Leuven.
- , DAN FLICKINGER, & IVAN A. SAG. 1997. Minimal Recursion Semantics: An Introduction. Unpubl. ms., CSLI and Stanford University.
- CREARY, LEWIS G., MARK GAWRON, & JOHN NERBONNE. 1989. Reference to Locations. In *Proceedings of the 27th Annual Meeting of the Association for Computational Linguistics*, Vancouver, Canada. Association for Computational Linguistics.
- DALRYMPLE, MARY, JOHN LAMPING, FERNANDO PEREIRA, & VIJAY SARASWAT. 1995. Linear Logic for Meaning Assembly. In *Proceedings of the Workshop on Computational Logic for Natural Language Processing*, Edinburgh, UK.
- DIESING, MOLLY. 1992. *Indefinites*. Cambridge, MA: MIT Press.
- DOWTY, DAVID. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Kluwer Academic Publishers.
- , ROBERT WALL, & STANLEY PETERS. 1981. *Introduction to Montague Semantics*. Dordrecht: D. Reidel Publishing Company.
- ENGDAHL, ELISABET. 1986. *Constituent Questions*. Dordrecht: Reidel.

- EVANS, HYWEL. 1996. Legitimate Termination of Nonlocal Features in HPSG. In *Language, Information and Computation (PACLIC 11)*, 317–326. Seoul: Kyunghee University.
- FIENGO, ROBERT, JAMES HUANG, & TANYA REINHART. 1988. The Syntax of Wh-in-Situ. In *Proceedings of the 7th West Coast Conference on Formal Linguistics*, 81–98, Stanford University.
- FILLMORE, CHARLES, & PAUL KAY. 1993. *On Construction Grammar*. Berkeley: University of California. Ms.
- FODOR, JANET, & IVAN A. SAG. 1982. Referential and Quantificational Indefinites. *Linguistics and Philosophy* 5.355–398.
- FUKUI, NAOKI. 1988. LF Extraction of NAZE: Some Theoretical Implications. *Natural Language and Linguistic Theory* 6.503–526.
- GAZDAR, GERALD. 1981. Unbounded Dependencies and Coordinate Structure. *Linguistic Inquiry* 12.155–184.
- GERDEMANN, DALE. 1994. Complement Inheritance as Subcategorization. In *German in Head-Driven Phrase Structure Grammar*, ed. by John Nerbonne, Klaus Netter, & Carl Pollard, number 46 in Lecture Notes, 341–363. Stanford University: CSLI Publications.
- , & ERHARD HINRICHS. 1990. A Unification-based Approach to Quantifier Scoping. In *Proceedings of the 9th European Conference on Artificial Intelligence*, ed. by L. Aiello, 292–297.
- GINZBURG, JONATHAN. 1992. *Questions, Queries, and Facts: A Semantics and Pragmatics for Interrogatives*. Stanford University dissertation.
- GREEN, GEORGIA, & JERRY MORGAN. 1996. Auxiliary Inversions and the Notion 'Default Specification'. *Journal of Linguistics* 32.43–56.
- GROENENDIJK, JEROEN, & MARTIN STOKHOF. 1982. Semantic Analysis of Wh-Complements. *Linguistics and Philosophy* 5.175–233.
- HAMBLIN, C. 1973. Questions in Montague English. *Foundations of Language* 10.41–53.
- HEIM, IRENE. 1988. *The Semantics of Definite and Indefinite Noun Phrases*. New York and London: Garland Publishing, Inc.
- HIGGINBOTHAM, JAMES. 1980. Pronouns and Bound Variables. *Linguistic Inquiry* 11.679–708.

- HINRICHS, ERHARD, & TSUNeko NAKAZAWA. 1989. Flipped out: Aux in german. In *Papers from the 25th Regional Meeting of the Chicago Linguistic Society*, volume 25, 193–202, Chicago, Illinois. CLS.
- , & ———. 1994. Linearizing AUXs in German Verbal Complexes. In *German in Head-Driven Phrase Structure Grammar*, ed. by John Nerbonne, Klaus Netter, & Carl Pollard, number 46 in Lecture Notes, 11–37. Stanford University: CSLI Publications.
- HOBBS, JERRY, & STUART SHIEBER. 1987. An Algorithm for Generating Quantifier Scopings. *Computational Linguistics* 13.47–63.
- HOJI, HAJIME. 1985. *Logical Form Constraints and Configurational Structures in Japanese*. University of Washington dissertation.
- HORNSTEIN, NOBERT. 1984. *Logic as Grammar*. Cambridge, MA: MIT Press.
- HUANG, JAMES. 1982. *Logical Relations in Chinese and the Theory of Grammar*. MIT dissertation.
- HUKARI, THOMAS, & ROBERT D. LEVINE. 1995. Adjunct Extraction. *Journal of Linguistics* 31.195–226.
- JACKENDOFF, RAY. 1983. *Semantics and Cognition*. Current Studies in Linguistics. Cambridge, Massachusetts: MIT Press.
- JOHNSON, DAVID, & SHALOM LAPPIN. to appear. A Critique of the Minimalist Program. *Linguistics and Philosophy* .
- JOO, YANGHEE SHIM. 1989. *A Cross-Linguistic Approach to Quantification in Syntax*. University of Wisconsin-Madison dissertation.
- KADMON, NIRIT. 1985. The Discourse Representation of Noun Phrases with Numeral Determiners. In *Proceedings of the North East Linguistic Society*, ed. by Stephen Berman, Jae-Woong Choe, & Joyce McDonough, volume 15, 207–219, Amherst. Graduate Linguistic Student Association, University of Massachusetts.
- KARTTUNEN, LAURI. 1977. Syntax and Semantics of Questions. *Linguistics and Philosophy* 1.3–44.
- , & STANLEY PETERS. 1980. Interrogative Quantifiers. In *Time, Tense and Quantifiers*, ed. by C. Rohrer. Niemeyer, Tübingen: .
- KASPER, ROBERT. to appear. Semantics of Recursive Modification. *Journal of Linguistics* .

- KATHOL, ANDREAS. 1995. *Linearization-Based German Syntax*. Ohio State University dissertation.
- KAYNE, RICHARD S. 1975. *French Syntax: The Transformational Cycle*. Cambridge, MA: MIT Press.
- 1983. Connectedness. *Linguistic Inquiry* 14.223–249.
- 1984. *Connectedness and Binary Branching*. Dordrecht: Foris.
- KELLER, WILLIAM R. 1988. Nested Cooper Storage: The Proper Treatment of Quantification in Ordinary Noun Phrases. In *Natural Language Parsing and Linguistic Theories*, ed. by U. Reyle & C. Rohrer, 432–447. D. Reidel Publishing Company.
- KIM, JONG-BOK. 1994. A Constraint-Based Lexical Approach to Korean Verb Inflections. Unpubl. ms., Stanford University.
- , & IVAN A. SAG. 1995. The parametric Variation of English and French Negation. In *Proceedings of the 14th Annual Meeting of the West Coast Conference on Formal Linguistics*, Stanford University. CSLI Publications/SLA.
- , & ———. 1996. French and English Negation: a Lexicalist Alternative to Head Movement. Ms., Presented at the Third International Conference on HPSG, June, 1996, Marseille, France.
- KIM, SOOWON. 1989. The QP Status of Wh-Phrases in Korean and Japanese. In *Proceedings of the Eighth West Coast Conference on Formal Linguistics*, ed. by E. Fee & K. Hunt, 358–372.
- . 1991. *Chain Scope and Quantification Structure*. Brandeis University dissertation.
- KISS, TIBOR. 1994. Obligatory Coherence: The Structure of German Modal Verb Constructions. In *German in Head-Driven Phrase Structure Grammar*, ed. by John Nerbonne, Klaus Netter, & Carl Pollard, number 46 in Lecture Notes, 71–107. Stanford University: CSLI Publications.
- KRIFKA, MANFRED. 1992. Definite NPs Aren't Quantifiers. *Linguistic Inquiry* 23.156–163.
- KROCH, ANTHONY. 1989. Amount Quantification, Referentiality, and Long Wh-Movement. Unpubl. ms., University of Pennsylvania.
- KUNO, SUSUMU. 1990. Against Pied Piping in LF. In *Interdisciplinary Approaches to Language*, ed. by Carol Georgopoulos & Roberta Ishihara, 373–397. Dordrecht: Kluwer.

- , & KEN ICHI TAKAMI. 1993. *Grammar and Discourse Principles: Functional Syntax and GB Theory*. Chicago: University of Chicago Press.
- , & JANE ROBINSON. 1972. Multiple Wh Questions. *Linguistic Inquiry* 3.463–487.
- LASNIK, HOWARD, & MAMORU SAITO. 1984. On the Nature of Proper Government. *Linguistic Inquiry* 15.235–289.
- , & ——. 1992. *Move α : Conditions on Its Applications and Output*. Cambridge, MA: MIT Press.
- LEE, EUN-JI. 1987. ECP and Subjacency in LF and Hierarchical Order of WH-Adjuncts. In *Harvard Studies in Korean Linguistics II: Proceedings of the 1987 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 93–103.
- LEE, HYO-SANG. 1982. Asymmetry in Islands Constraints in Korean. Unpubl. ms., UCLA.
- LINK, GODEHARD. 1983. The Logical Analysis of Plurals and Mass Terms: A Lattice-theoretical Approach. In *Meaning, Use, and Interpretation of Language*, ed. by Rainer Bauerle, Christoph Schwarze, & Arnim von Stechow. Berlin: de Gruyter.
- MALOUF, ROB. 1996. A Constructional Approach to English Verbal Gerunds. In *Proceedings of the Twenty-second Annual Meeting of the Berkeley Linguistics Society*, Berkeley, California.
- MANNING, CHRISTOPHER D., IVAN A. SAG, & MASAYO IIDA. 1996. The Lexical Integrity of Japanese Causatives. In *Studies Based on the Universality of Constraint-Based Phrase Structure Grammars*, ed. by Takao Gunji, Report of the International Scientific Research Program Joint Research, Project No. 06044133, Supported by the Ministry of Education, Science, and Culture, Japan, 9–37. Osaka: Graduate School of Language and Culture, Osaka University. Also to appear in *Studies in Contemporary Phrase Structure Grammar*, ed. by Georgia Green & Robert D. Levine. Cambridge: Cambridge University Press.
- MAY, ROBERT. 1977. *The Grammar of Quantification*. MIT dissertation.
- . 1985. *Logical Form: Its Structure and Derivation*. Cambridge, MA: MIT Press.
- . 1988. Ambiguities of Quantification and Wh: A Reply to Williams. *Linguistic Inquiry* 19.118–135.
- MCDANIEL, DANA. 1989. Partial and Multiple Wh-Movement. *Natural Language and Linguistic Theory* 7.565–604.

- MONTAGUE, RICHARD. 1974. The Proper Treatment of Quantification in Ordinary English. In *Formal Philosophy: Selected Papers of Richard Montague*, ed. by Richmond Thomason. New Haven: Yale Univ. Press.
- MOON, MYEONG-OK. 1991. Interpretation of Wh-Phrases without LF Movement in Korean. In *Harvard Studies in Korean Linguistics IV: Proceedings of the 1991 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 353–363.
- NAM, KI-SHIM. 1986. *Kwuke Wanhyung Pomwunpep Yenkwu (The Grammar of Undeformed Sentential Complement Constructions in Korean)*. Seoul: Thap.
- NERBONNE, JOHN. 1994. Partial Verb Phrases and Spurious Ambiguities. In *German in Head-Driven Phrase Structure Grammar*, ed. by John Nerbonne, Klaus Netter, & Carl Pollard, number 46 in Lecture Notes, 109–150. Stanford University: CSLI Publications.
- , MASAYO IIDA, & WILLIAM LADUSAW. 1989. Running on Empty: Null Heads in Head-Driven Grammar. In *Proceedings of the 8th Annual Meeting of the West Coast Conference on Formal Linguistics*.
- NISHIGAUCHI, T. 1990. *Quantification in the Theory of Grammar*. Dordrecht: Kluwer.
- PARSONS, TERENCE. 1980. *Nonexistent Objects*. New Haven: Yale University Press.
- PARTEE, BARBARA, & EMMON BACH. 1981. Quantification, Pronouns, and VP Anaphora. In *Mathematische Centrum*, ed. by Jeroen Groenendijk, Theo Janssen, & Martin Stokhof, number 1 in Formal Methods in the Study of Language. Amsterdam: .
- PENN, GERALD. 1997. Linearization and WH-extraction in HPSG. Presented at the Fourth International Conference on HPSG, July, 1997, Ithaca, NY.
- PESETSKY, DAVID. 1982. *Paths and Categories*. MIT dissertation.
- . 1987. Wh-in-Situ: Movement and Unselective Binding. In *The Representation of (In)definiteness*, ed. by Eric J. Reuland & Alice G. B. ter Meulen, 98–129. Cambridge, Massachusettes and London, England: The MIT Press.
- POLLARD, CARL. 1989. Notes on the Syntax and Semantics of Comparatives. Unpublished ms., Hewlett-Packard Laboratory.
- . 1996. Linear and Hierarchical Factors in Weak Crossover. Unpubl. ms., Ohio State University and University of Tübingen.

- , & IVAN A. SAG. 1987. *Information-based Syntax and Semantics, Vol. 1*. Number 13 in Lecture Notes. Stanford University: CSLI Publications.
- , & IVAN A. SAG. 1994. *Head-Driven Phrase Structure Grammar*. CSLI Publications and University of Chicago Press.
- , & EUN JUNG YOO. to appear. A Unified Theory of Scope for Quantifiers and Wh-Phrases. *Journal of Linguistics*.
- PRZEPIÓRKOWSKI, ADAM. 1997. Quantifiers, Adjuncts as Complements, and Scope Ambiguities. Unpubl. ms., University of Tübingen.
- QUINE, WILLIAM VAN ORMAN. 1960. *Word and Object*. MA: The MIT.
- REAPE, MIKE. 1994. Domain Union and Word Order Variation in German. In *German in Head-Driven Phrase Structure Grammar*, ed. by John Nerbonne, Klaus Netter, & Carl Pollard, number 46 in Lecture Notes, 151–198. Stanford University: CSLI Publications.
- RIZZI, LUIGI. 1990. *Relativized Minimality*. Cambridge, MA: MIT Press.
- . 1991. Residual Verb Second and the Wh-Criterion. In *Technical Reports in Formal and Computational Linguistics No.2*, ed. by Robin Clark, Luigi Rizzi, & Eric Wehrli. Genève: Département de Linguistique Générale et de Linguistique Française.
- ROBERTS, CRAIGE. 1990. *Modal Subordination, Anaphora, and Distributivity*. New York: Garland Publishing, INC.
- ROSS, JOHN. 1967. *Constraints on Variables in Syntax*. MIT dissertation.
- RUDIN, CATHERINE. 1988. On Multiple Questions and Multiple Wh fronting. *Natural Language and Linguistic Theory* 6.445–501.
- SAG, IVAN. to appear. English Relative Clause Constructions. *Journal of Linguistics*.
- SONG, JAE-GYUN. 1995. Wh-in-Situ and Island Phenomena in Korean. In *Harvard Studies in Korean Linguistics VI: Proceedings of the 1995 Workshop on Korean Linguistics*, ed. by Susumu Kuno et al., 402–412.
- SUH, CHUNG-MOK. 1987. *Kwuke Uymwunmwun Yenkwu (A Study on the Interrogative Sentences in Korean)*. Seoul: Thap.
- SUH, CHUNG-SOO. 1984. *Contaypep-uy Yenkwu (A Study of Honorification)*. Seoul: Hanshin.

- SUH, JINHEE. 1990a. *Scope Phenomena and Aspects of Korean Syntax*. University of Sourthen California dissertation.
- . 1990b. The Scope Interaction of *Wh*-word and Quantifier. In *Japanese/Korean Linguistics*, ed. by Hajime Hoji, 413–428. CSLI.
- SUÑER, MARGARITA. 1991. Indirect Questions and the Structure of CP: Consequences. In *Current Studies in Spanish Linguistics*, ed. by H. Campos & F. Martínez-Gil. Washington, DC: Georgetown University Press.
- . 1993. About Indirect Questions and Semi-Questions. *Linguistics and Philosophy* 16.45–77.
- TAKAHASHI, DAIKO. 1993. Movement of *Wh*-Phrases in Japanese. *Natural Language and Linguistic Theory* 11.655–678.
- TAKAHASHI, SONOKO. 1995. *The Interrogative Marker KA in Japanese*. Ohio State University M. A. thesis.
- TSAI, WEI-TIEN DYLAN. 1994. On Nominal Island and LF Extraction in Chinese. *Natural Language and Linguistic Theory* 12.121–175.
- VAN RIEMSDIJK, HENK, & EDWIN WILLIAMS. 1981. NP-Structure. *The Linguistic Review* 1.171–217.
- WAHBA, W. 1991. LF Movement in Iraqi Arabic. In *Logical Structure and Linguistic Structure*, ed. by C.-T. Huang & R. May, 253–276. Dordrecht: Kluwer.
- WATANABE, AKIRA. 1992. Subjacency and S-Structure Movement of *Wh*-in-Situ. *Journal of East Asian Linguistics* 1.255–291.
- WILLIAMS, EDWIN. 1986. A Reassignment of the Functions of LF. *Linguistic Inquiry* 17.265–299.
- . 1988. Is LF Distinct from S-Structure? A Reply to May. *Linguistic Inquiry* 19.135–146.
- YOO, EUN JUNG. 1995. *Wh*-Phrases and Their Quantification in Korean. In *Harvard Studies in Korean Linguistics VI*, ed. by Susumu Kuno *et al.*, 458–473. Cambridge and Seoul: Harvard University Press and Hanshin.
- . 1996. *Wh*-Subjects, Superiority, and Scope. Presented at the Third International Conference on HPSG, June, 1996, Marseille, France.
- ZWICKY, ARNOLD. 1994. Dealing out Meaning: Fundamentals of Syntactic Constructions. In *Proceedings of the Twentieth Annual Meeting of the Berkeley Linguistics Society*, 611–625, Berkeley, California.