WH DEPENDENCIES IN HINDI AND THE THEORY OF GRAMMAR

A Dissertation

Presented to the Faculty of the Graduate School

of Cornell University

in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

by

Veneeta Srivastav

January 1991

Biographical Sketch

Veneeta Srivastav grew up in India. She got her M.A. and M.Phil in English Literature from Delhi University and taught at Jamia Millia Islamia in the English Department for three years before coming to the United States. She joined the Ph.D program in Linguistics at Cornell University in 1984.

Acknowledgements

I came to Cornell and into linguistics by accident, but I stayed by choice. To those who inluenced my decision to stay I owe a debt of gratitude.

My thesis advisor, Gennaro Chierchia, taught me most of what I know about being a linguist. A certain amount of insecurity and anxiety goes with being a graduate student, but having a generous and sensitive advisor meant I had that much less of it to deal with. I thank him for all that he did for me and all that he did not. This dissertation benefitted from the fact that, in spite of his kindness, he never wasted a compliment on it.

Wayne Harbert taught me my first syntax course and was the first to place his confidence in me. I thank him for finding in my term papers the tiniest idea, and ignoring the rest. He has given me generously of his time over the last six years. I could not have reached this point without his encouragement and advice.

To Barbara Lust I owe the fact that I started working on correlatives. And her seminar on learnability influenced the way I came to view linguistics. I thank her for the interest she has always shown in my work.

With Jim Gair I enjoyed talking about the special problems of doing South Asian linguistics. He could always find data to challenge a good hypothesis and I thank him for keeping me honest.

Fred Landman let me pressure him into teaching a course on mathematical methods. It meant many extra hours of class prep for him, but an invaluable experience for me. I thank him for that as well as for his support of my work.

Sally McConnell-Ginet and Kashi Wali have been members of my committee in all but name. They have listened to my complaints and given me much good advice. I also thank Jim Huang, John Bowers, Magui Suner, Peter Hook and Carol Rosen for help and encouragement. I consider myself lucky to have learnt about linguistics at DMLL, a department of good linguists and good people.

My fondest memories of Ithaca, of course, will be of times spent with friends. I will remember specially the wonderful evenings I spent at the home of Gennaro and Isa Chierchia and their cute kids; the conversations with Kate Davis about balancing family and career; the lunches at the mall with Gita Martohardjono; the talks I had with Leslie Porterfield, discussing our lives over cups of coffee; the friendship with Remi Sonaiya and her family. As I will remember all the others with whom I spent my last six years -- Vicky Carstens, Abby Cohn, Beverley Goodman, Beth Hume, Tami Kaplan, Gunhild Lischke, Yetunde Laniran, Bill McClure, Selina Stewart, Gudrun Thorhallsdottir, David Silva, Lelwala Sumangala, Jackie Toribio, Alice Turk, Jane Tang, Wendy Snyder, Hilary Sachs, Adam Wyner, Keiko and Tomo Yoshida and Renee Zakia. Things may not always have been easy but it was never for lack of friends. In leaving Ithaca I realise that I am leaving a place which I have come to consider home.

And I owe a special thanks to those I leave with. To my parents, Lakshmeshwar and Usha Dayal, who in their different ways have always given me help and support. My father taught me to enjoy a good

argument, to question and analyze before accepting. My mother supported me in more concrete ways, specially now by taking care of my house and my child. I am glad that they are here with me to share in the completion of my degree.

To Teju, a special thanks for not letting me give up linguistics and follow him in his job, for bearing the brunt of commuting these past years with relatively few complaints, for being my informant for Hindi (though not always a co-operative one!), for being generally supportive--being a student spouse, we all know, is almost harder than being a student.

To my little Karuna, who did her bit by making my greatest joys and my biggest worries during my dissertation year non-linguistic in nature. In the final months she was just old enough to sit in my lap and help me with "thithi" writing. Though I had to erase most of what she wrote I believe her contribution is present at some underlying level of representation.

TABLE OF CONTENTS

CHAPTER I

INTRODUCTION

1.1. Theoretical Assumptions

In the last two decades linguistic research into Hindi, as into other South Asian languages, has focused primarily on sociolinguistic and applied fields. South Asian languages have therefore remained out of the mainstream of grammatical theorizing in recent times. This dissertation is part of a resurgence of interest in linking the analysis of South Asian languages with linguistic theory. It focuses on two kinds of wh constructions in Hindi, relative clauses and questions. Though relative clauses have been researched by various scholars in the past, these studies are couched in terms that are no longer current. Hindi questions have remained largely uninvestigated so that there is hardly any account of them available at the present time. As we will see, both these constructions raise questions that challenge standard syntactic and semantic assumptions about the grammar of relative clauses and questions. My aim is to provide an analysis of Hindi wh constructions which would be relevant not just to those interested in South Asian linguistics but to general theoreticians as well. In this introduction I will briefly list some of the more important questions that will be addressed in the following chapters. In order to be clear about the issues, however, I will make explicit the framework within which I am going to present my analysis before introducing the data and discussing their theoretical relevance.

The syntactic framework which I assume is the one often referred to as Government and Binding, the philosophical underpinnings of which are articulated in Chomsky (1986a). Within this approach, the grammar of natural languages is conceived of in terms of principles and parameters; principles being properties common to all languages and parameters being a set of available options that languages must choose from. It thus provides a means for explaining the uniformity as well as the diversity among individual languages. This conception of language also ties in with the observation that natural language though exceedingly complex is acquired by human beings with relative ease and without the benefit of overt instruction. The universal principles are assumed to be part of the innate language capacity and do not have to be learnt. The process of language acquisition involves only the setting of parameters on the basis of language data. What this implies for linguistic analyses is that all parametric variation proposed to account for differences between languages must pass the criterion of learnability; the values of the parameters must be accessible to the child on the basis of positive evidence alone. The principles and parameters model thus provides a powerful yet constrained apparatus for doing cross linguistic studies.

This dissertation follows the syntactic framework of Barriers (Chomsky 1986b) which represents a refinement of the model of grammar introduced in Lectures in Government and Binding (Chomsky 1981). Barriers, like Lectures in Government and Binding, assumes a T-model of grammar:

(1) D-structure

S-structure

PF Logical Form

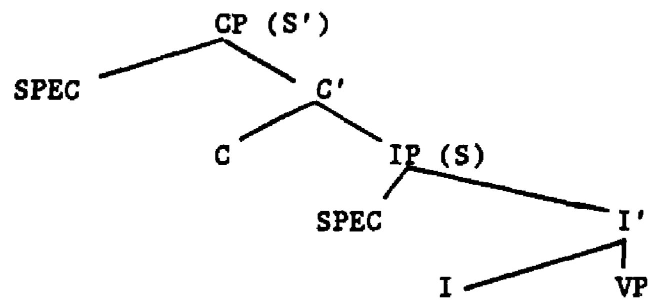
Phrase structures are generated in accordance with the X′ theory and rules of lexical insertion. The map from D-structure to S-structure is provided by transformations which have the general form "move alpha". S-structure feeds into the phonological as well as the semantic components of the grammar. On the semantic side, a level of Logical Form is assumed at which expressions corresponding to logical operators are assigned scope. This involves movement of quantified NPs and unmoved wh from argument positions to appropriate operator positions. LF is thus derived from S-structure through transformations in the same sense as S-structure is derived from D-structure.

This approach does away with the conditions on transformations required in the Aspects model (Chomsky 1965) by shifting the burden of restricting overgeneration to independently established modules of grammar. Only those outputs which satisfy all the subtheories of grammar are licensed as grammatical, the rest being filtered out as ill-formed.

The primary innovation in the Barriers framework is the attempt to unify the notions of government and bounding by defining a minimal domain which counts as a barrier for both. Any maximal projection is a blocking category if it is not L-marked (i.e. if it is not assigned a theta role by a lexical item) and hence an inherent barrier. In addition, any maximal projection dominating a blocking category is a barrier by inheritence. IP is defective in that it is never an inherent barrier, though it can be a barrier by inheritence. Government and bounding can be unified by using this definition since an item may not govern across a barrier while movement (at S-structure but not at LF) may not cross more than one barrier. These innovations have empirical and theoretical consequences which are widely discussed (see, for example, Lightfoot and Weinberg (1988)).

Barriers also introduces the hypothesis that Complementizer and Inflection are functional heads and are incorporated into the X′ system of maximal projections. The basic structure of a clause is given below.

(2)



CP corresponds to S′ and IP to S in the earlier system. The SPEC of CP is the landing site for WH operators, the SPEC of IP the position for subject NPs. This is the system followed in this dissertation so this correlation needs to be kept in mind.

In the model of grammar assumed within this syntactic framework, the level of LF is generally taken to be an aspect of semantic interpretation. The primary motivation for LF is to provide a structural characterization of scope. For example, a sentence like (3) "Every man loves some woman" can have two meanings. One, for each man there exists some woman or the other who that man loves; two, there is a particular woman who is loved by all men. Ambiguities of this kind can be expressed easily in first order predicate calculus by ordering the universal and existential quantifiers as in (4a-b) respectively:

(4) a. $\forall x\ \exists y\ [man(x) \rightarrow love(x,y)]$
b. $\exists y\ \forall x\ [man(x) \rightarrow love(x,y)]$

May (1977 and 1985) showed that the ambiguity of (3) could be captured in a way that would mimic (4) if a rule of Quantifier Raising (QR) were posited. QR would apply to the surface structure of (3), raising the quantified NPs and adjoining them to IP. This would yield two LF representations depending on which quantified NP was raised first:[1]

(5) a. $[_{IP}$ every man$_x$ $[_{IP}$ some woman$_y$ $[_{IP}$ t_x loves $t_y]]]$
b. $[_{IP}$ some woman$_y$ $[_{IP}$ every man$_x$ $[_{IP}$ t_x loves $t_y]]]$

These LF representations encode scope relations in a manner analogous to the formulae in (4).

Huang (1982) provided further evidence for LF by showing that wh expressions in languages like Chinese remained in argument positions at S-structure but their scope properties could be explained by positing a movement similar to overt wh movement after S-structure. Wh movement at LF differs, according to Huang, from movement at S-structure in not being constrained by subjacency. Like QR, movement of wh in-situ at LF is motivated by semantic considerations. Wh expressions are also operators whose meanings cannot be interpreted in argument positions.

---

[1] These representations are not quite accurate. In fact, May (1985) argues that only (5b) is syntactically possible. He proposes a further operation whereby both readings become available on the basis of (5a).

The assumtion of this dissertation is that LF representations transparently display scope relations which are directly relevant in semantic interpretation but do not themselves represent meaning. LF, therefore, is taken to be the level of syntax which is the input to interpretation.

Though it has always been assumed that the grammar has a semantic component, the nature of this component has been, and to some extent is still, at the center of much controversy. The point of view adopted here is that a semantic theory should account for semantic intuitions about synonymy, contradiction or entailment, in addition to the scopal properties of quantifiers, just as a syntactic theory accounts for syntactic intuitions about grammaticality in language. To do this in a precise way is, of course, a non-trivial task. In fact, a substantive theory of meaning for natural language was not available till fairly recently. The idea that semantic properties of natural language could be amenable to formal analysis was first articulated in some detail in the 60s and 70s, in the work of Richard Montague (see Dowty, Wall and Peters (1985) and Chierchia and McConnell-Ginet (1990) for an introduction to Montague's works and its place in a theory of grammar).

The semantic framework assumed in this dissertation stems from what is known as Montague grammar. This is a truth conditional theory of meaning, the basic idea behind truth conditional semantics being that knowing the meaning of a sentence is tantamount to knowing the conditions that would have to obtain in order for that sentence to be true. So, for example, knowing the meaning of (6) "Mary is in school" is to know its truth conditions. We know, for example, that if the individual referred to by the name "mary" is in the place denoted by "school" the sentence is true, otherwise it is false. Other aspects of the world are irrelevant to the truth or falsehood of that sentence. For example, Joan's being in school is not part of the truth conditions of (6). Following Frege, one can assume that the semantic value (extension) of a sentence is its truth value which is computed with reference to a world by ascertaining whether the truth conditions of the sentence obtain in that world. It is worth pointing out that knowledge of truth conditions is distinct from factual knowledge about the world. In this sense, truth conditions represent in abstract terms the meaning of sentences.

Since there are infinitely many sentences in a language, the theory has to provide an algorithm for computing the truth conditions of any sentence that the syntax can generate. A fundamental idea in truth conditional semantics, then, is the Principle of Compositionality which says that the meaning of the whole is a function of the meaning of the parts and the way in which they are combined. This means that each syntactic constituent is assigned a meaning and for each well-formed phrase structure of a language there exists a corresponding semantic rule which computes meaning from the meanings of the immediate constituents. Compositionality thus ensures a tight connection between the syntax and the semantics.

Since the meaning of a sentence is recursively built up out of the meanings of the basic expressions which make up that sentence, the theory also needs to make explicit what those meanings would be. One of the standard ways of doing this is by resorting to the notion of a model. A model assigns meanings to basic expressions of language with the help of the apparatus of set theory. For example, a common noun like "girl" can denote the set of individuals in the model who are girls. The meaning of the NP "every girl" can be derived from the meaning of the determiner "every" and the meaning of the common noun. Specifically, the determiner can be associated with a function which takes the set of girls and yields the set of sets which contain every girl. Though the actual set of individuals denoted by the common noun will differ from model to model, the meaning of the NP "every girl" will not vary. It will always denote all the sets that include the set of girls, whoever they may be. Thus, in particular, "every girl" will denote the set of girls and all its supersets. It will include, for example, the set of females. Suppose the NP "every girl" combines with a VP like "laughs", the meaning of the sentence (7) "every girl laughs" can be evaluated solely on the basis of the meanings of the two constituents. The VP, for example, would denote the set of individuals who laugh and the semantic rule combining NP and VP would state that this sentence is true if and only if the set denoted by the VP is one of the sets in the meaning of the NP. This will only be the case if the set of girls is a subset of the set of individuals who laugh, which intuitively is what we understand (7) to mean. The analysis of quantification I have just sketched is known as the theory of generalized quantifiers (cf. e.g. Barwise and Cooper (1981)). Model theory thus helps in formulating a truth conditional semantics by assigning objects in the world as the meanings of basic linguistic expressions and the relationships between these objects as the meanings of complex linguistic expressions.

I will also follow in this dissertation the standard possible worlds analysis of intensional constructions. The need for introducing possible worlds into the ontology is made transparent, for example, by sentences like (8) "Mary could be in school" where clearly the truth conditions do not depend on Mary's being in school in the actual world. Rather, the truth conditions refer to possible worlds in which Mary is in school and the relation between those worlds and the actual world. Determining the nature of this relationship is obviously not simple but several interesting proposals have been developed in this connection. Montague's approach to semantics has thus generated substantive theories of meaning in natural language.

Though it has always been accepted that both syntax and semantics are relevant to the grammar, syntactic and semantic theories have not generally been developed in unison. Just as the semantic component was left unarticulated in transformational grammar, the syntactic component has often been neglected in the semantic tradition. A significant development of current linguistic research is the recognition that the interface between syntax and semantics must be taken seriously.

To summarize, I will adopt in this dissertation Chomsky's T-model of syntax and assume that LF mediates between surface structure and meaning, where the latter is understood in Montagovian terms. We will see that some of the phenomena under investigation will be explained in purely syntactic terms, while others appear to receive a more satisfactory account in semantic terms. This reinforces the idea that genuine understanding of wh phenomena cannot be achieved without paying close attention to how form and meaning are put together.

Having made explicit the theoretical assumptions behind this work, let me turn now to the data which this dissertation focuses on.

1.2. The Data

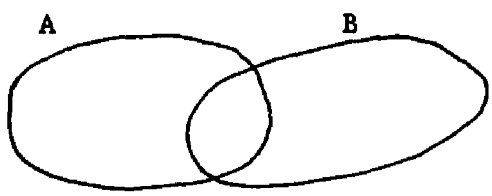
Hindi is known to be one of the languages in which relativization takes the form of the correlative construction. The primary feature distinguishing correlatives from ordinary relative clauses is the fact that they need not appear adjacent to the noun they are understood as modifying. In Hindi, for example, the relative clause can occur in one of three positions, as shown below:

(9) a. jo khaRii hai vo laRkii lambii hai **left-adjoined**
who standing is that girl tall is .
b. vo laRkii lambii hai jo khaRii hai **right-adjoined**
that girl tall is who standing is
c. vo laRkii jo khaRii hai lambii hai **embedded**
that girl who standing is tall is
"The girl who is standing is tall".

If we consider the pattern in (9) there are a priori two ways of analysing it, both of which have been pursued in previous analyses. One possibility is that the relative clause may be generated next to the head noun and moved to the left or the right periphery at S-structure. In this view, let us call it the NP-embedded approach, the source of (9a) and (9b) would be (9c). Alternatively, the relative clause in (9a) and (9b) could be base-generated in adjoined position. Let us call this the adjoined clause approach. The NP-embedded approach locates the difference between correlatives and ordinary relatives in the greater freedom of movement available to noun modifiers in the first type of language. The adjoined clause approach, instead, suggests that syntactic adjacency is not needed at any level of representation for noun modification to take place. Both these approaches raise non-trivial questions from the theoretical point of view and are addressed in Chapter II.

We will see that our investigation of the nature of correlatives will lead us to a more fundamental question: is the function of relative clause necessarily to restrict NPs? In particular, do all the sentences in (9) involve noun modification? This question is prompted by facts that do not seem to fit into a characterization of (9a-c) as cases of noun modification. Let us consider briefly what we mean by noun modification. Semantically, it involves the intersection of two sets, one denoted by the common noun and one denoted by the relative clause. We might think of it in terms of the following diagram, where A represents the set of individuals denoted by the common noun and B the set denoted by the relative clause:

(10)



In the case of (9), A would be the set of girls and B the set of individuals standing. The modified noun would denote the set of individuals who fall in the intersection. The determiner is defined on this set of individuals, so that in the case of (9) it is required that there be a unique individual in the intersection. This account is general and extends to all types of structures. For example, in "No one who is standing" A would denote the set of people, B the set of entities standing, and the determiner would require that the intersection of these sets has no member in common with the set denoted by the VP.

Consider now the following fact:

(11) a.* jo laRkiyãã khaRii hãĩ   do lambii hãĩ
REL girls   standing are two tall are
b.   do laRkiyãã lambii hãĩ jo khaRii hãĩ
two girls tall are   REL standing are
c.   do laRkiyãã jo khaRii hãĩ   lambi hãĩ
two girls   REL standing are   tall are
"Two girls who are standing are tall."

If left adjoined relatives like (9a) are indeed noun modifiers, it is completely unclear why (11a) should be ungrammatical. All that a determiner like do "two" requires is that the intersection of the relevant sets contain at least two members. The obvious conclusion stemming from these observations is that left adjoined structures do not involve noun modification at all.

Let us take another fact that does not fit in with the view that all relative clauses modify nouns:

(12) a.   jis laRkiiNE$_i$ jis laRkeKO$_j$ dekhaa
which girl ERG   which boy ACC saw
usNE$_i$ usKO$_j$ pasand kiyaa
she ERG him ACC liked
b.*   us laRkiiNE$_i$ us laRkeKO$_j$ pasand kiyaa
that girl ERG   that boy ACC liked
jisNE$_i$ jisKO$_j$ dekhaa
who-ERG whom-ACC saw
c.*   Impossible to construct.
"Which girl saw which boy, she liked him".

(12a) shows that Hindi left adjoined structures can have more than one wh NP, each linked to a noun in the main clause. It is obvious that the relative clause here cannot be a noun modifier, for what would be the set denoted by it? If anything, it denotes some kind of a relation between sets of girls and boys. And which noun in the main clause would it modify? The dependence between the relative clause and the two NPs cannot be characterized in terms of set intersection.

(11) and (12) show that right adjoined and embedded relatives display the expected characteristics of relative clauses, namely noun

modification, but left adjoined relatives do not. The logical question to ask is: what is the correct characterization of a relative clause which does not function as a noun modifier?

One clue to the puzzle is provided by contrasting the semantics of single and multiple relatives. (9a) carries a uniqueness implication, while (12a) suggests that there are several pairs of girls and boys in the "see" relation. This distinction is reminiscent of the distinction between single and multiple wh questions in English:

(13) a. Which girl saw the boy?
b. Which girl saw which boy?

This contrast has sometimes been assumed to stem from a difference between unary quantification in (13a) and binary quantification in (13b) (Higginbotham and May (1981)). The question posed by the facts of Hindi can perhaps be sharpened in the following way: is it possible for relative clauses to function like unary and polyadic quantifiers? The next five chapters are concerned with providing answers to questions like these.

In Chapter VII, we turn to questions in Hindi. In general, two language types are recognized with respect to question formation strategies--languages in which the wh word occurs in clause initial position and those in which it remains in-situ. The first is exemplified by English (14a), the second by Chinese (14b):

(14) a. What did Lisi buy ?
b. Lisi mai-le sheme ?
Lisi bought what
"What did Lisi buy ?"

Within the GB framework (14a) is analyzed as the result of wh movement at S-structure, (14b) as having wh in-situ at S-structure but movement at LF. Based on observed differences between overt movement in English and covert movement in Chinese, it is standardly assumed that S-structure movement is constrained by Subjacency while LF movement is not (Huang (1982) and Chomsky (1986b)). The relevant examples are given below:

(15) a.* Who$_i$ do you like the articles where I criticised t_i?
b. ni zui xihuan wo piping she de wenzhang
you most like I criticize who DE article
"Who is the person such that you like the articles here I criticise him."

Let us consider Hindi questions in light of this view of wh movement. In simple sentences Hindi wh's do not occur in clause initial position.

(16) a. tum <u>kahãã</u> jaa rahe ho
you where are going
"Where are you going ?"
b. tum <u>kisko</u> pasand karte ho
you whom like
"Who do you like ?"

Hindi is clearly an in-situ language in which wh movement occurs at LF. We would therefore expect that the scope of Hindi wh would not be constrained by Subjacency. This expectation, however, is not met, as shown by the following considerations.

Hindi questions in which the wh occurs in embedded finite clauses are necessarily interpreted as indirect questions:

(17) tum jaante ho [ki usne <u>kya</u> kyaa]
you know that he what did
"You know what he did."
NOT "What do you know he did?"

The fact that (17) cannot be interpreted as a direct question means that movement of wh to matrix spec is blocked. Since the wh expression originates in direct object position, i.e. a lexically governed position, this movement cannot be illicit due to an ECP violation. The logical alternative explanation for the impossibility of wh extraction would be in terms of Subjacency. But this raises the following question: why is the finite complement in Hindi a blocking category? And further: why should there be Subjacency effects at LF in some languages and not in others?

Direct questions out of embedded clauses also raise interesting questions. In order to get a direct question reading in structures like (17) Hindi employs the following strategy:

(18) tum kyaa jaante ho ki usNE kyaa kiyaa
you what know that he what did
"What do you know that he did?"

It is not immediately obvious how such questions can be analyzed in terms of wh movement, at S-structure or LF. Some way of linking the two is needed so that the scope of the lower wh is passed up. In descriptive terms, the **kyaa** "what" of the matrix clause is like a pleonastic; it marks scope but it does not mark the argument position which is to be bound. Structures like (18) raise the question: what are the syntactic and semantic properties of wh elements which function like pleonastics?

In Chapter IX I turn to another problem that Hindi wh phenomena present. Though Hindi wh in embedded contexts like (17) necessarily take narrow scope, a question like (19) allows for a pair list answer:

(19) kaun jaantaa hai ki merine kahãã kyaa khariida
who knows that Mary where what bought
"Who knows where Mary bought what?"

The standard view of pair list answers in contexts like (19) takes it as deriving from an LF in which the embedded wh **kyaa** "what" moves to matrix spec, since an answer is assumed to specify values for all and only the wh expressions in matrix spec:

(20) $[_{CP}\text{what}_j\ \text{who}_i\ [\ldots t_i \ldots [_{CP}\ \text{where}_k\ [_{IP} \ldots t_k \ldots t_j \ldots]]]]$

But an LF like (20) is apparently not possible in Hindi, given the facts in (17). The question raised by this example is the following: if pair list answers cannot be derived as a result of wh movement at LF, what is the explanation for pair list answers to questions in Hindi? And taking it a step further: if an alternative explanation is available for Hindi, can this alternative also explain pair list answers in languages like English?

The investigation into wh constructions is done in two parts. Chapters II through VI deal with relative clauses, Chapters VII through IX with questions. Though the two are partly independent of each other, there are several theoretical concerns which tie them together. The conclusions reached in each part and the connections between them are made explicit in the concluding chapter.

As a general strategy I have tried to follow, for the most part, widely shared assumptions. Although the tools I use are drawn from the principles and parameters framework and formal semantics, I hope that the key generalizations and issues raised by Hindi for the theory of grammar will emerge in a way that can be of use also to researchers working within different frameworks.

CHAPTER II

RECONSIDERING CORRELATIVES

2.1. Introduction

It is traditionally accepted that the function of relative clauses is to modify nouns. Typically, they place a restriction on the noun they are adjacent to. Thus in the English sentence,

(1) a. The girl who is standing is tall.

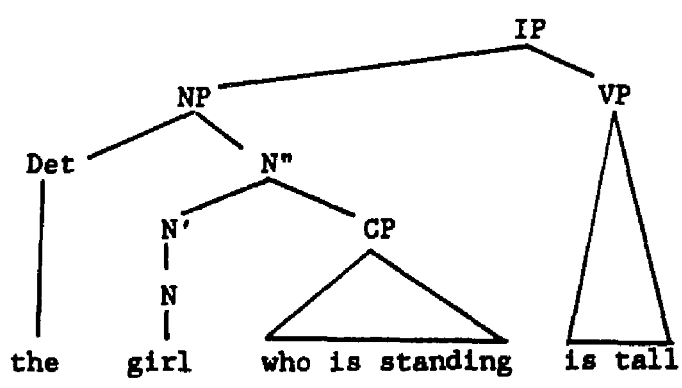
the relative clause who is standing modifies girl, which immediately precedes it. Sometimes, a relative clause may appear at the end of the sentence, as in (1b)

(1) b. The girl is tall who is standing.

However, this sentence is marked by an intonational break after tall and is usually taken to be a stylistic variant of the first.

In the Government and Binding framework the D-structure representation of (1a-b) would look something like (1c) with an optional extraposition rule accounting for (1b).[1]

(1) c.



[1] I represent the relative clause as attached at the level of N" rather than NP. This issue is controversial and will be discussed in Chapter III. Nothing in the present discussion hinges on this choice though.

The relative pronoun "who" is analysed as an operator that moves into spec of CP by LF, yielding the following:

(1) d. $[_{IP}[_{NP}[_{D}\text{the}][_{N''}[_{N'}\text{girl}_{i}][_{CP}[_{spec}\text{who}_{i}][_{IP}\ t_{i}\ \text{is standing}]]]]\ [_{VP}\text{is tall}]]$

The lowest maximal projection of the operator heading the relative clause is a syntactic sister of a projection of the head. This is required in order for noun modification to take place under the assumption that syntactic adjacency is required for predication (Chomsky (1986b) and Safir (1986)).

Semantically, the predication involved in noun modification corresponds to intersection of the sets denoted by the head and the relative clause. In a model theoretic interpretation of GB syntactic structures, the desirability of syntactic sisterhood is even greater since compositionality, a fundamental semantic principle, dictates that the meaning of each phrase be determined by the meanings of its immediate subparts. The semantic interpretation of (1d) would be something like the following:

(1) e. $\lambda P\ P(\iota x(\text{girl}'(x)\ \&\ \text{stand}'(x)))\ \ (\text{tall}')$
$\text{-(lambda conversion)->}$
$\text{tall}'(\iota x(\text{girl}'(x)\ \&\ \text{stand}'(x))$

The determiner "the" is associated with the iota operator which encodes the uniquenes associated with the definite article. This view of "the" is standard in Montague grammar and goes back to Russell (1905) but the specific formulation follows Partee (1987). The iota operator combines with an open sentence to denote the unique entity that satisfies it. It is well defined if such a unique entity exists and is undefined otherwise. Here the iota is defined on the unique individual who satisfies the predicates girl' and stand'. The resulting expression is then "lifted" into a generalized quantifier, analogous to the interpretation the noun phrase would have in Barwise and Cooper (1981).[2] In a model in which there is a single standing girl it will denote the set of all sets that contain this individual.[3] The sentence will be true just in case the set denoted by the VP is in the set denoted by the NP. In an analysis deriving (1b) from (1a) compositionality will be satisfied since the determiner "the" has syntactic scope over the derived constituent [$_{N'}$girl who is standing].

While the view that syntactic sisterhood is a necessary condition for noun modification seems well motivated in languages like English where relative clauses typically appear next to the head, there are other languages where this does not seem to be the case. In Hittite, Walpiri and Indic languages like Hindi, Marathi, Gujarati and Bangla, relative clauses quite naturally appear separated from the noun they are construed with. Such constructions are known in typological literature as correlatives.

In Hindi, for example, the relative clause may precede or follow the main clause, as in (2a-b). The linking between the two clauses is indicated by means of a morpheme, usually a demonstrative, which appears on the main clause nominal and a relative morpheme which

---

[2] Partee's iota operator yields an entity while in Barwise and Cooper (1981) the function **the** takes a set and yields a generalised quantifier. Partee's iota operator has the effect of making the noun phrase meaning different from Montague's and more in keeping with Barwise and Cooper's. In particular, in this account the noun phrase lacks a denotation when there is no unique entity which satisfies the sentence. In Montague's system the noun phrase has a denotation but the sentence is false in such cases.

[3] I deal here with extensions only. The semantics can be easily modified to include intensions.

appears on the noun in the relative clause.[4] In the rest of this chapter I will use underscores to mark the relative clause and boldface to indicate the noun to which it is linked, in order to enhance readability.

(2) a. jo laRkii khaRii hai   vo lambii hai
REL girl standing is   DEM tall is
b. vo **laRkii** lambii hai jo khaRii hai
DEM girl tall is   REL standing is
"The girl who is standing is tall"

The relative clauses in (2a) and (2b) do not have the marked intonation of English extraposed clauses. It is not clear whether they should be considered constituents of the noun phrase at any level of syntactic representation. If the relative clause is analyzed as having an NP internal source, the adjacency requirement for modification is satisfied. Parametric variation must then account for the fact that the head and the modifier can surface freely to the left or the right as discontinuous constituents in Hindi, but only to the right in English. If, however, it is analyzed as base-generated away from the head, the predication relation has to be defined non-locally. The requirement of syntactic sisterhood would then have to be abandoned if a uniform account is to be given for relativization in languages like English and Hindi. Thus correlatives pose a challenge for syntactic and semantic accounts of noun modification.

Despite the considerable body of literature on correlatives (Verma (1966), Kachru (1973) and (1978), Subbarao (1984), Downing

---

[4] In Hindi the relative pronoun is distinct from the interrogative. The relevant relative and demonstrative forms are given here:

	RELATIVE		DEMONSTRATIVE	
	Singular	Plural	Singular	Plural
NOMINATIVE CASE	jo	jo	vo	ve
OBLIQUE CASE	jis	jin	us	un

(1971)), they have remained something of a mystery, usually confined to mention in typological surveys (Keenan (1985), Andrews (1985)). The aim of the present work is to bring them out from the realm of the exotic and provide a formal syntactic and semantic account relating them to the more familiar kinds of relativization.

The claims made in this dissertaion are essentially for correlatives in Hindi, though they extend to the other Indic languages as well. Since crucial examples in Hittite and Walpiri are not available to me I make no claims about them. However, there do not seem to be obvious counterexamples in the literature known to me. The analysis will, therefore, be presented as if it applied to all languages reported to have the correlative construction. I leave it for further research to determine whether they have all been correctly thought to have the same construction.

As a first step I will show that it is misleading to use the term "correlative" to refer to the sentences in (2). I will argue that the two sentences in fact have distinct properties; in (2a) the relative clause is adjoined to IP at D-structure while in (2b) it originates inside the main clause NP and is moved rightwards at S-structure. This syntactic difference corresponds to a semantic difference. The relative clause in (2a) acts like a quantificational phrase binding a position inside IP while in (2b) it is a noun modifier. Thus correlatives do not present any evidence against the view that noun modification requires syntactic sisterhood. Further, this approach to the phenomenon leads us to recognize other uses of the relative clause. It is suggested here that the ability of a relative clause to act like a quantificational phrase is not limited to languages with correlatives but may, in fact, be universal.

In the rest of this chapter, I will explore the phenomenon known as correlatives, as it is manifested in Hindi. In section 2.2 I will introduce its basic features and review previous analyses, highlighting the theoretical issues involved. In section 2.3 I will present evidence that casts serious doubt on the traditional view that Hindi correlatives represent a single strategy of relativization. Finally, I will outline the formal syntactic and semantic representations of the Hindi relative clause in its two capacities, as a quantifier and as a noun modifier, and show how the range of facts presented in section 2.3 can be accounted for.

2.2. Hindi Relative Clauses

Hindi is an SOV language that allows scrambling and has null arguments. A special feature of its phrase structure is that non-finite complements precede the verb while finite complements follow it. In the case of noun phrases too directionality and finiteness seem to interact. Non-finite relatives precede their heads, as demonstrated by (3), but the direction of finite relativization is less clear, as was shown in (2) above.

(3) a. mãĩNE <u>naactii hui</u> ek laRkiiKO dekhaa
I ERG dance PARTICIPIAL one girl ACC saw
a'.* mãĩNE ek laRkiiKO <u>naactii hui</u> dekhaa
I ERG one girl ACC dance PARTICIPIAL saw
"I saw a dancing girl" (= a girl who was dancing)
b. mãĩNE <u>naacne vaalii</u> ek guRiyaa kharidii
I ERG dance ADJ one doll bought
b'.* mãĩNE ek guRiyaa <u>naacne vaalii</u> kharidii
I ERG one doll dancing ADJ bought
"I bought a dancing doll" (= doll that can dance)

Though the correlation between finiteness and directionality is an important aspect of Hindi syntax, I will leave aside this issue till Chapter VII. I believe a fruitful discussion of the issues involved in finite relativization is possible without settling the more general question of complementation. For this reason, I will focus on finite relativization in this chapter, taking the surface forms in (2) as the primary data to be analyzed.

The English sentence "The girl who is standing is tall" has three possible translations into Hindi. As seen in (2), repeated below, the relative clause can precede or follow the main clause. In addition, it can also follow the head noun, as in English.

```
(4)  a. jo laRkii khaRii hai   vo lambi hai left-adjoined
        REL girl standing is   DEM tall is
     b. vo laRkii lambii hai jo khaRii hai  right-adjoined
        DEM girl tall  is    REL standing is
     c. vo laRkii    jo khaRii hai     lambi hai  embedded
        DEM girl    REL standing is  tall is
        "The girl who is standing is tall".
```

Let us first see why these variations cannot be explained in terms of word order possibilities in the language. This view of the phenomenon is not implausible since Hindi allows for scrambling. In (5) we see several acceptable versions of (4):

```
(5)  a. khaRii   hai jo laRkii  vo  hai lambii
        standing is  REL girl DEM is  tall
     b. lambii vo   laRkii hai jo  hai khaRii
        tall   DEM girl   is  REL is  standing
     c. vo   laRkii khaRii   hai jo  hai lambii
        DEM girl   standing is  REL is  tall
        "The girl who is standing is tall."
```

The variation in the relative ordering of the two clauses seen in (4), however, cannot be the result of scrambling since the following examples are not possible under the intended interpretation:

```
(6)  a.*  vo laRkii hai jo hai khaRii   lambii
          DEM girl is  who is standing tall
     b.*  jo  vo laRkii lambii hai  khaRii hai
          REL DEM girl tall   is   standing is
          "The girl who is standing is tall."
```

In (6a) we see that a relative clause cannot break up the main clause arbitrarily; in (6b) we see that the main clause cannot break up the relative clause. That is, relative clauses can appear only at the periphery while scrambling allows constituents to be moved to non-peripheral sites.[5] Though relativization in Hindi allows the relative clause to be positioned more freely than in English, we see that there are constraints on it which need to be characterized.

Another argument against the view that the variation in (4) is a reflex of free word order possibilities in the language comes from non-restrictive or appositive relatives. As in English, non-restrictive relatives in Hindi can modify proper names and are accompanied by an intonational break. Unlike restrictive relatives, however, these relatives must be adjacent to the head:

(7) a.* jo laRkii khaRii hai amu lambii hai
REL girl standing is Anu tall is
b.* amu lambii hai jo khaRii hai
Anu tall is REL standing is
c. amu jo khaRii hai lambii hai
Anu REL standing is tall is
"Anu, who is standing, is tall".

Non-restrictive relatives, we see, do not have the same options as restrictive relatives. If the variation in (4) were a manifestation of free word order alone, there would be no reason why a similar variation would not be permitted with non-restrictive relatives. The variation in (4) thus has to be recognized as a defining characteristic of restrictive relatives in Hindi.

The typological distinction that is made between correlative type languages and others, then, seems well motivated. The position of a relative clause in a correlative construction is far freer than

[5] I will not have much to say about scrambling in this dissertation.

in regular relativization. At the same time, the variation cannot be explained in terms of general properties of the language. I would like, therefore, to make the nature of this distinction precise. Let us begin by reviewing some of the more important analyses of this phenomenon.

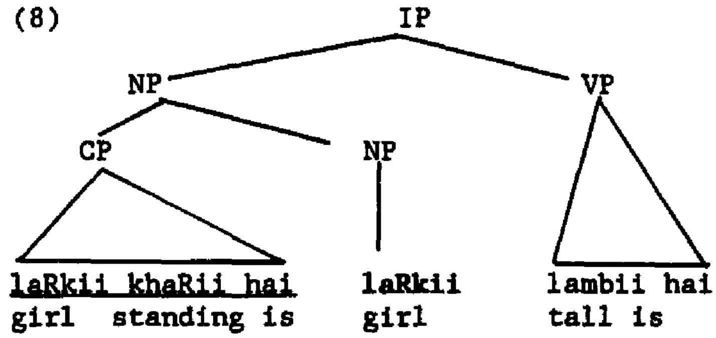
Earlier studies of Hindi relativization basically fall into two classes. One group of studies takes all of them to be underlyingly restrictive relative clauses of the English kind; the other assumes that all relative clauses are base-generated adjoined to the main clause. While the two approaches differ in the syntactic representation of correlatives, they agree that semantically they are the same -- the relative clause in both structures modifies the head noun. Under either approach, the sentences in (4) are analyzed as having a uniform underlying structure.[6]

Verma (1966), Kachru (1973) and (1978) and Subbarao (1984) consider relative clauses in Hindi to derive from a rule expanding NP, just as in English. The surface forms result from movement, which is assumed to be freer in Hindi than in English. Junghare (1973) and Wali (1982) take the same view of Marathi correlatives. Abstracting away from the details, on which they differ, these studies would represent the base form of the sentences in (4) as in (8). This analysis is essentially Subbarao's, except for the node labels which have been changed for the sake of uniformity.

---

[6] The two approaches also make different predictions for acquisition. See Srivastav (1988) for problems in learnability associated with each of them.

(8)



A transformational rule of pronominalization is assumed, which replaces the second instance of a coreferential NP with a pronominal form. In (8), the main clause NP is replaced by the demonstrative vo by pronominalization. This is followed by another transformation (relativization), which attaches the relative pronoun jo to the noun phrase in the subordinate clause. We thus get the surface form in (4a). In the case of (4b), the relative clause is first extraposed to the right. Pronominalization now affects the NP in the relative clause since it follows the main clause. After relativization takes place the relative clause has the appropriate pronominal form, namely jo. In order to get the embedded form in (4c), a rule (Sentence-flip) is needed to flip the order of the relative clause and the head. This is followed by pronominalization and relativization.

Subbarao's analysis, as it stands, cannot account for (9) in which a left-adjoined relative is construed with a non-topicalized object. Donaldson (1971), in fact, takes such sentences as arguing against an NP embedded source for correlatives.

(9) jo laRkii khaRii hai raam usKO jaantaa hai
REL girl standing is Ram DEM ACC knows
"Ram knows the girl who is standing."

(9) can be accounted for within an analysis like Subbarao's if a transformational rule of left extraposition is added. In Baltin (1985) it is argued that leftward movement of modifiers is generally

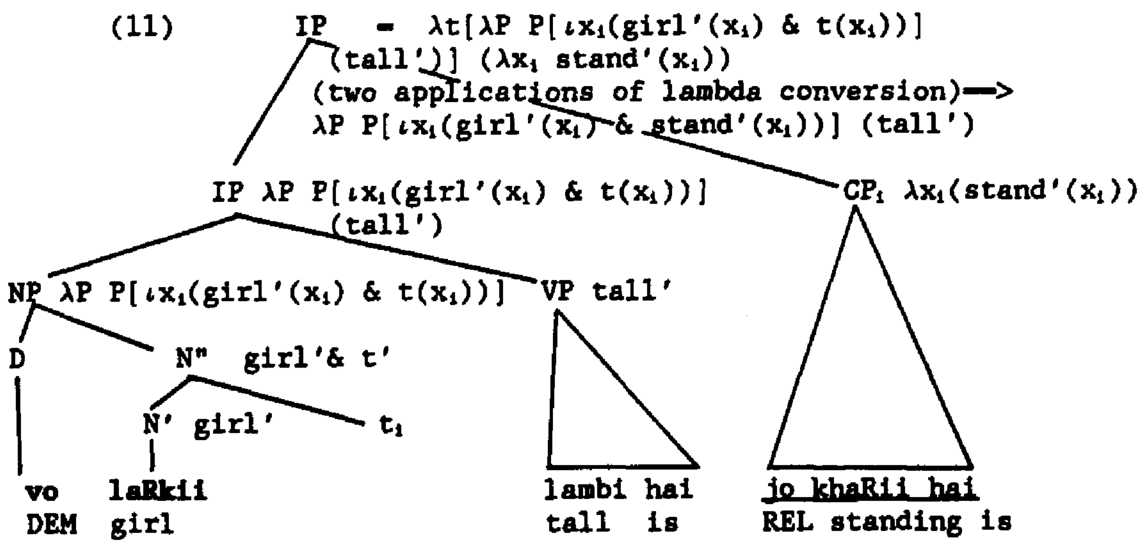
proscribed in languages. The analysis under consideration, if correct, would suggest that Hindi is among those languages in which modifiers can be preposed as well as extraposed.

The semantics for the NP embedded analysis of correlatives is not problematic. Essentially, set intersection, as proposed for English, augmented by rules to interpret moved constituents would suffice. One simple way is to interpret the noun phrase with a lambda abstract over the trace of the moved CP and then fill in the value of the extraposed/preposed CP by lambda conversion. This is possible if the semantic type of the variable corresponding to the trace is that of a predicate:

(10) Relative clause: $\lambda z\,[CP']$ (type <e,t>)
Main clause : $\lambda t\,[IP']$ (type <<e,t>,t>)
Sentence : $\lambda t\,[IP']\,(\lambda z[CP'])$ (type t)

Applied to (4b), for example, this would yield the interpretation in (11). DEM is interpreted for now as the iota operator, analogous to the English determiner the:

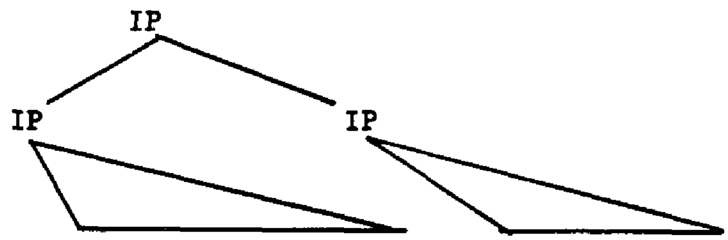
(11)



Since the transformational rule of <u>move alpha</u> is assumed to leave traces, rules such as (10) would be needed in any language to interpret moved constituents. Thus, under the NP embedded approach to correlatives the primary question of theoretical interest is whether Hindi allows movement of relative clauses to the left.

Now let us consider the adjoined clause approach to correlatives, which takes relativization in Hindi to involve a type of phrase structure not attested in English, namely $IP \rightarrow IP_{rel}\ IP_{main}$ or $IP \rightarrow IP_{main}\ IP_{rel}$. This is the structure argued for by Donaldson (1971) and is implicit in typological surveys such as Downing (1973), Keenan (1985) and Andrews (1985). The structure of the sentences in (4) would be something like the following:

(12)



a. jo laRkii khaRii hai — vo lambii hai
REL girl standing is — DEM tall is

b. vo laRkii lambii hai — jo khaRii hai
DEM girl tall is — REL standing is

"The girl who is standing is tall".

The adjoined clause approach, thus, separates relativization in Hindi and English. Since the syntax is completely different, it is the semantics that must bear the burden of conveying the similarity between relativization strategies in the two languages. One implementation of this idea is given in Dasgupta (1980) who analyses sentence-initial relative clauses in Bangla. In his view, the relative morpheme marks an open slot. It is thus a variable that needs to be bound by an antecedent in the main clause. Relativization is effected by means of a binding relationship that identifies the head with the modifier.

Dasgupta's analysis, however, does not address the problem of non-compositionality in this approach to noun modification. Given that the NP is already interpreted at the point the relative clause combines with the sentence, the predication relation cannot be defined locally. This problem is addressed by Bach & Cooper (1978) and Cooper (1979). They suggest that the relative clause and the main clause are interpreted independently. The main clause NP is understood as having a variable R, a mnemonic for relative, which is abstracted over. Then the relative clause is fed in as argument of the lambda abstract. The effect of this rule is to bring the relative clause under the scope of the head noun, thereby accounting for the synonymy of correlatives and relatives across languages:

(13) Relative clause: $\lambda z[IP_{rel'}]$ (type <e,t>)
Main clause : $\lambda R[IP_{main'}]$ (type <<e,t>,t>)
Sentence : $\lambda R[IP_{main'}]$ $(\lambda z[IP_{rel'}])$ (type t)

Applied to (4b) this yields the following interpretation:

(14) Relative clause: $\lambda z(stand'(z))$
Main clause: $\lambda R[\lambda PP[\iota x_1(girl'(x_1) \; \& \; R(x_1))]$ $(tall')]$
Sentence: $\lambda R[\lambda PP[\iota x_1(girl'(x_1) \; \& \; R(x_1))]$ $(tall')]$ $(\lambda z \; stand'(z))$
(two applications of lambda conversion)⟶
$\lambda PP[\iota x_1(girl'(x_1) \; \& \; stand'(x_1))]$ $(tall')$

The difference between (10) and (13) is purely syntactic. Instead of the trace of a moved element there is a free variable posited, which modifies the denotation of the NP. The interpretation of a base generated adjoined relative clause becomes equivalent to the interpretation of a moved relative clause. In this sense Bach and Cooper provide an interpretive analogue of movement, showing that a compositional semantics is possible for correlatives analyzed as having discontinuous constituents in their base forms.

There is, of course, a fundamental problem with the adjoined clause approach which has not been sufficiently addressed by its proponents. There is no explanation for the fact that if a relative clause occurs inside the main clause it must be adjacent to the head, as shown by the grammaticality of (4c) and the ungrammaticality of (6a).

To sum up, the NP-embedded approach to correlatives suggests that cross-linguistically, relativization is uniform syntactically and semantically. Languages differ with respect to movement possibilities. The adjoined clause approach to the phenomenon, on the other hand, holds that correlatives are syntactically distinct from relatives but semantically alike. The basic premise shared by both approaches is that there is a single strategy of relativization in Hindi, represented by (4a-c).[7]

In the following section, differences between left-adjoined relative clauses on the one hand, and embedded/right-adjoined relative clauses on the other, will be pointed out. We will argue that these asymmetries can only be explained as a reflex of fundamental structural differences between relative clauses that precede the main clause and those that follow the noun.

2.3. Asymmetries Between Correlatives

One important difference between left adjoined and right adjoined/embedded relatives has to do with headedness, by which I mean the presence or absence of the common noun with the REL and DEM elements. It has been observed that in left-adjoined structures both

[7] Dasgupta's (1980) account is different in that he considers left adjoined relative clauses to be syntactically distinct from the right adjoined ones, but he too takes them to be semantically alike.

NPs can be realised with a common noun.[8] Right adjoined and embedded structures, however, do not allow the relative clause to contain the common noun. Thus the relative clause in (15a), but not in (15b-c), can be "internally headed":

(15)	a.	jo laRkii khaRii hai	vo lambii hai	
		REL girl standing is	DEM tall is	
		jo laRkii khaRii hai	vo laRkii lambii hai	
		REL girl standing is	DEM girl tall is	
		jo khaRii hai	vo laRkii lambii hai	
		REL standing is	DEM girl tall is	
	b.	vo laRkii lambii hai	jo khaRii hai	
		DEM girl tall is	REL standing is	
	*	vo DEM laRkii lambii hai	jo laRkii khaRii hai	
		DEM girl tall is	REL girl standing is	
	*	vo DEM lambii hai	jo laRkii khaRii hai	
		DEM tall is	REL girl standing is	
	c.	vo laRkii	jo khaRii hai	lambii hai
		DEM girl	REL standing is	tall is
	*	vo DEM laRkii	jo laRkii khaRii hai	lambii hai
		DEM girl	REL girl standing is	tall is
	*	vo DEM	jo laRkii khaRii hai	lambii hai
		DEM	REL girl standing is	tall is

In order to account for the second form in (15a) Subbarao, for example, would have to say that pronominalization is optional. In order to account for the third, he would have to say that the pronominalization rule is not based on linear order but on hierarchy. Ad hoc though such stipulations may be, the real problem is that they fail empirically. For example, if pronominalization is optional, we would predict the second form in (15b) to be correct also. And if pronominalization is really hierarchy based, there is no explanation for the first form in (15a) in which the pronominalized NP is in the

[8] In Kachru (1973) and (1978) sentences like the second one in (15a), that is, those with a common noun in both clauses are represented with a question mark. I consider the first sentence basic and, in some sense, more natural than the other two. All three, however, are acceptable and need to be accounted for.

main clause. Capturing the full paradigm reduces to a statement that pronominalization is less restricted in left adjoined relative clauses. It is optional, and when it does apply may refer to either linear order or c-command. Such a statement has little explanatory value. Similar problems arise with other analyses which manipulate the rules of pronominalization and relativization to derive the forms in (15a). No account extends to (15b-c) in a straightforward way.

A second difference between the two types of relatives has to do with a demonstrative requirement in left adjoined structures. Subbarao (1984;13) observes that if the main clause NP is indefinite, the relative clause can only occur to the right.

(16) a.* jo laRkiyãã khaRii hãĩ do lambii hãĩ
REL girls standing are two tall are
b. do laRkiyãã lambii hãĩ jo khaRii hãĩ
two girls tall are REL standing are
c. do laRkiyãã jo khaRii hãĩ lambi hãĩ
two girls REL standing are tall are
"Two girls who are standing are tall."

The only way to express (16) in a left adjoined structure is to use a partitive in the main clause. The partitive provides the demonstrative **un** and makes the main clause NP definite:

(17) jo laRkiyãã khaRii hãĩ un-mẽ-se do lambii hãĩ
REL girls standing are DEM-PARTITIVE two tall are
"Two of the girls who are standing are tall".

Similarly, compare (16) with (18) in which a demonstrative has been added to the main clause NP. All three structures become acceptable:[•]

(18) a. jo laRkiyãã khaRii hãĩ ve do lambii hãĩ
REL girls standing are DEM two tall are

[•] Hock (1989) considers (18a) ungrammatical. Although speakers may prefer the main clause to have **ve dono** "both those" in place of **ve do** "those two", both are possible.

b. **ve do laRkiyãã** lambii hãĩ <u>jo khaRii hãĩ</u>
DEM two girls tall are REL standing are

c. **ve do laRkiyãã** <u>jo khaRii hãĩ</u> lambii hãĩ
DEM two girls REL standing are tall are
"The two girls who are standing are tall."

Note that under either version of the uniform structure hypothesis, (16) and (18) are both equally interpretable. Application of (10), the rule I have proposed for interpreting moved relative clauses, or (13), the rule proposed by Bach and Cooper, will yield an interpretation.[10]

(16') $\lambda PP[2\ x(girl'(x)\ \&\ stand'(x))]$ (tall')
(18') $\lambda PP[\ \iota 2\ x(girl'(x)\ \&\ stand'(x))]$ (tall')

The difference between the two operators is in uniqueness -- (16') will be well-defined as long as there are at least two individuals who are girls and are standing while (18') will be well-defined only if there are exactly two such individuals. There is therefore no semantic reason why (16a) should be ungrammatical if it is indeed a variant of (16b-c). Subbarao's observation, however, is not quite accurate. When the main clause NP is definite relative clauses are not freely left adjoined. In Hindi, bare noun phrases can function as definites (see Verma (1966) and Porterfield and Srivastav (1988) for discussion). Such NPs are not possible in left adjoined structures:[11]

(19) a.* <u>jo laRkii khaRii hai</u> **laRkii** lambii hai
REL girl standing is girl tall is

b. **laRkii** lambii hai <u>jo khaRii hai</u>
girl tall is REL standing is

c. **laRkii** <u>jo khaRii hai</u> lambii hai
girl REL standing is tall is
"The girl who is standing is tall."

---

[10] <u>do</u> "two" and <u>ve do</u> "DEM two" are interpreted as the entity level correlate of the functions **two** and **the two** in Barwise and Cooper (1981), in keeping with the semantics adopted for "the".

[11] I thank Geoff Pullum for reminding me of this.

It would seem, then, that the restriction on the main clause NP in left adjoined structures is stricter than definiteness; the NP must contain a demonstrative.

The facts in (16)-(19) are problematic for standard approaches to correlatives. Under the NP embedded analysis it has to be stipulated as a constraint on leftward movement that the quantifier contain a demonstrative. Rightward movement would not be similarly restricted. Such a constraint has no independent motivation. Under the adjoined clause analysis, on the other hand, the problem is to block the left-adjoined relative clause from being interpreted in the scope of certain kinds of quantifiers, while allowing the right adjoined relative to be so interpreted. These facts about quantification raise serious doubts about the nature of the relationship between the left adjoined relative clause and the main clause NP. While the relative clause is obviously linked to the NP, it does not seem to modify it in the way that a right-adjoined/embedded relative clause does. Finally, sentence-initial relative clauses may have more than one relative element, each construed with an NP in the main clause. This option for multiple relativization is not available to the other two. Consider (20) in which two REL elements are linked to two DEM elements:

(20) a. jis laRkiiNE$_i$ jis laRkeKO$_j$ dekhaa
REL girl ERG REL boy ACC saw
usNE$_i$ usKO$_j$ pasand kiyaa
DEM ERG DEM ACC liked

b.* us laRkiiNE$_i$ us laRkeKO$_j$ pasand kiyaa
DEM girl ERG DEM boy ACC liked
jisNE$_i$ jisKO$_j$ dekhaa
REL ERG REL ACC saw

c.* Impossible to construct.
"Which girl saw which boy, she liked him".

(20c) is impossible to construct since the same relative clause cannot be simultaneously adjacent to two different nouns.[12]

The problem for the NP embedded analysis is clear. There is no source for the left-adjoined relative clause as shown by the impossiblity of constructing (20c). The problem for the adjoined clause analysis is to provide an interpretation for (20a) while blocking one for (20b). Note, furthermore, that the Bach-Cooper semantics does not extend to such sentences. Since its effect is to bring the relative clause under the scope of the main clause NP, its application is blocked because it cannot bring a single relative clause into the scope of two different NPs at the same time. In fact, any semantics adopted for the left-adjoined relative clause would have to be prevented from applying to the right adjoined relative clause. The fact that Hindi has multiple relativization only on the left is therefore significant. Left adjoined relative clauses obviously cannot originate inside noun phrases and would therefore have to analyzed as base generated in adjoined position. Right adjoined relative clauses not being multiply headed are plausibly analyzed as originating inside NP, and adjoined to IP by extraposition.

In this section it has been shown that left-adjoined relative clauses systematically behave differently from embedded/right-adjoined relative clauses. Specifically, they differ with respect to headedness, the demonstrative requirement, and multiple

---

[12] Sometimes right adjoined sentences are accepted by speakers. Usually, such sentences do not have more than two linked elements and do not contain common nouns with REL and DEM. There is also an intonational break between the clauses. I take these to be marginal constructions in which the main clause has been fronted. At this point, however, I do not have an account of the constraints on such fronting.

relativization.[13] It was noted earlier that correlatives pose a challenge for a characterization of the predication involved in noun modification. The facts presented here, however, show that the problem is more fundamental.

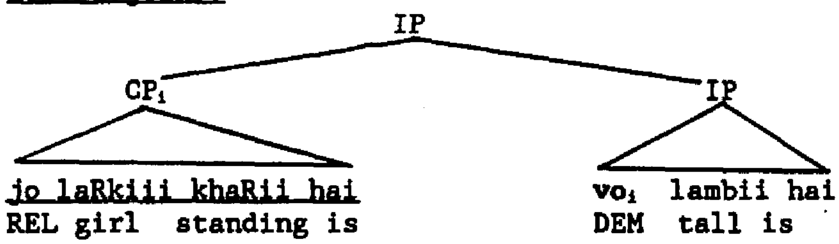
Syntactic and semantic accounts of noun modification extended to cover correlatives fail to account for more than a few basic cases. In each instance it is the left-adjoined structure that does not behave in the expected manner. This casts doubt on any analysis that posits a uniform underlying structure for Hindi relative clauses.

2.4. Towards a Solution

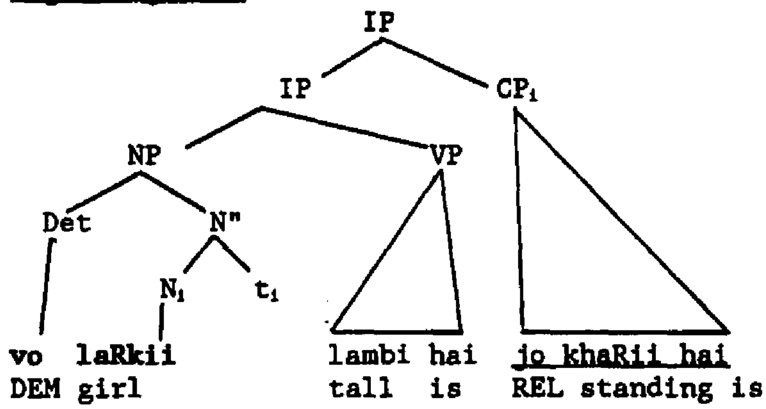
In this section I will propose a structural distinction between left adjoined and right adjoined/embedded relatives which provides a principled way of organizing the data presented above. Let us consider the following syntactic representations for the sentences in (4):

[13] In Srivastav (1988) I claimed that left adjoined structures, unlike embedded and right adjoined structures, do not allow recursive relativization of the following form: [...REL_i...] [...DEM_i...REL_j...] [...DEM_j...]. It has been pointed out to me that one can construct acceptable sentences of this form. I still believe them to be different, however, in that they require the REL and DEM elements to be stressed. Also, their intonation pattern is different in that breaks are required between the clauses.

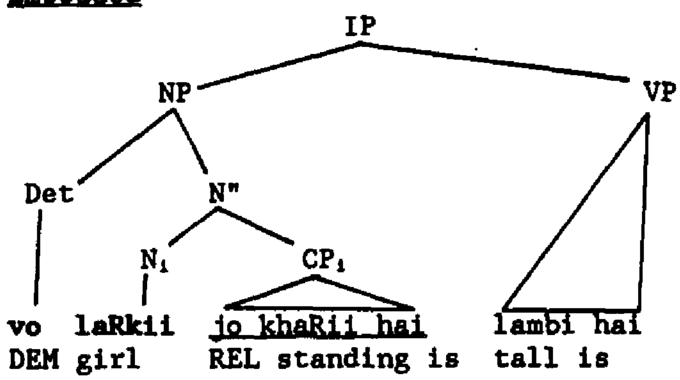
(21) a. Left-adjoined



b. Right-adjoined



c. Embedded



The basic syntactic difference between (21a) and (21b-c) is that in the first the relative clause is base generated outside the main clause NP while in the second it originates inside it. Thus, in (21b-c) but not (21a) there is a level of representation, namely D structure, at which the relative clause is adjacent to the main clause nominal.

This syntactic distinction can be related to a semantic distinction. As discussed earlier, noun modification involves predication and it has been well established that syntactic sisterhood is a requirement for predication. In fact, the problem posed by correlatives to the theory of predication was to define a semantics for noun modification in the absence of an appropriate syntactic configuration. If the requirement of syntactic adjacency for predication is not weakened, (21b-c) will be the only structures in which noun modification can take place. The question then arises about what sort of interpretation (21a) should have. I suggest that it is a quantificational structure in which the relative clause binds the main clause nominal.[14]

A consequence of this analysis of the phenomenon is that the relative clause is not in the scope of the main clause nominal in left adjoined structures but is so in the other two. We might expect this fact to be reflected in the language in some way, and indeed, it is. In (22) we have a sentence in which the main clause NP has a singular determiner, **har ek** "each".[15] However, the agreement on the verb in the left adjoined relative must be plural, while the agreement in the other two relatives has to be singular:

(22) a. <u>jo laRke khaRe hãĩ</u> **har ek** meraa chaatr hai
REL boys standing are each one my student is
a.'* <u>jo laRkaa khaRaa hai</u> **har ek** meraa chaatr hai
REL boy standing is each one my student is
b. **har ek laRkaa** meraa chaatr hai <u>jo khaRaa hai</u>
each one boy my student is REL standing is
b.'* **har ek laRkaa** meraa chaatr hai <u>jo khaRe hãĩ</u>
each one boy my student is REL standing are
c. **har ek laRkaa** <u>jo khaRaa hai</u> meraa chaatr hai
each one boy REL standing is my student is
c.'* **har ek laRkaa** <u>jo khaRe hãĩ</u> meraa chatr hai
each one boy REL standing are my student is
"Each boy who is standing is my student".

---

[14] The nature of this binding will be made precise in Chapters IV and V.

[15] I am not sure whether **har ek** is like "every" or "each". In any case, it is clearly singular.

It was noted earlier that left adjoined structures require a demonstrative in the main clause. The NP in (22a) does not have a demonstrative but it can be analysed in the following way. We can think of it as having a null partitive **un-mẽ-se har ek** "DEM-PARTITIVE each one". The plural morphology in the relative clause is explained since the relative clause is linked to a plural demonstrative; it is not inside the scope of **har ek**, a singular determiner. In (22b-c), on the other hand, the relative clause has singular morphology as is expected if it originates inside the scope of a singular determiner.

Another piece of supporting evidence for (21) comes from the following:

(23) a.* jo laRke khaRe hãĩ **kaun** vahãã rahtaa hai
REL boys standing are who there lives
b. **kaun laRkaa** vahãã rahtaa hai jo khaRaa hai
which boy there lives REL standing is
c. **kaun laRkaa** jo khaRaa hai vahãã rahtaa hai
which boy REL standing is there lives
"Which boy who is standing lives there ?"

A left adjoined relative cannot be construed with a noun phrase which is a question word. This follows from the analysis being proposed here. The relation between the relative clause and the main clause noun phrase is that of variable binding. A question word, however, is itself a quantificational element. As such, it cannot provide a variable for the relative clause to bind. Note, of course, that the problem is solved if a partitive is used:

(24) jo laRke khaRe hai **un-mẽ-se kaun** vahaa rahtaa hai
REL boys standing are DEM-PART who there lives
"Which boy who is standing lives there ?"

Here, the relative clause binds the variable **un** "DEM" and not the quantifier **kaun** "who".

Notice also that the left adjoined relative clause has plural morphology, unlike the other two, as expected. Although the question word is singular, the question presupposes that there would be more than one boy standing, of whom the predicate "lives there" could be true. The left adjoined relative picks out the set of possible individuals who might fit the main clause. It is therefore plural, like the variable that it binds. The right adjoined and embedded relative clauses, on the other hand, occur inside the scope of the question word and must therefore have singular morphology. Thus (22)-(24) provide fairly concrete evidence of the claim embodied in the representations in (21).

Let us now consider the asymmetries between left adjoined and right adjoined/embedded relatives noted in the previous section from the perspective of (21).

Let us look first at the facts about headedness presented in (15). Given (21), only right adjoined and embedded relatives can be considered noun modifiers. The absence of the common noun is not surprising since relative clauses in noun modification structures, such as restrictive relative clauses in English, typically do not contain internal heads. What (21a) claims is that internally headed relatives are allowed in quantificational structures. This difference in the distribution of internally headed relatives will have an explanation when the semantics of the relative clause is discussed in Chapter V. Briefly, it will be argued that internally headed relatives and relative clauses without internal heads have different semantic types. Internally headed relatives are generalized quantifiers while ordinary relatives can be set denoting terms. As such, the former can appear only in a structure like (21a) where a quantifier is needed, while the latter can appear in structures like (21b-c) where intersection with a common noun, another set denoting term, is needed. We will see in Chapters V and VI that in English the only instances of internally headed relatives are free relatives, a construction that is also analyzed as a quantificational relative clause.

The demonstrative requirement for left adjoined relative clauses, noted in (16)-(18), can also be better described in view of (21). Since we are taking (21a) to be a quantificational structure in which the relative clause binds a variable in the main clause, a proper characterization of the phenomenon amounts to a classification of appropriate variables in the language. I suggest that only NPs with demonstratives qualify as variables that can be bound in such configurations.[16] The Hindi DEM is a pronominal element and can be interpreted as a resumptive pronoun, i.e. a pronoun that can be A' bound. The demonstrative requirement follows from the fact that a base generated relative clause, being a quantifier, must bind a variable. Demonstratives can provide this variable. (16a) and (19a) are ruled out as cases of vacuous quantification since there is no DEM in the main clause NP and the relative clause does not have a variable to bind (see Chapters IV and V for details). In the case of right adjoined/embedded structures, on the other hand, the relative clause

[16] Hindi allows null arguments and it is therefore possible for the main clause NP to be null. Null arguments are not problematic since any account developed for cases with overt demonstratives will be extendable to pro under standard theories of pro drop (for example, Huang 1982). For some problems, however, see Chapter IV.

forms a constituent with the common noun. It may then remain bare, as in (19) or combine with a determiner, as in (16). Since the determiner has scope over this derived constituent, it makes no difference what kind of a determiner it is.

There remain two issues to settle with regard to this account of the demonstrative requirement. The first is the fact that a definite noun phrase such as the bare NP **laRkii** "girl" in (19a) cannot satisfy the variable requirement of the relative clause. Most theories of definites (Cooper (1983) and Heim (1982), for example) do not differentiate between NPs with "the" and those with demonstratives -- the interpretation of both types of noun phrases involve variables. We will see in Chapter V that it is possible to account for this fact within a theory of definites, such as Cooper (1983), with some modification that separates definites from NP's with demonstratives.

The second question has to do with the possibility of null demonstratives. If the main clause NP in (22a) can have a null demonstrative **(un-mẽ-se) har ek** "(DEM-PARTITIVE) each one" it is not clear why the NP in (16a) **do** "two" cannot contain one. Also consider (25), which are acceptable with null demonstratives:

(25) jo laRke khaRe hãĩ **(ve)sab/(ve) dono** mere chatr hãĩ
REL boys standing DEM all DEM both my students are
"All(the)/both(the) boys who are standing are my students."

Universal terms, of course, with or without the demonstrative are semantically equivalent. That is **ve sab** "all those" and **sab** "all" are equivalent in that they both refer exhaustively to the set of boys standing. Similarly, with **ve dono** "both those" and **dono** "both", and **un-mẽ-se har ek** "each one of them" and **har ek** "each one". Note also that the class of determiners that can surface without demonstratives are precisely those which are known as floating quantifiers. This is significant since it is not obvious that part of a noun phrase, i.e. a determiner or a partitive phrase, can be null. If these are instances of floating quantifiers, however, there is no such problem since they would be outside the noun phrase and the noun phrase could be a null argument.[17]

To sum up the explanation for the facts in (13)-(16), we can say that left adjoined relatives, being quantificational, require a variable to bind. The pronominal element DEM provides such a variable. Apparent counterexamples to this claim can be analyzed as cases of floating quantifiers linked to null arguments.

Finally, let us look at the facts about multiple relativization presented in (20). Since right adjoined relative clauses are produced by movement, (20b) will never be generated. There is no syntactic source for it as shown by the impossiblity of constructing (20c). I have analyzed left adjoined structures as quantificational, with the relative clause binding a variable in the main clause. In order to interpret multiply relativized structures, I propose to extend this idea to cover cases of multiple binding. While a relative clause with one REL element is analysed as a unary quantifier, those with more than one REL will be analysed as polyadic quantifiers. This will ensure that the main clause contain the same number of DEM elements as the REL elements in the relative clause. The semantics involved in

[17] See Sportiche (1988) for a proposal that floating quantifiers are partitives. This is relevant to Hindi since **har ek** "each one" can only be analyzed as having a null partitive, not as a regular NP with a null demonstrative.

interpreting polyadic quantifiers will be discussed at length in Chapters IV and V.

This account of the asymmetries, admittedly, is sketchy. The idea, however, was not to give full explanations but to show that the present analysis provides a means for organizing the facts in a way that does not call for ad hoc stipulations. Given the representations in (21), the asymmetries can be derived from general structural principles.

To put the present analysis in the perspective of earlier studies, the view that one type of adjoined relative clause is base-generated while another is produced by movement is not completely radical. Keenan (1985;168) mentions the possibility that right adjoined relative clauses in Hindi could result from extraposition. However, it does not seem to me that he is making a claim distinguishing two structures. Dasgupta (1980:306-7) does make such a claim for Bangla. Semantically, however, he believes that they are essentially the same. He focuses on left adjoined structures, indicating that an appropriate semantics for this will naturally extend to the other. My proposal differs crucially in correlating the syntactic difference with a corresponding semantic distinction.

To sum up, I agree with the NP-embedded approach to correlatives that adjoined relative clauses can result from movement. I claim, however, that this is true of only those relative clauses that follow the main clause NP. As a consequence of this, I can maintain that Hindi does not present a counterexample to the observation in Baltin (1985) that modifiers cannot move to the left. I agree with the adjoined clause approach that it is possible to base-generate relative clauses adjoined to IP, but claim that this only happens with left adjoined structures. And I differ in the characterization of the relationship between such relative clauses and the main clause NP. Instead of modifying the main clause nominal, the relative clause actually binds it. It remains, however, to justify the structures in (21) within the general framework of Government and Binding and truth conditional/model theoretic semantics. The following chapters will place relativization in Hindi within a general theory of relativization.

CHAPTER III

RESTRICTIVE RELATIVE CLAUSES IN HINDI

3.1. Embedding and Extraposition

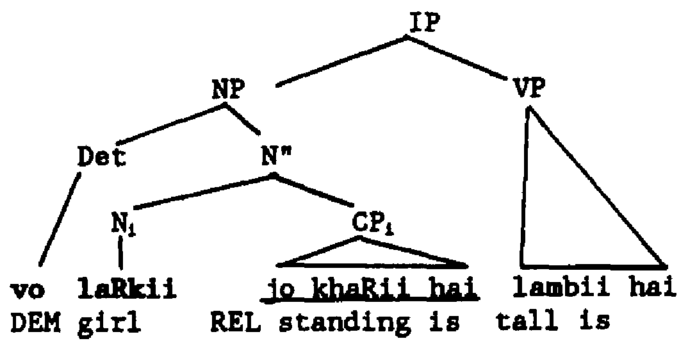
It was established in Chapter II that the term "correlatives" is misleading since Hindi correlatives can be separated into two types. Embedded and right adjoined relatives originate inside the noun phrase and restrict the interpretation of the head, left adjoined relatives are adjoined to IP at D-structure and bind argument positions in the main clause. In this chapter I will focus on restrictive relatives, i.e. on embedded and right adjoined relatives such as (1) and (2):

(1) **vo laRkii** jo khaRii hai lambii hai **embedded**
DEM girl REL standing is tall is
(2) **vo laRkii** lambii hai jo khaRii hai **right-adjoined**
DEM girl tall is REL standing is
"The girl who is standing is tall".

There are two aspects of the analysis I have proposed for these sentences which are worth exploring. The first is that relativization involves ordinary noun modification, the second that right adjoined relatives are derived from embedded relatives by extraposition.

Let me begin with the embedded relative in (1). It is proposed that it has the following structure:

(3)



There is nothing radically new about (3) as a structure for restrictive relatives, yet there are several issues that are worth exploring. For example, the relative clause in (3) is generated to the right of the head. Though this represents the surface order it is not self-evident that it should be so at D-structure. Simple clauses in Hindi are head final but finite complements and relative clauses follow the head. Because of this there has been some controversy about the phrase structure of the language (Gambhir (1981), Lust et al (1988) and Subbarao (1984) among others). The proposals made in the literature about the structure of Hindi embedded relatives span all the possible options. Subbarao, for example, generates relative clauses to the left (cf. Chapter 2.2.), Junghare (1973) to the right and Bains (1987) claims that both left and right branching relatives are instantiated at D-structure.[1]

In Chapter VII I will show that the basic structure of Hindi is SOV. The apparent violation of this order in the case of finite complementation is due to the fact that the Case Resistence Principle (Stowell (1981)) disallows CPs from appearing preverbally.[2] If the embedded relative clause in (1) is a CP we can assume that it cannot appear in a case marked position. I will show first that the position to the left of the head is a case marked position. Then I will argue

[1] Bains (1989) contains a fuller exposition of this claim. Since I have not been able to get access to the dissertation I am unable to comment on it.

[2] See Chapter VII for discussion. Also Davison (1990) for an alternative proposal in which government rather than case is critical.

that the relative clause cannot be in that position because it is a CP.

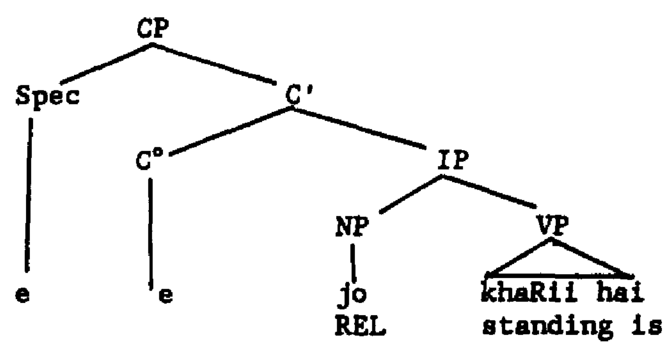
Consider examples of non-finite relativization in Hindi, given in (4):

(4) a. mãiNE **ek** <u>naactii hui</u> laRkiiKO dekhaa
I ERG one dance PARTICIPIAL girl ACC saw
"I saw a dancing girl" (= a girl who was dancing)
b. mãiNE **ek** <u>naactee hue</u> laRkeKO dekhaa
I ERG one dance PARTICIPIAL boy ACC saw
"I saw a dancing boy" (= a boy who was dancing)

In (4) the verb assigns accusative case to the noun phrase to its left. The head has the accusative marking **ko** and all the material to its left gets oblique case. This is transparent in the case of (4b) since the oblique ending for singular masculine nouns ending in **-aa** is **-e**. Thus we have **naacte hue** in place of **naactaa hua**. The examples also show that particilpial relative clauses agree in gender and number with the head. So it seems fairly clear that the position to the left of the head is a cased position.

Turning to the structure of the relative clause, let us see if it is a CP which would be barred from appearing in that position. The base structure that I will argue for is (5):

(5)



According to (5) the relative morpheme **jo** occupies an argument position inside IP where it gets case and theta role. Here it has nominative case, as expected of the subject of the verb **khaRaa honaa** "to stand". Thus its occurrence in the configuration is determined by the Projection Principle.

The question that needs to be addressed, however, is whether **jo** moves into spec of CP. Though there is a tendency for it to move to a clause-initial position, such movement is not obligatory in Hindi. It may remain in-situ or be scrambled like any other constituent. Direct evidence of S-structure movement, however, is available where it has to take scope over a higher clause, as in (6):[3]

(6) **vo laRkii** jo anuko lagtaa hai ki tez hai aayii thii
DEM girl REL Anu-Dat seems that smart is came
"The girl who Anu thinks is smart had come."

In (6), **jo** is not an argument of the predicate **lagnaa** "to seem", but of the predicate in its complement, **tez honaa** "to be smart". This is obvious from its case marking. "To seem" assigns dative case to Anu while "to be smart" assigns nominative case to its subject. Also, "to seem" does not have a theta role to assign to **jo**. It would appear that **jo**, like wh operators in English, originates inside IP but moves to spec position at some level of the derivation.

Huang (1982) and subsequent work in GB has shown that even in in-situ languages operators move at LF. So regardless of S-structure movement of **jo** we might assume that it would move at LF if it is an operator. An indirect piece of evidence suggesting that **jo** is indeed

[3] **jo** cannot be left in-situ here. We will see in Chapter VII that LF movement out of finite clauses is blocked in Hindi. If **jo** is left in-situ in (6) it will not be adjacent to the head **laRkii** "girl" and predication will fail.

an operator is the following. Hindi is a language that freely allows null arguments. However, jo can never be dropped, as seen below:[4]

```
(7)*    vo laRkii  (e) khaRii hai lambii hai
        DEM girl       standing is tall is
        "The girl (who) is standing is tall."
```

It would therefore seem that jo is not an ordinary argument. We may assume that it is an operator and that Hindi does not allow null operators in relative clauses. If it is an operator, however, it would have to move into spec of CP at LF for interpretation.

We have seen that the position to the left of the head is case marked and we have seen that the relative clause is a CP. This means that it cannot appear to the left of the head at S-structure. If we accept the standard view that noun modification requires syntactic adjacency between the head and the operator (Chomsky (1986), Safir (1986)) both the CRP and the adjacency requirement can be satisfied by generating the relative clause to the right.

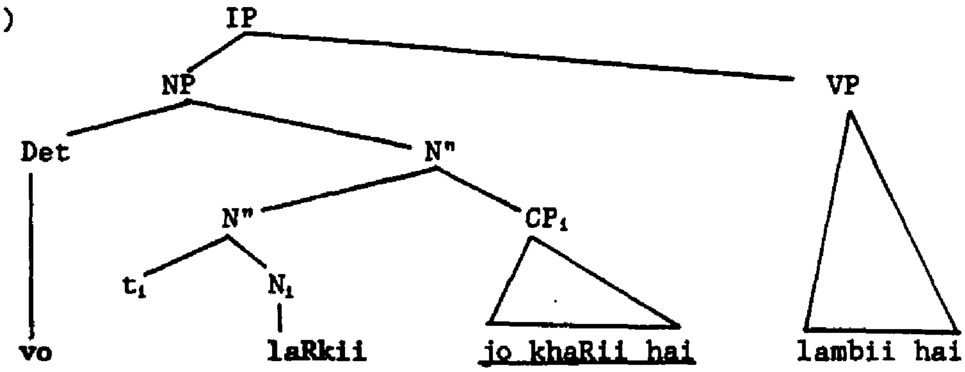
A problem with this, pointed out by Subbarao (1984), is that Hindi phrase structure can no longer be considered uniformly head final. He suggests an alternative derivation which maintains the head final character of the language. Incorporating his proposal into the present approach, we could say that the relative clause is generated to the left, i.e. in the case marked position. We know that some movement has to take place at S-structure in order to satisfy CRP but this could be effected by extraposition to the right periphery of the clause. What happens, however, is that the relative clause moves to the immediate right of the noun phrase by the transformation called

---

[4] This is also true of left and right adjoined relatives.

sentence-flip by Subbarao. The question we must address is whether there is a principled reason for this movement:

(8)



DEM girl REL standing is tall is

If we consider the internal structure of the relative clause in (5) we see that the spec position is to the left. This means that movement of jo to spec is not enough to satisfy adjacency between the head and the operator since they will be separated by the material inside the relative clause. Under the assumption that the predication relation is strictly local, an embedded relative must first undergo sentence-flip in order for the head and the wh operator to become adjacent. Note that once sentence-flip has applied, CRP is automatically satisfied and extraposition becomes optional.[5] As far as I can see, there are no real problems with (8) but there is also no empirical motivation for choosing this over (3). For example, there is no independent reason for sentence-flip except that it avoids generating a head-first structure in a predominantly head-final language.

---

[5] There are correlative languages in which the relative clause never surfaces in embedded position. One might speculate that in those languages CP's may be head final. In that case the adjacency requirement would be satisfied at D-structure if the relative clause were generated to the left. Movement at S-structure would be motivated only by CRP so that it would take the form of extraposition rather than sentence-flip.

Within current assumptions, however, no particular phrase structure is specified for a language (Chomsky (1981) and Stowell (1981)). The head final character of Hindi would follow from the fact that case and theta role assignment is leftward and the head first character of relative clauses follows from a combination of two facts. One, that Hindi CPs are head initial; two, that adjacency between the head and the wh operator is required in order for noun modification to be possible.[6] Subbarao's objection to (3) is thus resolved.

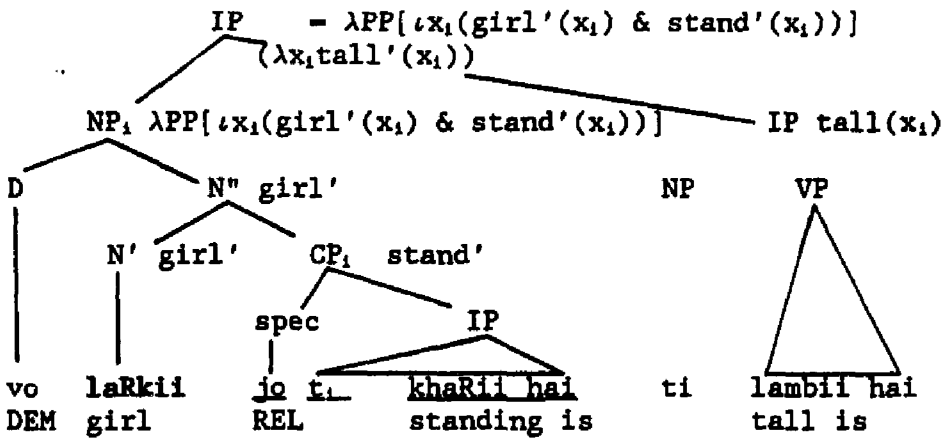
Let us see now how the embedded relative would be interpreted. The relative clause being a modifier, we can assume that **jo**, like the wh operator in English, is a lambda operator which abstracts over an open sentence and yields a set denoting term. In (1), for example, it would yield the set of individuals who are standing. Domain selection and the feminine gender on the verb will presumably restrict the set to a contextually relevant set of female individuals. This is of the right semantic type for noun modification since the head is also of this type. When combined with a common noun like **laRkii** "girl", it yields the intersection of girl' and stand'. The determiner **vo** is defined if the intersected set contains a singleton. The modified noun phrase denotes the set of properties of this individual. The whole sentence is true iff the property of being tall is in this set. The full derivation for (1) is given below:[7]

---

[6] I thank Wayne Harbert for pointing this out.

[7] I assume that the subject noun phrase raises at LF due to QR.

(9)

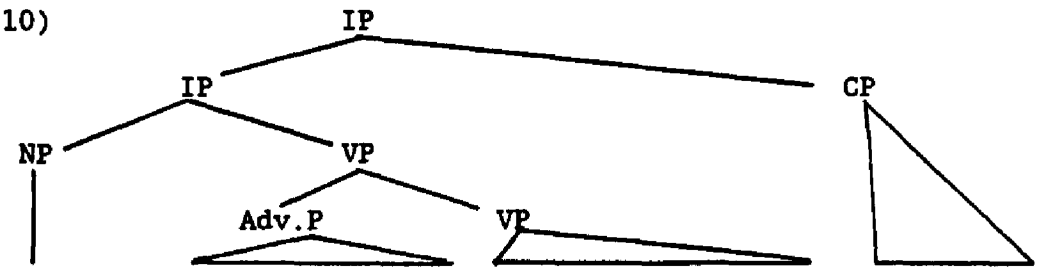


I have assumed here that the level of representation that feeds into the semantic component is LF. Traces left behind by wh movement or quantifier raising are interpreted as free indexed variables. In the case of wh movement, the lambda operator combines with the open sentence denoted by the IP by abstracting over the position with which it is coindexed. In the case of QR, I assume that a structure of the form $[NP]_i$ $[IP \ldots x_i \ldots]$ is interpreted as $\{Q(uantifier)_i\ \lambda x_i IP\ \}$, a form of quantifying in. In both cases, traces formed by syntactic movement will correspond to bound variables in the semantics. The rules involved are of the sort that would be needed in any grammar that disambiguates scope in the syntax.

It is clear from this example that the semantics of noun modification in Hindi embedded relatives is fairly straightforward. The mapping from LF representation to meaning follows standard interpretive procedures and is fully compositional.

Turning now to right adjoined relatives, I claimed that they derive from embedded relatives by extraposition. Let me back this up. My strategy will be to show that right adjunction has the properties typically associated with extraposed relatives, rather than to provide an explanation for those properties. For example, it has been claimed by Subbarao (1984) that Ross's Right Roof Constraint is not operative in Hindi but I will show that right adjoined relatives behave, in this respect, like extraposed relatives in English. Consider a simplified version of Subbarao's example:

(10)



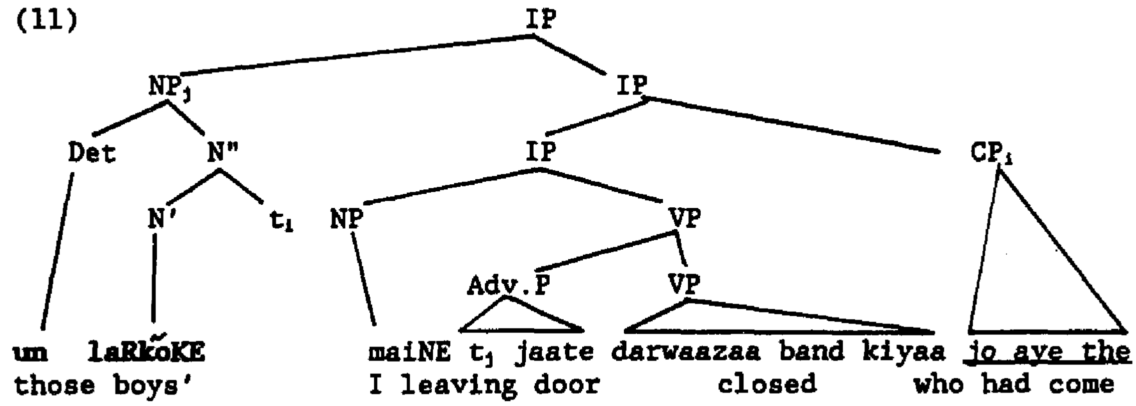
maiNE   un laRkõKE   jaate   darwaazaa   band kiyaa   jo aaye the
I   those boys'   leaving   door   closed   who came
"I closed the door on those boys' leaving who had come."

In (10) the relative clause originates inside the adverbial phrase and is adjoined to matrix IP. Subbarao claims that this is a case of attachment to a superordinate clause, in violation of the Right Roof Constraint. To decide whether this is so we need to determine, first of all, whether the adverbial phrase counts as a clause for purposes of extraposition. We also need to determine which principles of grammar yield the Right Roof effect.

In May (1985) The Right Roof Constraint is explained in terms of government. It is proposed that an extraposed relative clause must be governed by its head at LF. The head, being a quantified NP, is subject to QR. At LF, then, the head and the relative clause will be dominated by all the same maximal projections and there will be no intervening maximal projection. If the relative clause is adjoined higher, the head will not c-command it since QR is local. Thus proper government will not obtain unless extraposition obeys the Right Roof Constraint.

If it is the case that QR of the head **un laRkõKE** "those boys'" is not to the Adv P but to IP, it follows under May's account that the extraposition is also to IP, as shown in the LF representation of (10) below:

(11)



This LF is well formed since proper government obtains between the head and the modifier. In fact, it is predicted that extraposition of the relative clause to the right of the Adv.P would be ungrammatical since VP would intervene between the raised NP and its modifier. This prediction is borne out:

(12)* **mãiNE un laRkõKE** jaate <u>jo aaye the</u>
I those boy's leaving who had come
darwaza band kiyaa
door closed

Another illustration of the fact that Hindi extraposition is clause bounded can be given by the following. In the English sentence (13), and a parallel Hindi construction in (14), the pronoun and the proper name are necessarily interpreted as disjoint in reference. Consider (13) first:

(13) I told <u>her</u> that the concert was attended by <u>many people</u> last year <u>who made Mary nervous</u>.

Disjoint reference is required when a pronoun c-commands an R-expression. In (13) the necessity of disjoint reference between "her" and "Mary" suggests that the pronoun c-commands the relative clause and hence the R-expression inside it.[8] This can be explained if extraposition of the relative clause to matrix IP is disallowed.

Now consider the Hindi sentence:

(14) mãĩne use samjhaya [ki yeh kam un logõ ka nahĩ hai
I her explained that this work those peoples not is
jinse meri nafrat karti hai
whom Mary hates
"I explained to her that this is not those people's work whom Mary hates." (= the work of those people who Mary hates)

This sentence can only be interpreted with **use** "her" disjoint in reference with **meri** "Mary". If Hindi extraposition were not subject to the Right Roof Constraint, as claimed by Subbarao, there would be an LF representation in which the relative clause would be adjoined to the matrix IP. The pronoun inside IP would not c-command the R-expression inside the relative clause and it would be possible for the two to corefer.[9] It seems to me that whatever may be the right account for the Right Roof Constraint in English, it would apply also to Hindi since the facts are similar. There is enough empirical support to show that extraposition in Hindi follows the standard pattern.

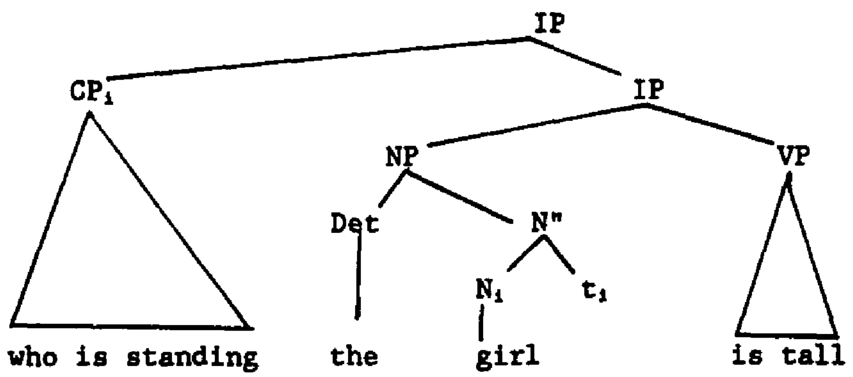
---

[8] The relevant definition of c-command here is one in which the first maximal projection rather than the first branching node counts.

[9] It is worth noting that a left adjoined relative clause can be interpreted with the pronoun and Mary being coreferential. This is expected in the analysis of left adjoined relatives proposed here since the two will not be in a c-command relationship.

In this connection, recall that we do not want to allow for extraposition to the left in Hindi. This, of course, fits in with the observation that extraposition to the left is generally ruled out (Baltin (1985)) but I am not aware of an explanation for this fact within current syntactic theory. May's account of extraposition does not help since proper government between the head and the modifier would obtain at LF regardless of whether an extraposed relative is adjoined to the left or the right of IP. A suggestion made by Gennaro Chierchia (p.c.) is that left extraposition would result in a bound variable (the trace of the relative clause) being coindexed with another element (the head noun) to its left, thereby resulting in a cross-over configuration:

(15)



Of course, we do not have a good account of why cross-over configurations are ruled out. The problem, however, is a general one and I will leave it for future research. I would only like to stress that the Hindi facts are not special in any way.

Before concluding my discussion of Hindi extraposition I would like to clarify a couple of points. In suggesting that right adjoined relatives are extraposed embedded relatives, I have excluded from the discussion a class of examples which have to be recognized as adjunction at base. Consider (16):

(16) bacce khel rahe the jiskii awaaz aa rahii thii
children were playing whose sound was coming
"Children were playing, whose sound was coming in"
= "The sound of children playing was coming in"

There is no noun that the singular genitive wh **jiskii** "whose" can be syntactically associated with, since the only noun phrase in the main clause is plural. Such structures have to be analyzed as modifying derived nominals, in this case "the children's playing".

Another set of examples has to do with the following type of sentence, due to Ross and Perlmutter and noted by Andrews (1985):

(17) A man came in and a woman went out who were similar.

The relative clause here obviously needs a plural antecedent. However, there is no such noun phrase in the main clause. This phenomenon, traditionally treated as Right Node Raising, is also present in Hindi, as shown by the possibility of the Hindi version of (17):[10]

(18) ek aadmii aaya aur ek aurat calii gayii
one man came and one girl left
jo ek duusre se milte the
REL each other resembled

While examples like (16) and (18) are part of the grammar of Hindi, a theory of relative clauses cannot be based on them. As in English, they do not represent the core case of noun modification. They only

[10] In both examples, it is not possible to have a full noun phrase in the relative clause. Since internal heads are always possible in left adjoined relatives, I take these sentences to involve noun modification rather than variable binding. Note also that (18) can have indefinite determiners on the nouns in the main clause, again suggesting that it belongs with restrictive relatives rather than with left adjoined relatives.

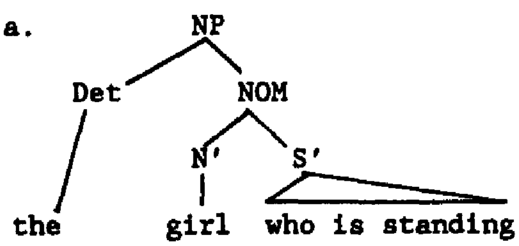
show that it may be possible to process sentences even in the absence of strict syntactic predication, as long as a likely nominal can be inferred. As such, I will take it as established that noun modifiers must be constituents of the noun phrase at some syntactic level.

3.2. The Structure of Restrictive Relatives

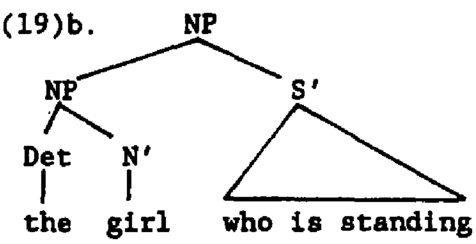
I have assumed in my discussion of noun modification that the relative clause attaches at the level of the common noun and not at the level of the noun phrase. That is, the relative clause is a sister of N' rather than NP. Since this is contrary to current practice let me justify my choice.

The controversy about the level at which the relative clause should attach is not new. Partee (1975) suggested that the choice between the two options, attachment to Nom, i.e. N" or to NP, could be determined on semantic grounds. The semantics of noun modification could be defined compositionally on a structure like (19a) not on (19b):

(19)a.



(19)b.



<u>THE NOM-S ANALYSIS</u> <u>THE NP-S ANALYSIS</u>

The interpretation of the unmodified NP in the NP-S analysis (19b) yields an interpretation only if there is a unique girl in the domain of discourse. The whole noun phrase, however, is understood to denote a unique individual who is both a girl and is standing. As pointed out by Partee the use of the restrictive relative is, in fact, felicitous only if "girl" is not uniquely denoting while "girl who is standing" is. This means that the normal interpretation of the NP "the girl" has to be undone at the level at which it combines with the relative clause, a procedure which goes against compositionality. In contrast, the Nom-S analysis is transparent in this respect since the determiner has scope over the modified noun phrase. Uniqueness is defined on the intersection of the two sets girl' & stand' rather than on girl' itself. As such, meaning can be determined compositionally in the context in which the restrictive relative is likely to be used.[11]

In spite of the intuitive appeal of this logic, the Nom-S analysis has been rejected in favor of the NP-S analysis (Bach and Cooper (1978), McCloskey (1979), Cooper (1979) and Safir (1986)). As discussed in Chapter II, it is possible to define a compositional semantics for structures like (19b). Bach & Cooper overcome the problem noted by Partee by interpreting the NP with a free variable inside it. This is later abstracted over and the value of the relative clause filled in by lambda conversion. The procedure is repeated below:

(20) S': $\lambda z\,[stand\,(z)]$
NP: $\lambda R\ \iota x\,[girl(x)\ \&\ R(x)]$
NP: $\lambda R\ \iota x\,[girl(x)\ \&\ R(x)]\ (\lambda z[stand(z)])$
—after 2 applications of lambda conversion—>
$\iota x\,[girl(x)\ \&\ stand(x)]$

Higginbotham (1980) makes a similar point against Partee's argument, saying that the choice between the two cannot be determined purely on

[11] Wayne Harbert (p.c.) points out that "No person who has any self respect" in which "no" has syntactic scope over the negative polarity item "any" also argues for (19a).

semantic grounds. Though the Nom-S analysis may be preferable from the point of view of semantic compositionality syntactic evidence could be used to argue for the NP-S analysis.

The argument for the NP-S analysis in Bach and Cooper is, in fact, syntactically motivated. Their strongest reason for choosing the NP-S analysis is provided by languages like Hittite in which correlatives cannot be easily analyzed as having an NP internal source. Their aim is to provide a single account for relativization in languages like English as well as those with correlatives. However, they admit that the NP-S analysis is not the optimal one for languages like English where the relative clause can be analysed as forming a constituent at the N" level. Their analysis, though compositional in a technical sense, goes against the spirit of compositionality by positing abstract variables. As such, the NP-S analysis, in my opinion, should be adopted only if there are strong empirical grounds for rejecting the Nom-S analysis.

We saw in Chapter II that the premise that relative clauses generated outside the NP can modify it is wrong, at least for Hindi. If the facts about Hindi relativization are representative of correlative constructions in general, we can conclude that whenever a relative clause modifies a noun it must be a constituent of the phrase at D-structure. Thus there is no evidence from correlatives to force us to move from a more strongly compositional account of noun modification to one that is weaker.

Let us evaluate some of the other reasons given in the literature for choosing the NP-S analysis. McCloskey (1979), following Bach and

Cooper's semantic procedure, provides the following reason for adopting the NP-S analysis. In Modern Irish, personal pronouns can be modified by relative clauses in their restricitve sense. Assuming the standard analysis that pronouns are basic NPs, he argues that the modification must be at the level of NP. He adds, however, "these arguments are ... only as strong as the assumption that the pronominal elements ... are to be taken as basic NP" (p.24). I will argue below that McCloskey's examples can be treated as modification at the N" level, given the DP analysis of noun phrases developed in Abney (1987).

The alternative that I am going to suggest actually builds on a possibility considered and rejected by McCloskey. He mentions Postal's claim that pronouns are in fact determiners. Intuitively, this idea is very appealing for Hindi. Consider the following paradigm:

(21)	DEMONSTRATIVE + NOUN	PRONOUN
Nominative	vo chiiz/ye chiiz that thing this thing	vo/ye (s)he
	ve chiizẽ/ye chiizẽ those things/these things	ve/ye they
Oblique	us chiiz/is chiiz that thing/this thing	us/is (s)he
	un chiizõ/in chiizõ those things/these things	un/in they

It seems quite plausible to analyze Hindi third person pronouns as the deictic determiners with which they are homophonous.

In Abney (1987) it is argued that noun phrases are headed by determiners which take NP complements. That is, DP corresponds to NP while NP corresponds to N" of the traditional system. The idea that pronouns are determiners is resurrected in the DP analysis in the following way. Pronouns are taken to be intransitive determiners generated in head of DP. That is, they are determiners that do not take NP complements. This account is in keeping with X' theory since the category of the noun phrase is DP and its head is Det. Within the older system, generating an intransitive determiner amounts to a structure in which the noun phrase is an NP whose head is Det.

Pronouns, in Abney's analysis, are like proper names in that they do not take NP (i.e. N") complements. Abney's view, as it stands, supports McCloskey's claim that relativization of pronouns indicates modification at the level of DP.

The McCloskey-Abney stand seems to be conceptually problematic, however, from a cross-linguistic point of view. All languages would disallow relativization of names and allow relativization of quantified DPs but languages would differ in allowing relativization of pronouns. For example, Irish would allow all pronouns to be relativized, English would not.[12] Let us see where Hindi would fit in. Relative clauses in Hindi can restrict the third person pronoun **vo/ye** "that/this", **ve/ye** "those/these".[13] They cannot restrict first and second person pronouns. Thus we would have to take into account that languages do not only differ in allowing relativization of

[12] English does allow relativization of the third person in generic sentences "He who fights and runs away lives to fight another day" but this option is very limited.

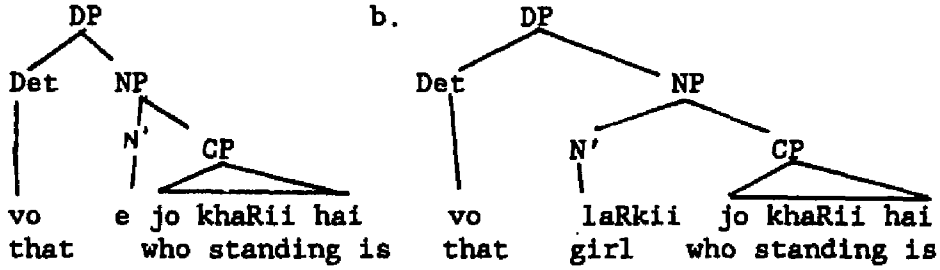
[13] It seems harder to relativize ye, but this could be a pragmatic effect.

pronouns, they also differ with respect to which pronouns can be relativized. Hindi would differ from English in allowing pronominal relativization; it would differ from Irish in allowing relativization only with third person pronouns. The way to implement this in the NP-S analysis, I think, is to say that some noun phrases and pronominals can be interpreted with an implicit property variable and so can combine with a relative clause while others cannot. This seems very stipulative. If pronominals are semantically and syntactically uniform across languages they should behave similarly with respect to relativization. I do not think that a choice of representations should be based on facts such as these. To my mind the NP-S analysis leaves open the question of what determines whether a language will relativize pronominals or not.

A more promising approach to the problem is possible, I think, under a modified version of Abney's analysis of pronouns if we assume the Nom-S analysis. Let us suppose that pronouns, being deictic elements, are in head of DP but let us not take all pronouns to be intransitive, as claimed by Abney. This would mean that pronouns may or may not take NP complements and that languages may differ with respect to this.

Hindi third person pronouns, for example, could reasonably be analysed as transitive determiners since they have the same form as noun phrase determiners. We get a DP like **vo larkaa** "that boy" when the NP complement is lexically headed , otherwise a pronminal form like vo "(s)he". While this is usually translated as "he" or "she", there is nothing specious I think in analysing it as "that one". Thus the difference between a relative clause restricting a full noun phrase and one restricting a third person pronoun in Hindi would be the following:[14]

(22)a.



Consider the semantic interpretatins of the two structures. In (22a) the denotation of the N' is every individual in the domain of discourse. The only restrictions will be contextual. When the set denoted by the relative clause intersects with the set denoted by N' the resulting set will be the one denotated by the relative clause. In a sense, the head is semantically vacuous. Though the determiner combines with a modified noun phrase, it appears as if it has combined only with the relative clause.[15] Thus under the Nom-S analysis it is possible to account for relativization of pronouns, using the same procedure as for full noun phrase relativization.

In this approach the difference between pronouns that can be relativized and those that cannot is reduced to differences in their syntactic structure. If a pronoun is intransitive it cannot be relativized but if it can take an NP complement it should be possible

[14] There need not be a position generated under N' in (22a). Transitive determiners could still take NP complements of the form [$_{NP}$ CP]. The semantics would remain as for (22).

[15] It would be hard to separate pronominal relativization semantically from variable binding in left adjoined structures. The syntactic tests mentioned in Chapter II, of course, identify the structure under consideration as belonging with restrictive relatives.

to modify it. Proper nouns in any language are intransitive and for this reason can never have restrictive relatives modifying them. Pronouns apparently differ with respect to transitivity across languages and even within languages. Hindi third person pronouns, for example, are transitive as shown by the fact that they can combine with common nouns. They can therefore be relativized. First and second person pronouns are intransitive and therefore resist relativization.

This, of course, does not constitute an explanation in itself but it does locate the proper area of inquiry. In order to have a full understanding of pronominal relativization a better account of (in)transitivity in determiners is needed, not a different structure for relativization. Pronominal relativization certainly does not argue against the Nom-S analysis, it may even favor it.

Thus it seems there are no compelling arguments for giving up the Nom-S analysis of noun modification, which is in my view, the null hypothesis.[16] I have shown that the two strongest reasons against the analysis do not withstand close scrutiny. I therefore take it as established that there is good reason to think that noun modification requires strict syntactic sisterhood at the level of the common noun.

---

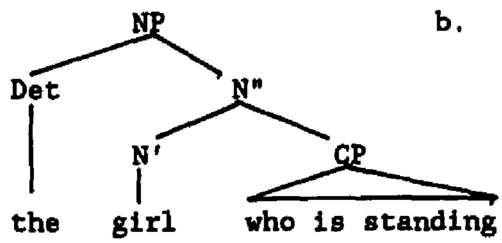
[16] Another argument against the Nom-S analysis, not discussed here, is noted by Jackendoff (1977). In "The car and the truck that collided" the predicate "collide" needs to be associated with both "car" and "truck". The only constituent which includes both is the conjoined NP [the car and the truck]. He points out, however, that this is also true of other complements. For example, "Three members and two vice chairmen of interlocking committees" would require the PP complement also to be attached at the NP level, thereby losing the distinction between complements and adjuncts. For further arguments see Jackendoff (1977) and for semantic arguments against abandoning the Nom-S analysis for such examples see Link (1984).

All non-local instances of restrictive relativization can be analyzed as cases of movement and must be construed locally with the head at the level of interpretation through appropriate interpretive procedures.

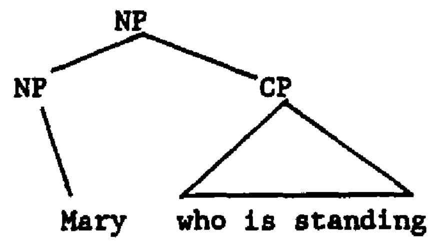
3.3. Non-restrictive Relativization

A consequence of adopting the Nom-S analysis is that it provides a means for distinguishing between restrictive and non-restrictive relatives in the syntax. The primary difference between the two types of relativization is that one can only modify quantified noun phrases while the other can only modify referential terms like proper names. Recall that in the Nom-S analysis proper names are intransitive, i.e. they do not take an N" complement. The possibility of restrictive relativization is thus ruled out. There is no problem with non-restrictive relativization, however, if we assume that non-restrictives are attached at the NP level.[17] Schematically put, we have the following options:

(23)a.



b.



This syntactic distinction was, in fact, proposed by Jackendoff (1977) who argued for restrictive relativization at the N' level and non-restrictive relativization at a higher level. An immediate consequence of this analysis is that an intonation break between the

[17] In my discussion of non-restrictives I will not refer specifically to Hindi since the facts are essentially the same as in English.

head and the modifier is predicted in (23b) since a maximal projection dominates the head. This would not happen in (23a).[18]

The essential difference between restrictive and non-restrictives is the fact that one modifies quantified noun phrases while the other modifies referential terms and capturing this fact has proved difficult. Differentiating them in terms of the level at which they are attached answers most of the question. It explains why restrictives can modify quantified noun phrases but not proper names and it explains why non-restrictives can modify proper names. What it does not explain is why non-restrictives cannot modify quantified noun phrases.[19] Take, for example, the following:

(24) *Every man, who is rich, is happy.

There is no problem in generating this syntactically. The logical conclusion is that the sentence should be ruled out in the semantics, but it is not clear why. Under standard assumptions, non-restrictive relatives are set denoting terms like their restrictive counterparts. While restrictive relativization involves set intersection of the common noun and the relative clause, non-restrictive relativization is defined on the set denoted by the relative clause being included in

---

[18] It could also explain the fact that extraposition is allowed for restrictives but not for non-restrictives. One could exploit the fact the trace of an extraposed restrictive is lexically governed while that of a non-restrictive is not. In May's account of extraposition, however, proper government of the trace of the relative clause does not play a role since the movement goes through successive adjunctions and the traces are locally governed. In his account, non-restrictives would not extrapose because their head, being referential, would not be raised by QR. An extraposed non-restrictive would be ruled out at LF since it would not be governed by its head.

[19] This fact is not explained in any syntactic account, as far as I am aware.

the family of sets denoted by the head (Cooper 1983). Since quantified noun phrases denote sets of sets, as much as referential terms do, there is no reason why (24) should be bad.[20] One might speculate, of course, that (24) is semantically well formed but pragmatically deviant but that does not seem likely. If we imagine a context of use, say a fairy tale, where every man is rich (24) should be completely felicitous. It seems to me that there is a fundamental problem with the standard semantic approach.

My solution to the problem relies crucially on the modification of Montague grammar proposed in Partee (1987). In classical Montague grammar all noun phrases were taken to be of the same semantic type, namely a set of sets. So a proper name like Mary would denote the set of all sets which contain the individual Mary while the quantified phrase "every man" would denote the set of all sets which contained the set of men. The advantage in assigning all noun phrases a uniform semantic type was to account for the conjoinability of different noun phrases as in "Every man and Mary". Partee departs from this view and suggests that noun phrases may correspond to a family of types. Thus referential terms are basically of type e i.e. they denote entities; predicative terms are of type <e,t> i.e. they denote sets; and quantificational noun phrases are of type <<e,t>t> i.e. they denote sets of sets. It is suggested that while the type of generalized

---

[20] In fact, if NPs have a family of semantic types, as has been argued by Partee (1987), it should be simpler to have quantified noun phrases than referential terms in non-restrictive structures. The basic type of a quantifier is a set of sets while a referential term basically denotes an entity and would have to shift to the higher type in order to combine with a non-restrictive relative clause.

quantifiers is the most complex, it is also the most general. All noun phrases have meanings of this type, while only some have meanings of type e or <e,t>. General type-shifting principles in natural language make it possible for noun phrases to change category thereby accounting for the conjoinability of noun phrases of different types. The basic idea behind this approach is that there is an unmarked type for each noun phrase and type shifting is only applied if the basic type is not compatible with a particular configuration.

The relevant distinction for our purposes is the difference between quantified noun phrases which are of type <<e,t>t> and referential terms which are of type e. Now, suppose we say that the non-restrictive structure is licensed just in case the head is a member of the set denoted by the relative clause.[21] We will automatically rule out non-restrictives with quantified terms since it will be of a higher order. Referential terms, on the other hand, will be of the right type. The proposal is summarized below:

(25) a. $[_{NP_1\ j}\ [_{NP_2\ j}$ John$]\ [_{CP\ \lambda x(rich(x))}$ who is rich$]]$

b. $[_{NP_1}\ [_{NP_2\ \lambda P P \forall x(man(x) \rightarrow P(x))}$ every man$]\ [_{CP\ \lambda x(rich(x))}$ who is rich$]]$

The non-restrictive is licensed in (25a) since it can be verified if NP_2, an entity denoting term, is a member of CP which denotes the set

---

[21] It is quite clear that non-restrictives do not contribute directly to meaning, in the sense that the truth value of the sentence is not dependent on it. For example, suppose the sentence "John, who is a doctor, lives in N.Y." is said in a context that John is not a doctor but does in fact live in N.Y. I think the sentence will be strange because of a presupposition failure but it will not be false. For this reason I think that the semantic priciple should be one of licensing.

of rich men.[22] The non-restrictive in (25b) is not since it cannot be verified if NP_2 is in the denotation of CP, NP_2 being of a higher order. Notice that it is not possible for NP_2 in (25b) to shift down to an entity level meaning since Partee's lowering rule can only apply to a generalized quantifier which is a principal ultrafilter, mapping it onto its generator set. For example, non-restrictives are possible with quantified noun phrases like "the man", presumably because lower(the man) will yield the entity level correlate of the quantifier and be able to license the relative clause.

The next question, of course, is what exactly is the function of a non-restrictive. Obviously there is no predication involved or we would get a truth value for the topmost NP node. There is also no set intersection. It seems to me that in using a non-restrictive relative, the speaker voices the most contextually relevant property of the individual.

There are other syntactic and semantic aspects of non-restrictive relatives that have been noted. Let us consider some of them to see if the approach suggested above sheds any light on them. Non-restrictives, for example, are opaque to the main clause as far as binding and scope phenomena are concerned. Safir (1986) notes the following fact from Giorgi. In Italian, the long distance anaphor proprio may not have an antecedent in the main clause if it is

---

[22] Notice that NP_1 in (25a) could type shift to a generalized quantifier meaning. This type shifting would be motivated by its syntactic relation to other constituents of the tree. What is relevant for licensing the non-restrictive is its type at the level at which it combines with CP.

contained in an appositive. If it is inside a restrictive relative, this binding is permitted:

(26) a. Giannij pensa che Marioi che ti ama
Gianni thinks that Mario who loves
la propriai/*j moglie sia intelligente.
self's wife is intelligent
b. Giannij pensa che chii ti ama
Gianni thinks that who loves
la propriai/j moglie sia intelligente.
self's wife is intelligent.
"Gianni thinks that self's wife is intelligent."

Consider also the fact that in a sentence like the following, the appositive is not interpreted in the scope of the verb "think" (McCawley (1982)):

(27) John thinks that Mary loves Bill, who is a genius.

(27) does not imply that Bill is a genius in John's opinion. In fact, John may consider him a fool.

Finally, as pointed out by Safir, appositives do not seem to display weak crossover effects:

(28) a. John, who his wife loves, is a lucky man.
b.* Every man who his wife loves is a lucky man.

These facts about non-restrictives have been analyzed in several ways. McCawley (1982) argues that appositives have a special syntactic status whereby they are linearly located in the structure next to the head noun but have IP as their immediately dominating node. This could account for the fact that appositives are not in the scope of the matrix verb in a sentence like (27) but, as pointed out by Safir, it is not clear why a c-commanding subject in (26) cannot bind an anaphor inside the clause.

Safir (1986) avoids McCawley's problem by suggesting that non-restrictives are not attached to the head till after LF. LF' derives

LF' derives from LF by the application of the rule attach alpha. At this level, predication between the head and the relative pronoun takes place, thereby ensuring full interpretation. This two-step interpretive procedure, for example, allows him to get the weak cross-over facts in (28a). At LF, the relative pronoun in the appositive and the head noun bear distinct indices. The pronoun inside the relative clause bears the index of the head and not the wh. Since the wh and the pronoun to its left are contraindexed at the level where weak crossover applies, namely LF, there is no weak crossover violation. At LF' the wh is reindexed to match the index of the head and the pronoun it has already crossed over.

Safir's account works for the facts cited by him but there are some stipulations that are required. In order to account for the absence of extraposition with non-restrictives, attach alpha has to be characterized as a local operation. And it has to be stated that attachment can only be to certain kinds of NPs, namely nonquantifiers. Interpretation has to be allowed at LF' in order to get the weak crossover facts in (28). Crucially, this involves reindexing of the head. However, reindexing for constituents inside the non-restrictive is banned in order to prevent **proprio** in (26) from being coindexed with Gianni.[23] As such, an approach which avoids these problems might be worth exploring.

If we keep in mind the function of the non-restrictive, I think we can get some insight into the reason for syntactic opacity observed in (26)-(28). For example, suppose that **proprio** was not bound locally by

---

[23] I do not think Safir accounts for the fact in (27).

the wh operator in (26). Being a long distance reflexive, this option should be available. However, at the point in the tree at which it combines with the term "Mario", it will have to be licensed. This licensing procedure will check to see if the individual mario is in the set denoted by the non-restrictive, i.e. λx[loves(x,y)]. This, however, is ill-formed because at this point y is a free variable. Even if it is assigned an arbitrary value, namely the individual Gianni, the representation will not be salvaged since **proprio** is a reflexive and needs an antecedent. Since the non-restrictive is not available in the interpretation tree at the point where Gianni can function as a binder, the only possible derivation is one in which **proprio** is locally bound.

Turning to (28), the set under consideration would be λx[love(y's wife,x)] with y free. Since we are dealing with a pronoun rather than a reflexive there is no requirement that there be a syntactic antecedent. The pronoun and the trace are contraindexed and there is no crossover. At the same time, coreference between the pronoun and head is possible since the free variable can be interpreted with reference to John.

Finally, consider (27). The interpretation for the whole sentence will be think'(j,^love'(m,b)). Since the meaning of the non-restrictive is not carried up the tree, it is not in the scope of the intensional verb. Thus it may be possible to get an account of the observed differences between restrictive and non-restrictives without recourse to a further level of derivation such as LF' if we develop the modified semantics proposed to account for the occurence of non-restrictives with referential but not quantified NPs.

In this chapter I have presented an analysis of restrictive relativization in Hindi, showing that in order for noun modification to take place the wh operator and the head must be syntactically adjacent. I have argued that the debate between the Nom-S and the NP-S analysis of relativization should be reopened since the primary reason for moving from the Nom-S analysis was based on a misanalysis of the correlative data. I have also claimed that adopting the Nom-S structure for restrictives would provide a syntactic means for differentiating it from non-restrictives which would have an NP-S structure. I have suggested a semantic account for interpreting non-restrictives which puts a new perspective on their syntactic opacity.

CHAPTER IV

THE SYNTAX OF CORRELATIVES

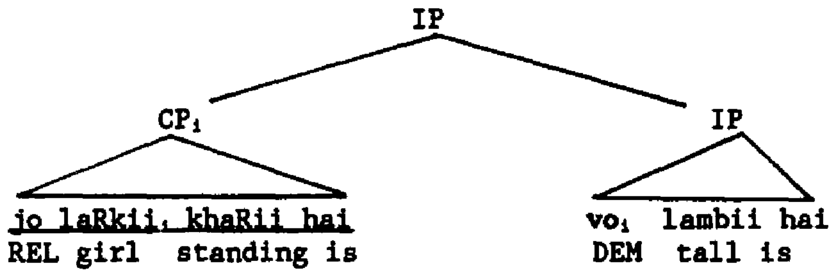
4.1. Quantifier Adjunction in Correlatives

We have established so far that the traditional view of correlatives incorrectly lumps all three types of relative clauses found in Hindi into one category. In particular, it was shown in Chapter II that left adjoined relatives display different syntactic and semantic properties from right adjoined and embedded relatives. In Chapter III, it was argued that right adjoined and embedded relatives are ordinary noun modifiers. In all essential respects they behave like English restrictive relatives and no special modifications need to be made to standard theories of relativization in order to account for them. Since there is no justification for considering right adjoined and embedded relatives typologically distinct from regular restrictive relatives, a special term such as "correlative" is not needed to refer to them. It is the structurally distinct left adjoined structures for which the name "correlative" is appropriate. As such, I will use the term, from this point on, to refer to them only.

In this chapter I want to take a closer look at the syntax of Hindi correlatives, i.e. the syntax of left adjoined structures. Let us begin by summing up the essentials of the analysis. In a left adjoined structure, the relative clause is a quantifier, adjoined to IP at D-structure. The main clause NP is a variable bound by the relative clause. Let us discuss the implications of this view with reference to (1) and its syntactic representation in (2):[1]

(1) jo laRkii khaRii hai vo lambii hai
REL girl standing is DEM tall is
"Which girl is standing, she is tall"

(2)



The first assumption that I would like to focus on is the categorial status of the two clauses and the way in which they are combined. According to (2), the relative clause is a CP, the main clause an IP, and the two are combined via adjunction at the level of IP.

Let us consider first the categorial status of the relative clause. I am assuming that the wh NP **jo laRkii** "which girl" originates inside IP where case and theta role assignment are satisfied. It is, however, an operator and must raise to spec of CP for interpretation. Since Hindi is an in-situ language, a question that always arises in this connection is whether raising occurs at S-structure or LF.

Though wh NPs in Hindi do not occur clause-initially in questions, they do tend to occur clause-initially in relative clauses.

---

[1] In Chapter II I translated (1) as "The girl who is standing is tall." Strictly speaking, this is inaccurate since Hindi **jo** does not translate into "the". In fact, Hindi does not have a determiner like "the". From this point on, therefore, I will translate correlatives more literally.

It is not clear, however, whether this S-structure movement is a result of scrambling or an instance of wh movement to spec of CP. In Chapter III the nature of this raising was discussed with respect to noun modifiers. Some of those arguments may carry over to correlatives but bear repeating.

The first point to note is that if Hindi has wh movement at S-Structure, it is optional. In the simple case it is always possible to leave the wh NP in-situ:

(3) raam jis laRkii se milaa anu usKO jaantii hai
Ram REL girl with met Anu DEM ACC knows
"Which girl Ram met, Anu knows her."

Overt movement of the wh NP would appear to be a scrambling effect since scrambling is typically optional. If so, movement of wh could involve IP adjunction rather than movement to specCP.

Now consider (4) in which a wh NP occurring inside a complement takes scope over a higher clause:

(4) jis laRkii se ravii soctaa hai ki raam milaa
REL girl with Ravi thinks that Ram met
anu us-KO jaantii hai
Anu DEM knows
"Which girl Ravi thinks that Ram met, Anu knows her."

The wh NP clearly originates inside the complement of the matrix verb in the relative clause. **jis laRkii** "which girl" has the postposition **se** which the object of the verb **milnaa** "to meet" should have. Moreover, the predicate **socnaa** "to think" has no theta role to assign to it. Clearly, (4) is a case of wh extraction. And in fact, this movement is necessary for the wh NP to have wide scope. In spite of its obligatory character, however, it is possible to think that movement may not be to spec position.

In Hindi the scopal properties of relative wh NPs is analogous to that of question wh NPs in this regard. In Chapters VII and VIII we will see that Hindi is a language in which a question word inside a finite complement has narrow scope if it remains in-situ, and wide scope if it is moved at S-structure. That is, Hindi seems to be a language in which extraction is more restricted at LF than at S-structure. From the standard theoretical perspective this is completely unexpected since cross-linguistic studies of English and Chinese suggest the opposite (Huang (1982), Chomsky (1986b)). A principled explanation for the facts of Hindi is possible when certain properties of its phrase structure are taken into account, but to go into them here is not possible. We will see, however, that what appears to be wh movement at S-structure in questions is actually adjunction to IP, a case of topicalization. If the same holds for relative clauses, (4) cannot be taken as evidence of movement to spec of CP. Or at least there is no conclusive evidence of it. I assume, however, that at the level of interpretation such movement would be necessary since the wh NP is an operator. For this reason, I have analyzed the relative clause as a CP.

Moving to the next point, there is somewhat better evidence for the claim that the main clause is an IP. Consider a sentence like (5), in which the sentential object is topicalized:

(5) kaun aane wala hai vo jaantii hai
who to-come she knows
"She knows who is going to come."

Assuming that topicalization involves IP adjunction, we can test where a left adjoined relative coindexed with vo "DEM" inside IP, would appear:[2]

(6) a.* jo laRkii vahãã rahtii hai kaun aane wala hai
REL girl there lives who to-come is
vo jaantii hai
DEM knows
"Which girl lives there, who is coming she knows."
b. kaun aanee wala hai jo laRkii vahãã rahtii hai
who to come is REL girl there lives
vo jaantii hai
DEM knows
"Who is coming, which girl lives there, she knows."

Since it seems necessary to order the relative clause after the topic phrase, one could conclude that the relative clause in a correlative construction is adjoined to IP and not CP.

I have suggested above that the relative clause has to be a CP, even though Hindi does not have overt wh movement into spec of CP. And I have shown that the main clause may be an IP since a left adjoined relative clause is positioned very close to it. Let us turn now to the third aspect of (2), namely that the correlative construction involves IP adjunction at D-structure.

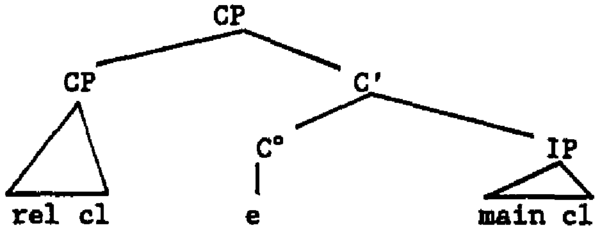
There has been some suggestion in the literature that adjunction at base is not an option, or at least, not an unmarked option.[3] Recall, however, that the presence of multiple relatives makes it impossible to generate the relative clause in argument position. An alternative to (2), in which the relative clause need not be generated

[2] Possibly, * is too strong for the judgement here but the argument about the position of the relative clause goes through anyway.

[3] See Ernst (1989) for discussion of and arguments against this view.

in argument position, yet is not adjoined to IP at D-structure, does exist. Compare (2) with (7):

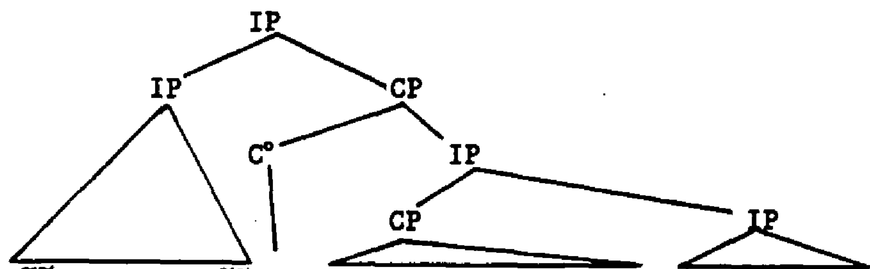
(7)



Since the relative clause is a +wh category, generating it in spec of CP seems plausible enough. Thus the relative clause could be base generated in an A' position without neccesitating adjunction at D-structure.

In spite of this, there is good reason to favor (2) over (7). Consider a sentence like (8) in which a correlative construction occurs in complement position.[4]

(8)



mãĩ jaantii hũũ ki jo laRkii khaRii hai vo lambii hai
I know that REL girl standing is DEM tall is
"Which girl is standing, she is tall."

We notice that the complementizer **ki** "that" precedes the correlative. Under the assumption that it is the head of CP and takes an IP complement, we can conclude that the categorial status of the correlative construction must be IP. The structure of correlatives, given the grammaticality of (8), has to be that of (2) and not (7).

---

[4] In (8) the complement of **jaannaa** "to know" is in adjoined position. This will be justified in Chapter VII.

It has been argued, however, by Mahajan (1987) that **ki** is not in head of CP, but rather in pre spec position. In Suner (1988) it is proposed that there are languages in which the following structure may exist: [C' C [CP spec [C' C IP]]]. In such an analysis there could be a **ki** in pre spec position which could take a CP complement. If this is the case, (8) will not constitute evidence against (7). However, it is not clear that Mahajan's claim can be maintained, given the following fact:

(9) a. yeh vo **laRkii** hai <u>jisKO ki sab jaante hãi</u>
this DEM girl is REL that all know
b.* yeh **vo laRkii** hai <u>ki jisKO sab jaante hãi</u>
this DEM girl is that REL all know
"This is that girl whom everyone knows."

In ordinary restrictive relative clauses a wh NP may cooccur with the complementizer **ki**. We see however, that when they do cooccur, the wh NP precedes the complementizer. If **ki** were really in pre spec position, we would have the order of elements in (9b) not (9a). If, however, **ki** is in complementizer position, we expect it to come after the wh NP in spec of CP.[5] Given this fact, we can assume the representation in which the relative clause is IP adjoined to the main clause.

Conceptually, this is a satisfactory result since (2) represents an adjunction structure, analogous to the one produced by Quantifier Raising. If left adjoined relative clauses in Hindi are base generated quantifiers, it does not seem implausible that they should be generated in the canonical position for quantifier construal.

---

[5] Again, * may be too strong for (9b). One reason why it may be marginally acceptable is that wh movement need not necessarily be to spec position. It could be scrambled to an IP adjoined position, in which case it is expected that **ki** in head of CP will precede wh.

There is a potential problem with the analysis that must be addressed at this point. Note that in the account of correlatives being proposed, the relative clause and the NP it binds do not form a constituent at any syntactic level. In this connection, however, consider the following sentences:

(10) a. QUES kaun ayii?
who came
"Who came?"
ANS <u>jo laRkii vahãã rahti hai</u> vo
REL girl lives there DEM
b. QUES kisne kisko pasand kiyaa ?
who whom liked
*ANS <u>jisNE jisKO dekhaa</u> usNE usKO
REL ERG REL ACC saw DEM ERG DEM ACC

According to Wali (1982), if the question in (10a) is given a short answer using a correlative construction, it must necessarily contain a demonstrative. The question in (10b), on the other hand, cannot be given a short answer in which demonstratives are present. On this basis, she argues that a left adjoined relative clause with one REL forms a constituent with the NP in the main clause. Consequently, she is forced to consider it distinct from a left adjoined relative with multiple REL.[6]

This, it seems to me, misses the basic similarity between the two types of correlatives. Ideally, one would like to account for the facts in (10) without giving up the insight that all left adjoined structures are quantificational.

---

[6] It should be noted that some speakers accept the answer to (10b), i.e. a short answer can be given using a multiple left adjoined relative and two demonstratives. Naturally, it is not possible to treat the relative clause and the NP as one constituent. I consider such an answer to involve a null VP. That is, the answer in (10b) has the form: [rel clause] [DEM DEM e] where e is the null VP.

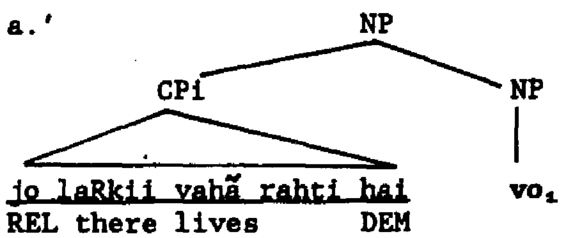
There is, however, an even stronger argument than (10a) for Wali's claim that the relative clause forms a constituent with the noun in the main clause. Consider (11):

(11) jo aaye unka kaam, jo gaye unke kaam se behtar hai
REL came DEM-GEN work REL left DEM-GEN work than better
"[Who came their work] is better than [who went their work]" =
"The work of those who came is better than the work of those who left"

In (11) there are two relative clauses construed with two arguments in the main clause. The present analysis, so far, alllows only for IP adjunction of the relative clause. It would seem, on the face of it, that cases like (11) cannot be accounted for in this analysis, but in fact, these examples are not problematic if the analysis is extended minimally.

Let us suppose that in addition to adjoining the relative clause at the IP level, Hindi also allows correlatives to be adjoined at the level of the noun phrase. The answer in (10a) could then be analyzed as having the following structure:

(10) a.'



This would represent quantification over NPs of the kind proposed for inversely linked noun phrases in May (1985). The demonstrative here is also a variable bound by the relative clause, analogous to the way in which it is bound in cases of IP adjunction.

This analysis can be verified by the following diagnostics, familiar from the discussion of relative clauses adjoined to IP.

(10a) has a variant with a common noun inside the NP: jo larkii vahãã rahtii hai **vo laRkii** "REL girl lives there, DEM girl". There is also the expected restriction on quantification. In order to say "two girls who live there", a partitive would have to be used: jo laRkiyãã vahãã rahtii hai un-me se do "REL girls live there, DEM-PARTITIVE two". A short answer which used an ordinary restrictive relative would behave differently. For example, it would not contain a common noun and it would not prohibit indefinite quantification. Thus (10a) could be answered by **vo laRkii** jo vahãã rahtii hai "DEM girl REL lives there" (not **vo laRkii** jo laRkii vahãã rahtii hai "DEM girl REL girl lives there") or by **do laRkiyãã** jo vahãã rahtii hai "two girls REL live there" without needing a partitive, if ordinary restrictive relatives were used.

Although Wali is right in claiming that the relative clause and the demonstrative can form a constituent, it is clear that this constituent structure is not the one used for restriction of noun phrases but the one used for quantification. While noun modifiers attach at the level of the common noun, quantifiers adjoin to the whole noun phrase. We see that the claim of quantifier adjunction in correlatives is empirically supported by a range of facts.

4.2. Variable Binding in Correlatives

Let us now turn to another claim of the present analysis, namely that the relationship between the relative clause and the main clause nominal is one of variable binding. There are two aspects to this claim that deserve attention. It has to be shown that the relative clause has the properties of a quantifier and it has to be shown that the noun phrase inside IP (or NP, as the case may be) functions like a variable. I will not go into the quantificational properties of the relative clause at this point (see Chapters V and VI). For present purposes it is sufficient to say that the quantificational force varies between a definite and a universal.

It is a well known fact that natural language quantifiers cannot be vacuous. In this section I will use this as a diagnostic to prove the quantificational status of a left adjoined relative. A range of facts show that such relatives are licensed if and only if there exists an appropriate variable with which they can be coindexed, that is, if they are not vacuous.[7]

In Chapter II it was shown that a left adjoined relative can only be linked to certain types of noun phrases in the main clause. The judgements are clear but pinning down the syntactic or semantic factors that determine the choice of the NP proves to be non-trivial. The relevant cases are repeated below:

(11)* jo laRkii khaRii hai   anu lambii hai
which girl standing is Anu tall is
"Which girl is standing, Anu is tall."

(11) shows that a left adjoined relative is not non-restrictive since non-restrictives typically occur with proper names.[8] This

---

[7] It has been observed by Saito (1985) that base-generated topics do not need to bind argument positions. In (i), for example, only an "aboutness" relation holds:
(i) As for fish, I like cod.
I want to stress that correlatives differ from such base generated topics in being quantificational rather than referential or generic. The claim here is that it is the quantificational nature of the relative clause that enforces variable binding.

[8] It is possible to have proper names with the demonstrative, for example, vo anu "that Anu" would make (11) acceptable but in that case Anu actually functions like a common noun. To make any pragmatic sense, there would have to be at least two individuals with that name and the relative clause would pick out one of them. This use of

point is worth making because the the left adjoined relative has a definite reading and is sometimes confused with non-restrictives because of this. The question we are interested in, however, is what rules out (11). The proper name "Anu" cannot be coindexed with an operator for good syntactic and semantic reasons. According to Principle C of the Binding Theory, R expressions must be free. That is, they cannot be coindexed with a c-commanding antecedent. The binding in (11) is also ruled out for semantic reasons. Proper names do not provide free variables and thus cannot be bound. The ungrammaticality of (11) fits in with the notion that the relative clause is a quantifier. There are no other variables to bind so it remains vacuous.

It is somewhat more difficult to deal with the other cases. It has been suggested that definiteness is criterial in determining if a noun phrase can be linked to the left adjoined relative clause (Subbarao (1984)). This observation is based on the contrast in grammaticality between (12) and (13)-(15). The acceptable sentences all have a definite in the main clause:

(12)* jo laRkiyã̃ khaRii hãĩ do laRkiyã̃ lambii hãĩ
which girl standing is two girls tall are
"Which girls are standing, two are tall."

(13) jo laRkii khaRii hãĩ ve do lambii hãĩ
which girl standing is DEM two tall are
"Which girls are standing, those two are tall."

(14) jo laRkiyã̃ khaRii hãĩ un-mẽ-se do lambii hãĩ
REL girls standing are DEM Part two tall are
"Which girls are standing, two of them are tall."

---

proper names is similar to that in English. "The Smiths who live here are my friends" does not use Smith as a proper name and is not non-restrictive.

(15) jo laRkii khaRii hai   vo laRkii lambii hai
which girl standing is DEM girl tall is
"Which girl is standing, that girl is tall."

This view of the phenomenon has to be modified, however, given the ungrammaticality of (16):

(16)* jo laRkii khaRii hai   laRkii lambii hai
which girl standing is girl   tall is
"Which girl is standing, girl is tall."

Hindi does not have a determiner corresponding to English "the" but bare NPs have traditionally been considered to be definites (Verma (1966) and Porterfield and Srivastav (1988)). If definiteness were at issue we would expect (16) also to be good. The correct descriptive generalization is that a noun phrase coindexed with a left adjoined relative clause must contain a demonstrative.

Let me lay out the problem and suggest a plausible way of approaching it. One way of ruling out a bare NP, as in (16), would be to use Principle C but that would also incorrectly rule out NPs of the form [DEM N'], as in (15). The classification on which the Binding Theory is based does not distinguish between NPs of the form "the N" and "that N", they are both considered R expressions.[9]

The significant fact about Hindi demonstratives is that they are homophonous with pronouns. This is important since it is well documented that natural language allows for resumptive pronouns, i.e. for pronouns to be "operator bound", in terms of Sells (1984). There is no documentation of resumptive elements which are pure definites like "the N". Let us suppose that it is the pronominal nature of an NP which determines whether it can be operator bound. Hindi

[9] It is also not easy differentiating them semantically. See Chapter V for one way of doing so.

demonstratives, being pronominal, will be able to function like variables but bare NPs will not be able to do so. The demonstrative requirement now follows from the interaction of two claims basic to the present analysis. The relative clause, being a quantifier, cannot be vacuous, it needs a variable to bind. Since the relative clause originates in an A' position this variable cannot be a trace. The only remaining option is a resumptive pronoun/demonstrative.[10]

I have argued so far that the demonstrative must be a variable on the ground that if it were not a variable the quantifier would become vacuous. The validity of this argument is, of course, dependent on the claim that the relative clause is a quantifier. This line of reasoning can rightly be attacked for circularity unless I can provide empirical evidence supporting my claim. I will therefore try to show that there are constraints on the binding of a demonstrative by a relative clause which are typical of operator-variable relationships.

Complex noun phrases in Hindi are islands for extraction as shown by the ungrammaticality of topicalization in (17a) and LF movement of wh in (17b). (17c) shows that the DEM of correlatives is also barred in this position, arguing for its status as a variable:

(17) a.* ravii mãĩ [yeh baat ki nahĩ aayegaa] jaantii thi
Ravi I this matter that not will come knew
"Ravi I knew the fact that will not come."

b.* mãĩ [yeh baat ki kaun nahĩ aayegaa] jaantii thi
I this matter that who not will come knew
"Who did I know the fact that will not come."

---

[10] This should not be taken to imply the existence of resumptive pronouns elsewhere in the language.

c.* <u>jo vahāā rahtaa hai</u> māī [yeh baat ki vo nahii
REL there lives I this matter that he not
aayeega] jaantii thi
will come knew
"Who lives there, I knew the fact that he
will not come."

Further, correlatives also show Weak Crossover Effects, typical of variable binding constructions, though admittedly, this is not very strong.

(18)* <u>jo vahāā rahtaa hai</u>$_i$ [[ek aurat jisse vo$_i$ pyaar
REL there lives a woman REL-ACC he loves
kartaa hai] [us-se$_i$ shaadii nahii karegii]]
DEM-ACC marriage not will-do
"Who lives there, the woman whom he loves will not
marry him."

This example has the schema [$_{CP}$relative clause]$_i$ [$_{IP}$ [$_{NP}$...pronoun$_i$...][$_{VP}$...DEM$_i$...]]. The pronoun inside the subject noun phrase cannot be the element bound by the relative clause since it is inside an island, as was shown by (17c). Therefore it is the DEM in the VP that the relative clause binds. Coreference is not possible between the two pronouns in this instance. DEM being a bound variable, coindexation with a pronoun to its left leads to a weak crossover violation. Of course, there would be no problem with coreference if there was no left adjoined relative clause. The problem is not internal to the main clause, but a result of coindexation between the relative clause and the VP-internal demonstrative.

Thus DEM seems to be on a par with variables created by movement. This is somewhat problematic, however, since resumptive pronouns and variables do not usually have the same distribution. McCloskey (1989:14) observes that the binding of resumptive pronouns is not constrained by Subjacency or the ECP, as is the binding of variables. (17) and (18) show that Hindi DEM is subject to these constraints.

Sells (1984) and (1987) provides a diagnostic for separating resumptive pronouns from variables which are locally A' bound. He argues that the former force extensional readings while the latter are ambiguous between extensional and intensional readings.[11] If this is true then it is easily shown that DEM behaves like a variable. The following clearly allow for intensional interpretations:

(19) a. <u>jo ciiz mujhe caahiye thi</u> vo us-ko mil gayii
REL thing I-ACC need was DEM he-ACC got
"Which thing I wanted, he got it."

b. <u>jo aadmii sabhii bhaashaaye bol sake</u>
REL man all the languages speak can
vo paidaa nahĩi hua
DEM born not has
"Which man can speak all languages, he has not been born."

The situation in Hindi seems comparable to Swedish. Engdahl (1985) argues that resumptive pronouns in Swedish are "phonetically realized traces" since they have the same properties as traces created by movement (see also Zaenen, Engdahl and Maling (1981)).[12] DEM, we might say, is also such a "phonetically realized trace". Notice that this actually supports the claim that the left adjoined relative

[11] Actually, he uses the notion of a 'concept' reading to distinguish the two. I use the term 'intension' to make the point because it is more familiar. The distinction between the two, though important, is not directly relevant.

[12] For example, resumptive pronouns in Swedish license parasitic gaps and in structures where subjacency violations obtain, their presence does not lead to grammaticality. Unfortunately, parasitic gaps are not testable in Hindi.

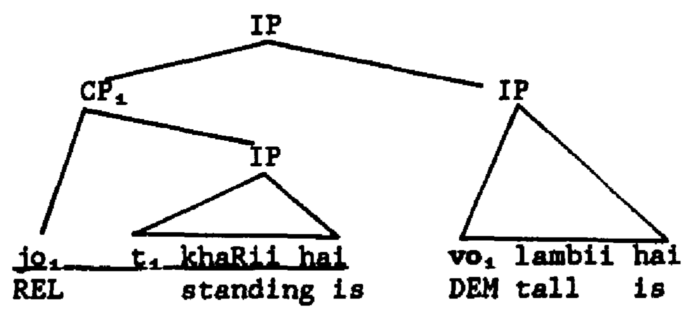
clause is a quantifier since a quantifier must not only bind a variable, it must bind one locally.[13]

Although I have not identified the property that allows a pronoun/demonstrative, as opposed to other kinds of definite NPs, to function like syntactic variables (see Chapter V for this), I have provided evidence that the demonstrative behaves like a syntactic variable. The claim that binding in correlatives is variable binding by a quantifier has so far held up under scrutiny.

It is worth clarifying, at this point, two crucial respects in which my approach to binding in correlatives differs from earlier approaches. Kachru (1973) and (1978), Subbarao (1984) and Dasgupta (1980), for example, assume a direct linking between REL and DEM, with REL being dependent on DEM. In the present analysis DEM is the bound element rather than the binder and there is no direct binding between the two.

Consider the following left adjoined structure:

(20)



A direct linking between REL and DEM is ruled out on formal grounds. jo cannot bind vo since it is an operator which already binds a trace

[13] There appears to be only one exception to the locality requirement. A demonstrative inside a noun phrase can be bound by the quantifier if it is in specifier position, i.e. if it carries genitive case as in (i):

(i) jo larkii khaRii hai, [[uski bahan] lambii hai]
REL girl standing is DEM sister tall is

inside the relative clause. For it to bind a variable inside the main clause as well would violate the Bijection Principle (Koopman and Sportiche (1982)), as well as the Parallelism Constraint on Operator Binding (Safir (1986)), principles proposed to ensure a one to one correspondence between operators and variables. Another problem with direct binding is that **jo** does not c-command the variable **vo**. Under standard assumptions a bound variable has to be c-commanded by its antecedent. I therefore take the antecedent of DEM to be the whole relative clause, rather than the wh NP inside it. The CP dominating the relative clause c-commands the demonstrative and it does not violate the Bijection Principle.

Before concluding this section let me show that binding in multiple relatives is also variable binding, although of a special kind. In the account outlined above I made a distinction between the wh NP and the category of the relative clause. Though the CP carries the index of the wh NP it is not identical to it. Let me now suggest that when a relative clause has more than one wh NP, it carries the indices of all of them. The only difference between single and a multiple relative is that one is a unary quantifier, the other a polyadic quantifier. Take a multiple correlative in which there are two REL elements. The idea is that the relative clause in such a sentence is a binary quantifier which must bind two variables in order to be non-vacuous. Compare (21a) and (b):

```
(21)  a.   jis laRkii-NE jis laRke-KO dekhaa usNE usKO maraa
           REL girl      REL boy      saw    DEM   DEM  beat
           "Which girl saw which boy, she beat him."
      b.*  jis laRkii-NE jis laRke-KO dekhaa vo khush hai
           REL girl      REL boy      saw    DEM is happy
           "Which girl saw which boy, she/he is happy."
```

(21a) is grammatical because the binary quantifier has two variables to bind, (21b) is not because the binary quantifier is vacuous.

Treating multiple correlatives as polyadic quantifiers also explains several facts that would otherwise remain mysterious. Consider (22), adapted from Wali (1982):

(22)* jisNE jisKO dekhaa usne kahaa ki vo ayega
REL REL saw DEM said that DEM will come
"Who saw who, she said that he will come."

A characteristic property of polyadic quantifiers is that they bind the appropriate number of variables simultaneously (van Benthem (1989)). The quantifier in (22) remains vacuous since the variables occur in different domains.

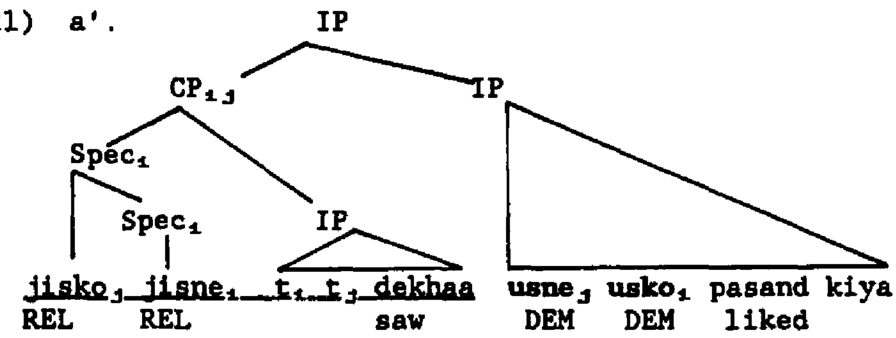
Another intriguing fact has to do with the order of binding. (21a) cannot be interpreted as "which girl saw which boy, he liked her" even though Hindi pronouns are neutral with respect to gender. This is not a pragmatic effect, as shown by the oddness of the following:

(23) jis dakTar NE jis mariiz KO dekha usNE usKO paisa diya
REL doctor REL patient saw DEM DEM money gave
"Which doctor saw which patient, he gave him money."

The only binding allowed by the syntax yields the weird interpretation in which the doctor pays the patient. That is, in a multiple correlative the subject and object of the relative clause must be linked to the subject and object of the main clause, respectively. Let us see why this is so.

Consider the LF representation of (21a), under the disallowed interpretation:

(21) a'.



Both wh operators in the relative clause are expected to raise into spec of CP. Following standard practice, if we raise the subject first and adjoin the object later the spec will carry the index of the subject. We then get the following paths for the two wh NPs and the demonstratives they bind:

path of j = {$spec_i$ CP IP IP}
path of i = {CP IP IP VP}

According to The Path Containment Condition, originally proposed in Pesetsky (1982), if two paths share a segment one must be contained in the other (see also May (1985)). In (21a') the two paths share the segment {CP IP IP} but neither contains the other. It is an instance of crossing dependencies, a phenomenon generally proscribed in natural language. Notice, that in the allowed reading the path of j would be {$spec_i$ CP IP IP VP} and would properly contain the path of i, namely {CP IP IP}. Thus, assuming that the multiple relative syntactically binds into the main clause allows us to correctly predict the binding possibilities between the two clauses.

Further evidence of the kind of syntactic binding that I am claiming comes from the fact that both variables in a multiple correlative cannot occur inside partitives, as shown by the ungrammaticality of (24):

(24)* <u>jinhõne jinko dekhaa</u> un-mẽ-se ek NE un-mẽ-se ek KO
REL REL saw DEM-partitive DEM-partitive
pasand kiyaa
liked
"Who saw whom, one of them liked one of them."

The sentence is bad regardless of coindexing because it violates the Path Containment Condition. Let us take the reading where the subject wh is construed with DEM in the partitive phrase in subject position. The path of j, i.e. the object wh will be (spec$_1$ CP IP IP VP PartitiveP$_2$) and path of i, the subject wh will be (CP IP IP PartitiveP$_1$). Neither path contains the other, though they have segments in common and the sentence is predicted to be ungrammatical. This is rather concrete evidence that left adjoined relatives are quantifiers which bind variables inside the IP.

It seems clear from the range of facts considered that the claim that Hindi has quantificational relative clauses is empirically sound. In the next section I will suggest that the ability of relative clauses to function like quantifiers is attested cross-linguistically.

4.3. Some Crosslinguistic Implications

So far I have been arguing for the quantificational status of Hindi correlatives on the basis of language internal evidence. In this section I would like to show that this use of relative clauses is not a marked phenomenon in natural language. English free relatives are argued to be one instantiation of quantificational relatives. Another instantiation of the type may be "internally headed" relative clauses in non-correlative languages like Lakhota or Quechua.

An optimal analysis of quantificational relatives should be able to show the essential similarity between these different subtypes as well as identify the reason for their diversity. The kind of crosslinguistic investigation this requires, however, is far beyond the scope of this dissertation but I will try to show that there is enough evidence to suggest that an investigation of free relatives and internally headed relatives along the lines of correlatives is promising.

Let us begin with the more familiar construction. Syntactic inquiry into the structure of free relatives has focused mainly on the issue of headedness (Bresnan and Grimshaw (1978), Groos and van Riemsdijk (1979), Harbert (1982)). Though their categorial status remains an open question, it is accepted as a descriptive fact that they can occur in argument positions. It is also accepted that they have quantificational force. Interestingly enough, the quantification involved seems to vary between a definite and a universal exactly in the way that the quantification in Hindi correlatives varies between the two readings.

Given the quantificational aspect of free relatives, we can assume that a free relative generated in argument position would have to raise for quantifier construal at LF. Taking a typical free relative like (25) we get the following derivation:

(25) a. Sue ate what Mary ate.
b. At S-structure: [$_{IP}$ Sue ate [$_{NP}$ what Mary ate]]
c. At LF: [IP[$_{NPi}$ what Mary ate] [IP Sue ate t_i]]

The LF representation is essentially parallel to the structure proposed for left adjoined relative clauses in Hindi. The crucial difference between the two languages appears to be that Hindi allows such adjunctions at D-structure while English does not.[14] The correct way to separate the two languages, then, is not in terms of the presence or absence of correlatives but in terms of the possibility of adjunction at base. In other words, the question to answer is not why one language has correlatives and the other does not but rather why one language has quantifier relatives in adjoined position and the other only in argument position.

Downing (1973:11) notes that "correlatives" are typically found in SOV languages which are not rigidly verb final. Based on the facts of Hindi, I will suggest a possible reason for this. In Chapter VII it will be shown that CPs in Hindi are unable to appear in case marked positions due to The Case Resistance Principle (Stowell (1981)). Thus finite complements of verbs must appear postverbally, thereby accounting for the non rigid SOV pattern of the language. If we assume that Hindi quantificational relative clauses are CPs, and not NPs, they would be barred from appearing in cased positions, namely argument positions, at S-structure.

Suppose quantifier relatives were generated in argument position. The Case Resistance Principle would force them to extrapose at S-structure. Since the phrase in question is quantificational, it would ultimately have to be adjoined to the left of IP for quantifier construal. It seems plausible that the language should exercise the

---

[14] I do not mean to suggest that Hindi and English are exactly like each other. Certain differences remain. For example, Hindi correlatives can be internally headed, English free relatives typically are not. Also, there is no multiple free relative corresponding to a multiple correlative since free relatives are generated in argument position.

option of generating it in this position.[15] If English free relatives differ from correlatives in being NPs they could occur in case and theta marked positions and there would be no need for the language to generate quantifiers in adjoined positions.

Let us turn now to "internally headed" relative clauses. Relative clauses in languages such as Quechua or Lakhota have been recognised as typologically distinct from "correlatives", though there also is considerable overlap between the two (Keenan (1985), Cole (1987), Williamson (1987) and Culy (1990)). For example, languages which allow internally headed relatives have properties similar to those which allow "correlatives" (Downing (1973), Keenan (1985) and Cole (1987), among others). They too are non rigidly SOV and have null arguments. The reason Keenan (1985) gives for considering them distinct from correlatives is the fact that they are nominalized expressions which have the normal distribution of noun phrases. In fact, they have determiners and case marking. This observation fits into the present approach to quantificational relatives in a fairly straightforward way. Being syntactic noun phrases, the CRP will not apply to them. They are expected to occur in argument positions and not at the periphery of the clause, the characteristic which defines correlatives.

---

[15] The analysis does not rule out the possibility of generating relative clauses in argument position, since CRP would apply only at S structure. This is possibile for single correlatives linked to phonetically null elements in the main clause. It is difficult to test if the null element is a trace, however, since Hindi allows <u>pro</u>. I have therefore simplified the exposition by proposing adjunction at base for all correlatives.

It is quite clear that correlatives and internally headed relatives will have different internal structures, one being clausal and the other nominal. Instead of repeating the observations in the available literature about their differences, I want to highlight some respects in which they are similar.

Let us take the case of Bambara, which was traditionally thought to have internally headed relatives. It is worth noting that Bambara relative clauses have some of the properties that we saw in Hindi.[16]

(26) a. Deni mi djolen file o (deni) ka djan
girl REL is standing DEM girl is tall
"Which girl is standing, that (girl) is tall".
b. Denu mun djolen file bula fila ka djan
girls REL are standing PARTITIVE two are tall
e to fila ka surun
the rest two are short
"Which girls are standing, two of them are tall and the other two are short".

We see in (26a) that like Hindi, Bamabara allows the common noun to be repeated in the main clause. In (26b) we see that indefinite quantification requires a partitive construction on a par with Hindi. The similarity between Bambara and Hindi, however, is not so surprising. Keenan (1985) and more recently Culy (1990) have argued that Bambara actually has correlatives rather than internally headed relatives.

One of the more explicit accounts of genuine internally headed relative clauses is Williamson (1987). She focuses on what she calls an indefiniteness restriction in such constructions in Lakhota, illustrated in the following example:

---

[16] I am indebted to Mai Wright, a native speaker of Bambara, for these examples.

(27) a. [$_{DPi}$ [$_{IP}$ Mary [owiza wa] ikage] ki] he ophewathu
Mary quilt a make the Dem I-buy
b.* [$_{DPi}$ [$_{IP}$ Mary [owiza ki] ikage] ki] he ophewathu
Mary quilt the make the Dem I-buy
"I bought the quilt that Mary made."

(27a) is good because the head of the relative clause is indefinite, it has the determiner **wa** "a". In (27b) the head is definite, the determiner being **ki** "the" and the sentence is ruled out. The other determiners that cannot occur in this position are roughly the class of "strong" determiners in Milsark's (1974) classification. Williamson's explanation for this is based on the given-new distinction, developed in Heim (1982). An indefinite being new information is compatible with the meaning of a restrictive relative clause. A definite, on the other hand, is familiar and presupposes the content of its predicate. According to her, "this property is at variance with the meaning of restrictive RCs, for if the head is already familiar to the hearer, further specification by the RC is, at best, unnecessary." This is not further developed by her.

The effect observed by Williamson can also be demonstrated for Hindi. Notice the distribution of determiners in (28):

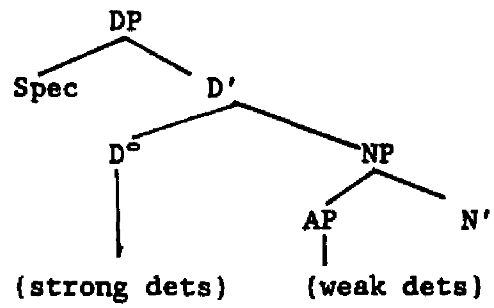
(28) jo *[vo /dono/sab] [do /kuch] ciizẽẽ
REL that/both/all two/few things
"Which that/both/all two/few things"

Williamson's pragmatic explanation seems weak since wh phrases generally seem to display the type of restriction she notes. For example, English wh NPs in questions also have a similar distribution. For example, "which two books" is good, but "which every book" is not. The facts also hold for Hindi interrogative wh NPs.

There exists a simple syntactic solution for Williamson's indefiniteness restriction in the analysis of the noun phrase in Abney

(1987). According to him, the determiner is the head of a noun phrase, which is of category DP, and it takes an NP complement, which is the correlate of N" in the traditional NP analysis. Abney argues that strong determiners are in the head of DP while weak determiners are inside NP:

(29)



If we assume that wh operators belong in the class of strong determiners it will follow that they cannot cooccur with other strong determiners. This explains the Hindi and English facts. Lakhota, and more generally languages of this group, do not have overt wh determiners (Culy 1990) so an analysis in terms of a strong wh determiner is not as obvious. It is quite likely, however, that even in these languages there is a null operator which would correspond to the semantic operation that obviously is needed to nominalize the clause. If we assume that this null operator is in the same syntactic position as other strong determiners, Williamson's indefiniteness restriction for Lakhota would be explained. There is an interesting consequence of taking this line. If there is an operator analogous to the wh operator of Hindi correlatives, the interpretation of an internally headed relative clause in Lakhota is expected to share some of the properties of NPs in languages with overt wh determiners.

It is well known that wh phrases with internal heads convey uniqueness. So, for example, the following English question and Hindi relative clause, imply that there are no more than two books that were read:

(30) a. Which two books did you read ?
b. jo do kitaabẽẽ tumne paRhĩĩ ve meri thĩ
REL two books you read DEM mine were
"Which two books you read, they were mine."

If internally headed relative clauses are really different and Williamson's explanation for Lakhota is correct, they should not carry this uniqueness implication. Unfortunately, I do not have access to data from Lakhota but the following fact from Quechua is relevant.[17]

Cole (1987) argues for an LF representation of Quechua internally headed relatives that would make it parallel to Quechua externally headed relatives on the grounds that the same semantic rule could interpret both (p.298). (31a) is an example of an internal relative in Ancash Quechua, taken from Cole (1987). In (31b) I add a numeral to it:

(31) a. nuna bestya-ta ranti-shqa-n alli bestya-m ka-rqo-n
man horse-ACC buy-PERF-3 good horse-VALIDATOR be-PAST-3
"The horse that the man bought was a good horse."
b. nuna ishkay bestya-ta ranti-shqa-n alli bestya-m ka-rqo-n
man two horse-ACC buy-PERF-3 good horse-VALIDATOR be-PAST-3
"The two horses that the man bought were good horses."

According to Don Sola the relative clause in (31b) conveys uniqueness. It contains the information that the total number of horses bought by the man is two. So, for example, the sentence could

---

[17] Another significant fact about example (26) is the presence of he glossed by Williamson as DEM. A footnote explains that it is not special to relative clauses but follows all noun phrases, even proper names. Even so, it would follow from theta theory that DEM and the relative clause should be coindexed since they must share a theta role. This looks suspiciously like variable binding in correlatives. It would be interesting to see if he could cooccur with a common noun, and if a partitive would be needed to translate "I bought two quilts that Mary made."

not be continued with "...and two were bad". In the corresponding headed relative there would be no such information conveyed, and the continuation would be felicitous. The correlation with Hindi relative clauses is too obvious to be ignored.

It would seem that internally headed relatives and externally headed relatives in Quechua have distinct semantic interpretations, contrary to Cole's suggestion. In terms of the present approach, internally headed relatives appear to be quantificational and externally headed relatives appear to be modifiers.

Thus languages as diverse as Quechua, English and Hindi have two types of relativization strategies, one for noun modification and one for quantification. I feel fairly confident in speculating that this is a general feature of natural language. At least, it should not be considered a marked phenomenon. If my speculation is correct, it has implications for a universal theory of relativization. Languages seem to vary greatly in relativization strategies because typological surveys have so far focused on relative clauses as noun modifiers. What might appear to be differences in noun modification may, in fact, be a difference in the particular type of relativization used. In order to factor out this possibility, it is necessary to check examples with definite as well as indefinite determiners.[18] I believe a more cohesive account will emerge if the distinction between relative clauses as modifiers and quantifiers is used in crosslinguistic studies of relativization.

---

[18] It is worth noting that examples of internal relatives in published literature tend to be definite.

4.4. Some Exceptions to Variable Binding.

The previous sections have emphasized the requirement of variable binding in correlatives. I want to present here some data that my analysis does not deal with. I will not attempt to explain the data though I will describe the features that appear to me significant. My aim is to show that they involve other mechanisms which need to be independently accounted for.

Dalrymple and Joshi (1986) observe that Marathi correlatives do not always have a one to one correspondence between REL and DEM elements. A Hindi equivalent is given in (32):

(32) maĩne jiski jo kitab dekhi, vo kitab mushkil payi
I whose which book saw that book difficult found
"Whose which book I saw, I found that book difficult"
= ∀x ∀y[[(book(x) & person(y) & own(y,x) & saw(I,x)]
--> found-difficult (I,x)]

In this sentence there is only one bound variable. The structure of the wh phrase is [$_{NP}$ whose[$_{N}$" which book]] and that of the main clause nominal [$_{N}$P [$_{N}$"that book]]. The wh which carries genitive case is not linked. It should be noted, however, that the main clause nominal could have a corresponding demonstrative for it. One is even tempted to suggest pro under Det since it is not possible to have another element in that position. So, (32) would be ruled out if the variable had the form [$_{NP}$Anu's[$_{N}$"that book]]. Also, **jiskii** seems to contribute little to the meaning of the relative clause. There would be no difference in the interpretation of (32) if it was omitted.

Another example of unlinked wh is the following:

(33) jo jahãã hua maĩ vo janti hũ
what where happened I that know
"What where happened, I know that."
= ∀x ∀y [(place(x) & event(y) & happen-at(x,y))
-->know(I,y)]

This differs from the previous example because it is not possible to have a variant with a corresponding demonstrative *jo jahãã hua mai vo vahãã janti huu ("What where happened, I that know there"). What is important here, I think, is that jahãã "where" in (33) stands for the location that a predicate like "happen" implies. It is not a genuine argument. Notice that jahãã "where" cannot be unlinked when it is an argument of the verb:

(34) a. jo jahãã gayaa vo vahãã rah gayaa
who where went he there remained
"Who went where, he remained there."

b.* jo jahãã gayaa vo Daktar ban gayaa
who where went he doctor became
"Who went where, he became a doctor."

The examples I have analysed as contributing to the formation of polyadic quantifiers have been arguments. The exceptions have the feel of implicit arguments rather than syntactic arguments. Variable binding appears to be sensitive to this difference.

Another class of examples that I have not dealt with are "concessive clauses" like the following:

(35) (caahe) jo aayee anu nahĩ jayegi
no matter who comes Anu not will go
"No matter who comes, Anu will not go."

Such sentences are clearly different from the ones I have analysed. For one thing, they have the optional element cahe "no matter" and for another, the predicate is in optative tense. Clearly, the sentence has a modal aspect to its meaning which suggests quantification over possible worlds rather than individuals. Notice that there need not be a wh element at all in the concessive clause. (36) belongs in the same class as (35):

(36) (caahe) vo aayee ya na aye Anu nahĩ jayegi
no matter he comes or not comes Anu not will go
"No matter whether he comes or not, Anu will not go."

The appropriate analysis for Hindi sentences like (35) and (36) would relate not as much to Hindi correlatives as to concessive clauses in other languages.

Another type of left adjoined relative that I have not dealt with is the following:

(37) jo kamiz anu ke pas hai **vaisi kamiz** rinaa ko bhi cahiye
which shirt Anu has that type shirt Rina also wants
"Which shirt Anu has, Rina wants that type of shirt"

Here the demonstrative refers to the type of the object denoted by the relative clause, not the object itself. Interestingly, such demonstratives are not possible in multiple correlatives:

(38)* jis laRkine jis laRkeko dekha
which girl which boy saw
vaisi laRkine vaise laRkeko pasand kiya
that type girl that type boy liked
"Which girl saw which boy, that type of girl liked that type of boy."

It is not clear to me why this should be so. The relevance of this example, to the present analysis is quite obvious though.

Another set of examples has to do with pairs of relatives and demonstratives indicating time and place, as in (39):

(39) a. jab anu aayii **tab** ravii calaa gayaa
when Anu came then Ravi left
"When Anu came, then Ravi left."

b. jahãã anu rahtii hai **vahaa** ravii rahtaa hai
where Anu lives there Ravi lives
"Where Anu lives, there Ravi lives."

These sentences also involve variable binding but the quantification is over time and location variables not over individual variables as in the case of correlatives. They also have versions where the subordinate clause follows the main clause. There are some differences between the two versions but not the kind we have seen with correlatives. Their analysis would be along the lines of similar constructions in English.

The final set of facts that I do not deal with has to do with the possibility of phonetically unrealised variables. Hindi is a language which allows null arguments. In the correlative construction it is possible to have a null element marking the position bound by the relative clause. For example,

(40) jo laRkii khaRii hai (e) bahut lambii hai
which girl standing is very tall is
"Which girl is standing, (she) is very tall."

This is not a problem in any theory of pro drop. For example, Huang (1982) allows for null arguments to be operator bound.

The intriguing question is determining where null arguments are not possible. Take the sentences in (41):[19]

(41) a.* jo laRkii khaRii hai (e) bahan lambii hai
which girl standing is sister tall is
"Which girl is standing, (her) sister is tall"

b. jis laRkiine jis laRkeko dekaa (e) usko pasand kiya
which girl which boy saw him liked
"Which girl saw which boy, (she) liked him."

c. jis laRkiine jis laRkeko dekaa (e) (e) pasand kiya
which girl which boy saw him liked
"Which girl saw which boy, (she) liked (him)."

d.* jis laRkiine jis laRkeko dekaa usne (e) pasand kiya
which girl which boy saw she liked
"Which girl liked which boy, she liked (him)."

It is expected that (41a) will be ungrammatical since the null possessive in specifier position is not recoverable. Specifier

[19] I thank Ken Safir for bringing this to my attention.

positions are only generated if an overt element occupies it so that a sentence like (41a) is likely to be analyzed without a specifier in the NP. If so, the relative clause would be vacuous. It is less clear why the object cannot be null in a multiple correlative unless the subject is also null. This issue relates to distinctions in the type of dependencies that overt and null elements involve, and in fact, to distinctions among different types of null elements. To get into this, however, would take us far afield.

While all of the examples mentioned in this section are relevant to a full account of relativization in Hindi, I believe they can be separated from the type of data I am focusing on. I will therefore leave them out from consideration.

To sum up, I have argued in this chapter that relative clauses that precede the NP they are linked to always represent adjunction structures. This adjunction is typically to IP, though it may also be to NP. Crucially, however, it will not be a sister of the common noun as in the case of noun modifiers. Adjunction structures of this kind represent quantificational structures in which the whole relative clause functions like a quantifier binding an NP which occurs inside its scope domain. Relative clauses with more than one wh NP function like polyadic quantifiers binding more than one variable simultaneously. Finally, it was argued that free relatives in English and internally headed relatives in Lakhota and Quechua may also be instances of relative clauses functioning like quantifiers.

CHAPTER V

RELATIVE CLAUSES AS GENERALIZED QUANTIFIERS

5.1. Relative Clauses as Unary Quantifiers

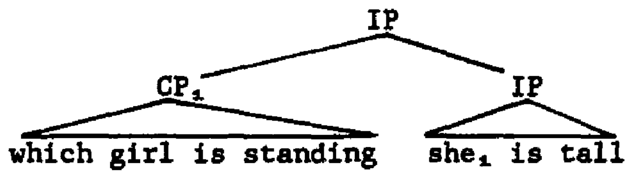
In Chapter IV I defended the claim that correlatives involve quantification from a syntactic perspective. I showed that the left adjoined relative behaved like a quantifier in needing to bind an argument inside its scope domain. I also showed that the bound element could be considered a kind of resumptive pronoun. In this chapter I want to focus on the semantics of correlatives, providing an account of the type of quantification involved. I will begin by considering single correlatives, i.e. correlatives in which there is only one REL linked to one DEM. The relative clause in such constructions is treated as a unary quantifier. I then turn to multiple correlatives, generalizing the semantics developed for unary quantification to polyadic quantification. Finally, I look at some facts that appear problematic, laying out the problem and outining possible solutions.

The claim that relative clauses can function like quantifiers is not standard. Wh operators in relative clauses are usually taken to be lambda operators which take an open sentence and yield a set denoting term. In Chapter III I showed that Hindi restrictive relative clauses have this interpretation. But I am claiming that in addition to being noun modifiers, relative clauses in Hindi can be quantifiers. That is, a relative clause does not necessarily denote a set of individuals, it can also denote a set of sets of individuals.

I will begin by outlining how the correlative can be interpreted, taking the correlative in (1) and its syntactic analysis in (2) for concreteness.

(1) <u>jo laRkii khaRii hai</u> vo lambii hai
REL girl standing is DEM tall is
"Which girl is standing, she is tall."

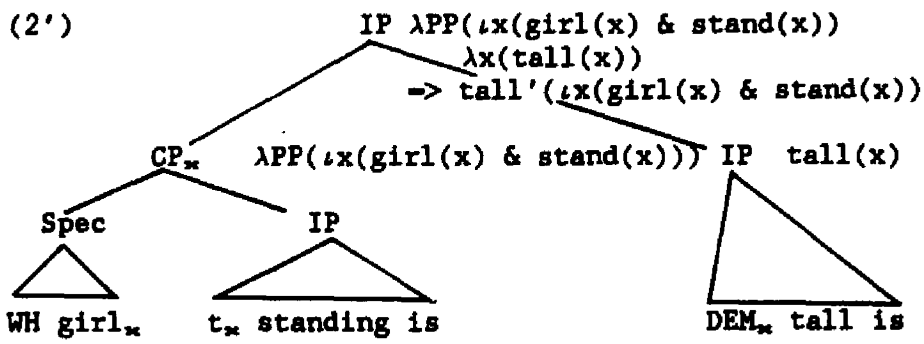
(2)



Given this syntactic analysis, the semantics follows straightforwardly if we adopt the theory of generalized quantifiers combined with some way of doing quantifying in. For explicitness, let us assume that structures of the form [QP_i IP] are translated as [Q(uantifier)$_i$ λx_i IP′].

It was mentioned in Chapter IV that the quantificational force of a correlative varies between a definite and a universal. Let us see how far we can capture its semantics by treating it like a definite. Applying the schema for doing quantifying in to the syntactic tree in (2), we get the following semantic derivation:

(2′)



The relative clause in (2′) will denote the set of properties of the unique individual who is a standing girl: $\lambda PP(\iota x\ (girl(x)\ \&\ stand(x)))$. The main clause will denote the property of being tall

$\lambda x(tall(x))$. The sentence will be true just in case the property of being tall is one of the properties of the standing girl. We see, then, that the right truth conditions can be derived by applying standard rules of quantification to the syntactic analysis in (2).

With this in mind, let us turn our attention to the relative clause and see how its meaning is built up. We want to end up with the set of all sets which include the unique individual who is in the intersection of girl' and stand'. Intuitively, **jo** acts like a restricted operator. We will see that its semantics is very close to the semantics of the English determiner "the".[1] It differs from "the" and other familiar determiners, however, in requiring two arguments. One is provided by the common noun (the internal head) and the other by the predicate in the relative clause. So **jo** can be thought of as an operator which takes two arguments and maps them into a generalized quantifier.

Formally, **jo** can be defined as a curried two-place operator, call it REL, in the following way:

(3) $REL_n(N") = REL*_n$, where
$REL*_n(IP) = \iota x_n(N"(x_n)\ \&\ IP)$

jo, we see, corresponds to a two-place indexed operator REL_n. This operator combines with a common noun meaning to yield another operator REL* which also carries the index of the noun phrase. REL* combines

[1] It is worth noting that Hindi and many of the other correlative languages do not have the definite article. If **jo** is semantically like "the", the absence of the definite article would explain why correlatives are put to such great use in languages like Hindi. English free relatives which have a similar semantics are not as common, since there is an alternative available in definite descriptions. Not directly related, is the fact that Hindi may type-shift a generic noun phrase, using the iota operator, to denote simple definites, like **aadmii** "man" for "the man".

with the open sentence denoted by the IP inside the relative clause to yield the unique entity that satisfies the predicates in the common noun and the relative clause. This, of course, has to be lifted in order to get a generalized quantifier meaning. We get this result by assuming that structures of the form [CP [spec jo N"]$_n$ [C' [IP]]] are interpreted as LIFT(REL*$_n$(IP)), where LIFT is a type shifting rule taking an entity denoting term and yielding a generalized quantifier by abstracting over the properties of that entity. The whole relative clause thus denotes the set of sets that contain the unique individual who is in the denotation of the common noun as well as the predicate in the relative clause. In (2") I give a derivation to make this clear:

(2") CP LIFT(REL*$_1$(stand'(x_1))) =
$\lambda P\ P(\iota x_1\ (\text{girl}'(x_1)\ \&\ \text{stand}'(x_1)))$

SPEC$_1$ REL*$_1$ IP stand(x_1)

NP$_1$

D REL$_1$ N" girl'

jo   laRkii t_1 khaRii hai
REL   girl   standing is

This semantics for jo makes the relative clause analogous to a definite description, and this seems to yield the correct results for sentences like (1) in which the relative clause has singular morphology. Consider, however, the plural counterpart of (1):

(4) <u>jo laRkiyãã khaRii hãĩ</u> ve lambii hãĩ
REL girls standing are DEM tall are
"Which girls are standing, they are tall."

The quantificational force of the relative clause here seems to be universal. The sentence would be true if every girl who is standing is tall. The question we have to decide on is whether jo is ambiguous between a definite and a universal quantifier.

If we adopt a theory of plurals such as Link (to appear) and Landman (1989) a very simple solution to the problem becomes available. Basically, they allow the domain of discourse to comprise of singular and plural individuals. In a model in which there are three singular individuals a, b, and c, for example, there will be a total of seven members in the domain, namely {a, b, c, a+b, a+c, b+c, a+b+c}. Of these, a, b and c are atomic individuals, i.e. they have no individual parts. The others are i-sums built up out of atomic individuals.

Let us see if this solves the problem. Let us evaluate (4) in a model with three standing girls, a, b and c. Assuming that plural morphology selects only plural individuals, in this model the iota operator will apply to {a+b, a+c, b+c, a+b+c}. Since this set does not contain a unique individual the iota operator will be undefined and the relative clause fail to denote anything. This, however, is not the result we want. We want (4) to be true if the girls who are standing are a subset of the individuals who are tall, and false otherwise.

This can be accomplished by ensuring that the iota is defined on the supremum of the set rather than on a unique individual in the absolute sense.[2] If we now evaluate (4), we will get the result we want. The relative clause will denote the set of sets that contain a+b+c since it is the unique maximal individual which satisfies girl′

---

[2] Thus ι here corresponds to Link's σ operator.

and stand'. From this one can infer that the i-parts also satisfy the two predicates. This yields the force of universal quantification for (4) without affecting the definite reading for (1). The dichotomy between definite and universal readings of the correlative, then, depends on whether the iota picks out a unique singular or a unique plural individual. When it picks out a singular individual the relative clause has a definite reading, when it picks out a plural individual it has a universal reading. There is no ambiguity in the type of quantification involved.[3]

To sum up so far, I have suggested that a generalized quantifier meaning for the relative clause can be obtained by thinking of **jo** as a special kind of determiner, corresponding to a two-place operator, which denotes the properties of a unique individual. The relative clause being a generalized quantifier, can combine with the main clause, a property denoting category, by standard rules of quantification.

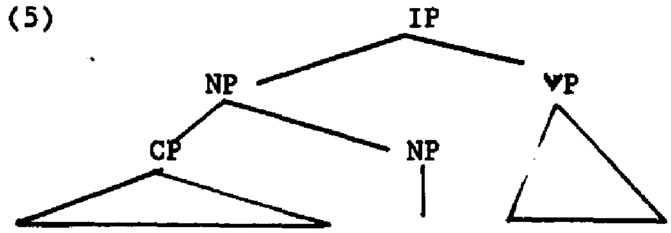
In Chapter III I pointed out that though left adjoined relatives quantify typically over IP, they can also quantify over NPs. The relevant example is given in (5):[4]

---

[3] Jacobson (1988) provides a similar solution for the variation between universal and definite readings of free relatives. We will discuss her analysis a little later.

[4] This example, of course, does not motivate adjunction to NP since it could as well be analyzed as adjunction to IP. Adjunction to noun phrase was motivated in Chapter 4 on the basis of examples which have the form [[which girl came she] is better than [which girl left her]].

(5)



jo laRkii khaRii hai vo lambii hai
REL girl standing is DEM tall is
"Which girl is standing she is tall."

It is not immediately clear how the relative clause, a generalized quantifier, can combine with an NP meaning. Obviously, the standard rule of quantification does not apply since the NP is not a property denoting category. But there is, in fact, a semantics available which would apply to structures like (5).[5]

Rooth (1985:112-19) provides a semantics for quantification which applies crosscategorially. Applying his schema to (5), the meaning of the CP $\lambda PP(\iota x(girl(x)\ \&\ stand'(x)))$ combines with the meaning of the NP $\lambda QQ(x_1)$ in the following way. The NP meaning is made into something of predicative type by adding a property variable to it $\lambda QQ(x_1)(Z)$ and then abstracting over the individual variable $\lambda x_1[\lambda QQ(x_1)(Z)]$. After lambda conversion we get $\lambda x_1 Z(x_1)$. This is of the right type to be an argument to the CP meaning. We thus get $(\lambda PP(\iota x(girl(x)\ \&\ stand'(x)))\ (\lambda x_1 Z(x_1))$. After lambda conversion, we get $\lambda x_1 Z(x_1)(\iota x\ (girl(x)\ \&\ stand'(x)))$. Another application of lambda conversion yields $Z(\iota x(girl(x)\ \&\ stand'(x)))$. A generalized quantifier is obtained by abstracting over the property variable Z which remains after lambda conversion, thus giving us $\lambda Z\ Z(\iota x(girl(x)\ \&\ stand'(x)))$ as the denotation of the topmost NP. That is, the quantified noun phrase in (5) denotes the set of sets that contains

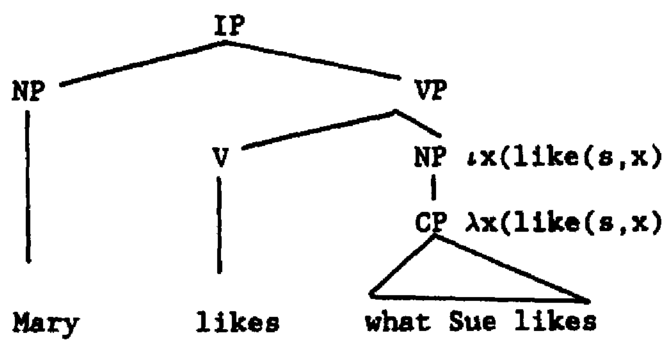
[5] I thank Gennaro Chierchia for bringing this to my attention.

the unique individual who is a girl and is standing. This is of the proper semantic type to function as the subject of the main clause. Thus the semantics for relative clauses adjoined to IP extends to those adjoined to NP without problem.

Before moving on to multiple correlatives I would like to discuss an alternative way of interpreting a relative clause like (1), suggested to me by Maria Bittner (p.c.). Instead of defining jo as a two-place operator, one could maintain the standard view that it is a simple lambda operator. The relative clause would then denote a set, as is typical for relative clauses. In a correlative construction· type shifting rules would raise the relative clause from a set denoting term to a generalized quantifier. This type shifting would be syntactically motivated since a set denoting term could not otherwise combine with the property denoted by the main clause.

In fact, this way of obtaining a noun phrase meaning for a relative clause has been suggested for English free relatives by Jacobson (1988). Her analysis can be illustrated with the following example:

(6)



The relative clause denotes the set of things liked by Sue. Type-shifting applies to this at the level of the NP and converts the set into the unique individual who is in the set. Since uniqueness is defined on the supremum of the set, Jacobson gets the variation between definite and universal readings of the free relative in the same way as I do for correlatives.

The two analyses appear to be equivalent though the type-shifted free relative is an entity level term while the left adjoined relative is a generalized quantifier.[6] It seems to me, however, that the type-shifting approach would not be optimal in the case of correlatives for the following reason.

Recall that left adjoined relatives can have internal heads while embedded and right adjoined relatives cannot:

(7) a. jo laRkii khaRii hai vo lambii hai
REL girl standing is DEM tall is
b* vo lambii hai jo laRkii khaRii hai
DEM tall is DEM girl standing is
c.* vo jo laRkii khaRii hai lambii hai
DEM REL girl standing is tall is

I am not aware of any explanation within current syntactic or semantic theories for the ungrammaticality of internally headed relatives functioning as modifiers, as in (7b-c). It seems to me that their distribution can be accounted for if a wh element like jo is considered ambiguous between a two-place operator which takes a common noun and a predicate to yield a generalized quantifier and a simple lambda operator which takes a predicate to yield a set. Since internally headed relatives will always be generalized quantifiers they could not occur in noun modification structures like (7b-c), where set denoting terms are required but would be perfectly well-

[6] If we assume QR for free relatives, as was suggested in Chapter IV, type shifting would presumably raise it to the level of a generalized quantifier.

formed in structures like (7a) where a quantifier level meaning is needed.

English free relatives typically do not have internal heads. A type shifting analysis like Jacobson's therefore seems reasonable for English. Note, however, that internally headed free relatives, though not as common as in Hindi correlatives, do exist:

(8) I drank what beer there was. (From Andrews 1985)

We might say that the basic type of a relative clause in English is predicative though it may also have, as a marked option, a quantificational meaning. That is to say, the primary meaning associated with the English wh would be that of a simple lambda abstractor; its secondary meaning would be that of a two-place operator like Hindi jo. Jacobson's type-shifting analysis would apply to standard free relatives like (6), while the generalized quantifier analysis would apply to internally headed free relatives like (8).

While I do not want to completely rule out the type-shifting analysis for correlatives I find the analysis in terms of generalized quantifiers more appealing since it provides an explanation for the distribution of internally headed relatives. It is quite possible that universal grammar may allow for quantificational uses of the relative clause but individual languages may differ in the way the quantifiers are built up. Languages like English may choose type-shifting as the primary option while languages like Hindi may have relative clauses whose basic type is quantificational.

In the next section we will consider the semantics of multiple correlatives which I think provide further support for the generalized quantifier approach. We will see that an analysis in terms of generalized quantifiers can be extended to cover multiple correlatives in a way that the type-shifting analysis cannot.

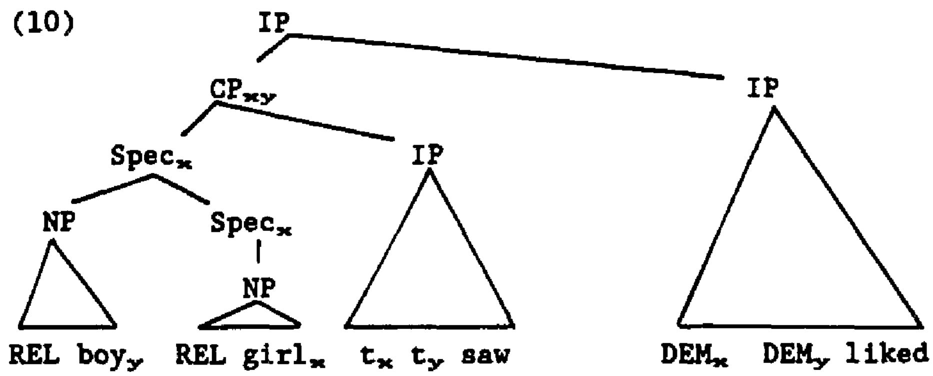
5.2. Relative Clauses as Polyadic Quantifiers

In the previous section I showed how correlatives with a single pair of REL and DEM could be interpreted. In this section I want to turn to multiple correlatives to see whether the same interpretation procedure applies to them.

Let us take a multiple correlative like (9) and its syntactic analysis in (10):

(9) jis laRkine jis laRkeko dekha usne usko pasand kiya
REL girl REL boy saw DEM DEM liked
"Which girl saw which boy, she liked him."

(10)

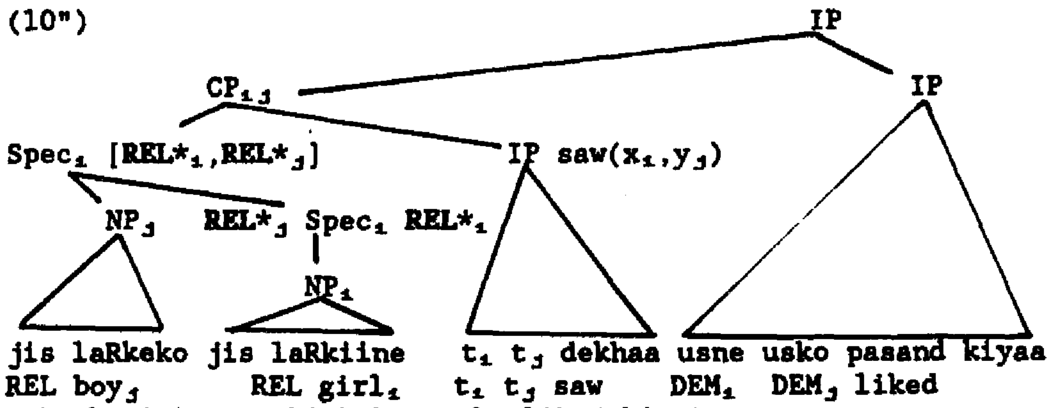


In dealing with single correlatives, I said that the relative clause denotes a set of properties. (9) differs in that the relative clause has two REL's, each of which bind one DEM in the main clause. The relative clause in this sentence appears to denote a set of relations and the main clause a relation between individuals. This requires extending the interpretation procedure to include polyadic quantification.

The main clause can be interpreted as a relation if we extend the quantification rule to cover polyadic quantifiers. That is, structures of the form [QP$_{ij}$ IP] will be interpreted as [Q$_{ij}$

$\lambda x_i \lambda y_j$(IP)]. Thus the main clause in (9) can easily denote a relation. If the relative clause can denote a set of relations, we can get an interpretation for structures like (9). The problem, of course, is in building up the meaning of the relative clause in a way that gets us the result we want. Let us take a full analysis tree for (9) to see what we have:

(10")



"Which girl saw which boy, she liked him."

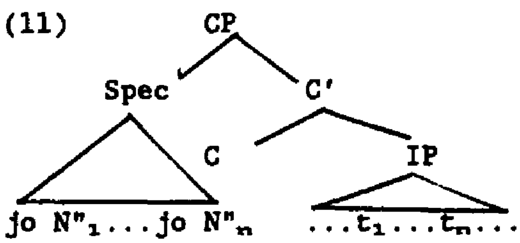
There are two wh NPs in the relative clause and both of them are raised at LF. We know, from the unary case that each of them corresponds to a two-place operator. The question of interest is how these two operators in spec of CP are to be combined.

One of the best-known accounts of the semantics of multiple wh structures is Higginbotham & May (1981). Very briefly, they claim that a multiple wh question denotes a polyadic quantifer, the polyadic quantifier being built up out of a series of monadic quantifiers by a transformation called <u>absorption</u> which applies optionally at LF. If we look at (10"), however, we see that their semantics cannot be applied directly. The transformational rule of absorption takes as input two or more monadic quantifiers. In (10"), however, we do not have a sequence of monadic quantifiers to work from. What we have are two indexed operators $\mathbf{REL*}_i$ and $\mathbf{REL*}_j$ in an adjunction structure, combining with an open sentence (saw x_i,y_j). What we need is an interpretive procedure for this structure.

Let us assume that Spec adjunction of one operator to another corresponds to simple juxtaposition. Thus at the topmost Spec node in (10") we will get a sequence of two operators [$\mathbf{REL*}_i$,$\mathbf{REL*}_j$]. By allowing the open sentence to be an argument to both operators, each operator can yield an entity level meaning. This is obtained via the iota in each operator which can bind the position inside IP with the same index as itself. We need to adjust the lifting operation in such a way that we end up with a set of relations, specifically that set of relations that hold between the girl and the boy she sees.

Let us replace the lifting operation we had in (3) with a more general type shift that would include the unary relative clause as a particular case:

(11)



(for n >= 1)

$$= \text{LIFTn}(\mathbf{REL*}_1 \ldots \mathbf{REL*}_n,\ C')$$
$$= \lambda R\ \forall x_1 \ldots \forall x_n([x_1{=}\mathbf{REL*}_1(IP) \ldots \ \& \ \ldots x_n{=}\mathbf{REL*}_n(IP)] \text{-->} R(x_1 \ldots x_n))$$

LIFT_n takes the operators in spec of CP and the open sentence in IP to yield a generalized quantifier. This procedure relates the entity level meanings that the individual REL* operators yield by universally quantifying over variables identical to them. Thus LIFT_n gives us the set of relations between all x and y that satisfy the common nouns in the wh NPs and the predicate in the relative clause. Note that this way of forming polyadic quantifiers applies, in principle, to any number of adjunctions.[7] So for example, if there are three wh elements in the relative clause, all three will be raised giving us a series of three indexed operators. At the level of CP, we will get a set of three place relations since the predicate in the relative clause will denote an open sentence with three argument positions, each of which can be bound by one operator in Spec of CP. Deriving a generalized quantifier meaning for relative clauses through a type shifting rule like $LIFT_n$ thus has the obvious advantage of providing a general procedure for interpreting correlatives with one or more wh elements.

Before we see whether $LIFT_n$ adequately characterizes the semantics of multiple relatives, however, let us see how it affects the semantics of single correlatives. Taking (1) as an example, we get the following interpretations for the relative clause:

(12) a. which girl is standing, she is tall.
b. $LIFT\ (REL*_1, C') = \lambda P P(\iota x(girl(x)\ \&\ stand(x)))$
c. $LIFT_1(REL*_1,\ C') =$
$\lambda P[\forall x_1(x_1 = \iota x(girl(x)\ \&\ stand(x))) \rightarrow P(x_1)]$

The crucial difference between LIFT and $LIFT_1$ is that there is universal quantification built into the latter. Note, however, that the universal force is restricted by the iota operator. This ensures that the result of applying $LIFT_n$ to (12a) is equivalent to the result of applying LIFT to it.

---

[7] Recall, however, that non-arguments need not affect the polyadicity of the quantifier. See Chapter IV for examples.

Let us evaluate (12b) and (12c) in the three situations in (13):

(13) a. **girl' stand'** mary sue john   b. **girl' stand'** mary sue john   c. **girl' stand'** mary sue john

In (13a) the uniqueness requirement is satisfied and the iota will pick out sue as the unique individual who is a girl and is standing. The relative clause in (12b) will yield the properties of sue. The relative clause in (12c) will yield the properties of all individuals who are identical to sue. Since the only such individual will be sue, it will yield the set of her properties. Thus in the situation where uniqueness is satisfied the two come out equivalent.

Turning to situations where the uniqueness requirement is not satisfied, such as (13b) and (13c), we have to decide what happens when the iota is undefined. In the case of (12b) we may say that when the iota is undefined, so is LIFT. Consequently, the relative clause fails to denote. In the case of (12c) we have to decide what happens to $x = \iota y(\Phi)$ when the iota is undefined. One option is to say that it lacks a truth value. This would mean that LIFT_n yields partial relations, based only on assignments which yield a truth value for $x = \iota y(\Phi)$. Another alternative is to assume that in situations where uniqueness is not satisfied the iota picks out a dummy object, possibly outside the domain of discourse. This would allow $x = \iota y(\Phi)$ to be evaluated. Specifically, it will be evaluated as false for all value assignments to x. This means that the consequent will always be true. That is, the relative clause will let every property through. Strictly speaking, (12a) will be true in these situations. However, the relative clause will not be a proper quantifier or sieve, in terms of Barwise and Cooper (1981), accounting for the intuition that it is odd or inappropriate in these situations. Thus the uniqueness requirement we had for single correlatives under LIFT is preserved under $LIFT_1$.

Now let us take the multiple relative in (9) and see how $LIFT_n$ yields an interpretation for it. At the CP level we get the interpretation in (14) for the relative clause:

(14) which girl saw which boy, she liked him = $\lambda R\ \forall x_i\ \forall y_j[(x_i = \iota x(girl(x)\ \&saw(x,y_j))\ \&\ y_j = \iota y\ (boy(y)\ \&\ saw(x_i,y))) \dashrightarrow R(x_i,y_j)]$

That is, the relative clause yields the set of relations which hold between unique girls and the unique boys they see. In a situation where <u>sue</u> is a unique girl who sees <u>bill</u> and he is the unique boy seen by her, the relative clause will denote the set of relations between them. Thus we see that $LIFT_n$ provides the interpretation that we had wanted for multiple relatives.

An immediate consequence of interpreting the relative clause by $LIFT_n$ is that it captures a rather subtle aspect of the meaning of multiple correlatives. Singular wh NPs, we saw, presuppose uniqueness. An interesting switch happens, however, when there are two singular wh NPs in the relative clause. Uniqueness is replaced by bijection.[8] In addition to the reading where a unique girl sees a unique boy, (9) also allows for multiple pairings in which each girl who saw a boy, saw a unique boy and each boy who was seen by a girl was seen by a unique girl.

---

[8] I would like to thank Vijay Gambhir for confirming judgements about the bijective readings of multiple correlatives, as well as judgements that I rely on in the discussion in Chapter VI.

This switch from a unique reading in the unary case to a bijective reading in the binary case can be better understood in terms of the difference in meaning between single wh questions and multiple wh questions in English.

(15) a. Which girl saw the boy?
     b. Which girl saw which boy?

As disussed by Higginbotham & May (1981), a single wh question such as (15a) presupposes the existence of a unique girl who saw the boy, while a multiple wh question such as (15b) presupposes multiple pairings between girls who saw boys, and the boys who were seen by girls. The case of correlatives like (9) is analogous. So let us see if (14) captures the bijective reading of (9). Again for clarity, let us evaluate it in the three different situations given in (16):

(16) a.

girl	**saw**	**boy**	**girl**	**liked**	**boy**
sue	→	bill	sue	→	bill
jane	→	harry	jane	→	harry
mary		john	mary		john

"Which girl saw which boy" = (saw, liked)

b.

girl	**saw**	**boy**	**girl**	**liked**	**boy**
sue		bill	sue		bill
jane	⇉	harry	jane		harry
mary		john	mary		john

"Which girl saw which boy" = (saw, liked)

c.

girl	**saw**	**boy**	**girl**	**liked**	**boy**
sue	→	bill	sue		bill
jane	↗	harry	jane		harry
mary		john	mary		john

"Which girl saw which boy" = (saw, liked)

In situation (16a), the relation *see* is bijective and we want the relative clause to denote the set of relations that hold between <sue, bill> and <jane,harry>. In situation (16b), however, the relation is not bijective since Jane sees two boys, Bill and Harry. Situation (16c) is also not bijective since Bill is seen by two girls, Sue and Jane.

In situation (16a), let us see if the relation like should be in the denotation of the relative clause. To do this, we evaluate the formula in (15) for all values of x_i and y_j. Let us go through some of the relevant assignments. We first assign Sue to x_i and Bill to y_j. Since Sue is the unique girl who sees y_j (namely Bill) and Bill is the unique boy seen by x_i (namely Sue), and Sue likes Bill, liked can be in the set as far as this assignment of values goes. Next we try the relation like assigning Jane to x_i and Harry to y_j. Since Jane is the unique girl who sees y_j (namely Harry) and Harry is the unique boy seen by x_i (namely Jane) and Jane likes Harry, like can be in the set. When other values are assigned, for example Bill to x_i and Sue to y_j, the antecedent will be false and like will be in the set, regardless of whether Bill likes Sue or not. So in (16a), the relative clause will denote the set of relations {liked, saw} and (9) will therefore be true in this situation.

Now, let us evaluate the sentence in situation (16b). We again evaluate the relevant part of the formula to test if like should be in the set of relations, assigning Jane to x_i and Bill to y_j. Since Bill is not the unique individual who is a boy and is seen by x_i (namely Jane), the second conjunct of the antecedent will be false. The pair <jane, bill> like the pair <jane, harry> will not determine whether like should be in the set. We will get a similar result for situation (16c) where the pairs <sue, bill> and <jane, bill> will not affect the set of relations denoted by the relative clause. This is because the interpretation procedure ensures that all and only the one-one pairings will be taken into account in determining the denotation of the relative clause.

We see then that the function $LIFT_n$ used to interpret adjunction structures captures the switch from a unique reading for single correlatives to a bijective reading for multiple correlatives.

Though the Higginbotham & May (1981) semantics for multiple wh is meant for questions and does not apply to correlatives, and the semantics outlined here is for correlatives only, a few words of comparison are in order. Higginbotham & May suggest that single wh NPs have uniqueness built into them. In multiple wh structures the transformational rule that absorbs two or more such quantifiers replaces uniqueness by a bijective relation. This approach to multiple wh questions remains controversial since absorption does not have sufficient independent syntactic motivation. Further, though the semantics they provide for polyadic quantifiers gets the right results, it is non-compositional in that it pulls apart the meanings of the NPs that are input to absorption. The rule provided here, on the other hand, is compositional and does not involve transformations on LF representations. It has the advantage of accounting for single as well as multiple wh by a uniform semantic procedure.

The discussion so far has assumed without argument that the relation expressed by a multiple wh construction involves bijection but, in fact, this issue is controversial. Engdahl (1986), for example, disagrees with Higginbotham and May (1981) and argues that the semantics of multiple wh questions should allow for the following possibility:

(17) a. Which table ordered which wine?
b. Table A ordered the Ridge Zinfandel, Table B ordered the Chardonay and Table C ordered the Rose and the Bordeaux.

According to her, a person asking a question like (17a) is interested in knowing all pairings between tables and the wines they ordered and an appropriate answer to his question should include the orders of tables which ordered more than one wine. The appropriateness of question-answer paradigms like (17) is alleged to show that the semantics of multiple wh questions should not be limited to one-one pairings. Engdahl's criticism of Higginbotham and May carries over to the semantics given here since it too ensures a bijective reading for multiple correlatives. I will focus on multiple wh questions in discussing this issue, however, since they are more familiar. The conclusions we reach with regard to questions will bear on the semantics of correlatives in a straightforward way.

I think there is little doubt that multiple wh questions have a predominantly bijective reading. The issue to be settled, however, is whether this is a presupposition or a conversational implicature. This is an important point since it is generally accepted that presuppositions should be represented in the semantics of questions while conversational implicatures need not.

A diagnostic for separating genuine presuppositions from conversational implicatures, due to Fred Landman, is given in Comorovski (1989). She shows that while an answer to a question can deny the presuppositions of the question, the question itself cannot. Consider, for example, (18):

(18) a. Who came?
b. Nobody.

Though (18a) is a perfectly acceptable answer to (18a), it does not indicate the absence of an existential presupposition in the question. What the answer does is implicitly deny this presupposition. She suggests the following cancellation test for determining the existential presupposition in (18a):

(19) # Although nobody came, who came?

(19) sounds odd because the questioner contradicts herself by asking a question with an existential presupposition after declaring that she has no such presupposition.

The point made by Comorovski is an important one since it shows that the appropriateness of answers should not be used as the only heuristic in deciding the semantics of questions. Although the question-answer paradigm in (17) is an acceptable exchange, we have to consider the consequences of removing the restriction to bijective relations from the semantics of multiple wh structures.

One immediate consequence of removing the restriction to bijective relations and allowing questions to have ordinary universal quantification will be the following. Take a situation like (20) in which some girl sees several boys.

(20)

girl	saw	boy
		Bob
Mary		Harry
		John
Jane		Dick
		Bill

It is predicted that the following question-answer exchange is acceptable:

(21) a. Which girl saw which boy ?
b. Mary saw Bob, Harry and John and Jane saw Dick and Bill.

Intuitively, however, this does not seem correct. This intuition is borne out by the cancellation test. A questioner who knows the situation to involve pairings between single girls and several boys cannot ask a question with two singular wh NPs, as shown in (22). The questioner is required to use a plural NP in the object position.

(22) # I know that each girl saw several boys, but which girl saw which boy ?

The cancellation test therefore confirms that multiple wh structures presuppose one-one pairings, as assumed above.[9]

Acceptable answers to multiple wh questions which seem to violate the restriction to bijective relations, for example (17), usually involve situations in which most of the pairings are unique. The questioner in (17) probably expects each table to have ordered just one wine. A questioner who is aware that tables may have ordered more than one wine would be more likely to ask "Which table ordered which wines ?" Assuming that questions are usually exhaustive requests for information, a cooperative interlocuter may provide an answer which includes pairings which are not unique, implicitly denying the questioner's presuppositions. This seems to me a plausible pragmatic explanation for the apparent acceptability of (17b). As such, it should not be taken as evidence against the restriction to bijective relations. As we saw above in (20)-(22),

---

[9] Higginbotham and May discuss the possiblity of answering "Which student got which grade?" with "John and Bill got As, Mary got B ..." They distinguish between the abstract letters A, B etc, which represent grades and their applications to individuals like John and Bill. In the application sense, John's grade is not the same as Bill's grade.

removing this restriction from multiple wh questions can lead to unwanted consequences.

5.3. Some Remaining Issues

In discussing the semantics of relative clauses I have focused on two types of relative clauses. Internally headed relative clauses are interpreted as quantifiers, those without internal heads as set denoting terms. I suggested that their distribution could be determined on the basis on their semantic type, internally headed relatives appearing in correlatives, those without internal heads in noun modification structures. This, however, does not give the full picture. As we can see in (23), a left adjoined relative need not have an internal head:

(23) <u>jo khaRii hai</u> vo lambii hai
REL standing is DEM tall is
"Who is standing, she is tall".

The meaning here is akin to that of a headless relative. I assume that jo in (23) is also a two place operator just as in (1). The only difference is that the first argument is not supplied by a common noun but by a contextually specified property variable. That is, the denotation of the relative clause would be $\underline{\lambda P \forall x(x=\iota y(C(y)\ \&\ stand(y)) \rightarrow P(x))}$. Suppose that (23) was uttered during a conversation about girls, the most contextually salient value for C would be "girl". And in that case, the iota would be defined on a unique girl. It would not matter if the domain of discourse contained standing women.

This becomes relevant when we consider the interpretations of possible variations in the correlative constructions mentioned in Chapter II:[10]

(24) a. <u>jo laRkii khaRii hai</u> vo lambii hai
REL girl standing is DEM tall is
"Who is standing, that girl is tall."
b. <u>jo khaRii hai</u> vo laRkii lambii hai
REL standing is DEM girl tall is
"Who is standing, that girl is tall."
c. <u>jo laRkii khaRii hai</u> vo laRkii lambii hai
REL girl standing is DEM girl tall is
"Which girl is standing, that girl is tall."

The three sentences are roughly synonymous but (24a) seems to be the basic case. This is reflected in earlier analyses which proposed a linear order for pronominalisation/deletion. The semantics given here also represents this version of the sentence. The meaning we obtain for it is $\underline{\lambda P\forall x(x=\iota y(girl(y)\ \&\ stand(y))->P(x))\ (\lambda x tall(x))}$. Let us see if the meanings we obtain for (24b-c) are related to it in a principled way.

The relative clause in (24b) will denote $\underline{\lambda P\forall x(x=\iota y(C(y)\ \&\ stand'(y))->P(x))}$, where C is a context variable, as demonstrated for (23). The NP in the main clause contains <u>vo laRkii</u> "DEM girl". Let us assume that its meaning is $\underline{\lambda PP[(x_1)\ \&\ girl'(x_1)]}$, where x_1 is a free variable. When the NP meaning combines with the VP tall', it will yield an open sentence with x_1 free: IP'= $\underline{\lambda P(P(x_1)\ \&\ girl'(x_1))\ (tall')}$, which after lambda conversion becomes $\underline{tall'(x_1)\ \&\ girl'(x_1)}$. (24b), therefore, will be interpreted as $\underline{\lambda P\forall x(x=\iota y(C(y)\ \&\ stand'(y))\ ->P(x))\ (\lambda x_1[tall'(x_1)\ \&\ girl'(x_1)])}$. If we reduce (24b) further by lambda conversion we get $\underline{\forall x(x=\iota y(C(y)\ \&\ stand'(y))\ ->\ \lambda x_1[tall'(x_1)\ \&}$

---

[10] I would like to thank Gennaro Chierchia and Maria Bittner for helpful discussion here.

girl'(x,)] (x)). Another application of lambda conversion yields $\forall x(x{=}\iota y(C(y)\ \&\ stand'(y)) \rightarrow (tall'(x)\ \&\ girl'(x)))$. This says that all individuals identical to the unique entity who is standing and has some contextually specified property are in the extension of girl' and tall'. This is not equivalent to (24a). For example, if the sentence was uttered during a discussion about girls in grade 1, a likely value for C would be girl-in-gradel. Suppose that there were two girls standing, one from grade 1 and one from grade 2 uniqueness will be satisfied in (24b) but not in (24a). Out of context, of course, C will tend to be interpreted as girl', giving the impression of semantic equivalence. It should be noted that the semantic procedure will rule out woman' as a likely value for C since the unique standing woman will not be in the extension of girl'.

(24c), on the other hand, is equivalent to (24a) since its reduced form $\forall x(x{=}\iota y(girl'(y)\ \&\ stand'(y)) \rightarrow (tall'(x)\ \&\ girl'(x)))$ says that all individuals identical to the unique standing girl is in the extension of girl' and stand'. It seems to me that the semantics captures the intuitions correctly with regard to these sentences.

This puts in perspective Downing's (1973:13) comment that left adjoined relatives and the main clause nominals in parallel Hittite constructions, "seem[s] to observe a condition of relevance or inclusion rather than the identity of reference". This is based on the following sort of example, taken from Berman (1972):[11]

(25) "What prayer I make to the gods, report the words to the gods."

---

[11] Downing does not give the Hittite form.

In terms of the present analysis, the main clause nominal corresponding to the relative clause must still provide a free variable which can be bound, though it may also include a property already specified in the relative clause or another property which holds of the individual picked out by the relative clause.

This point is worth stressing since the presence of additional material may be thought to argue against a bound variable interpretation. McCloskey (1989), for example, argues that left dislocation structures do not involve variable binding since they allow for epithets. In the case of correlatives, where there is strong evidence in favor of a bound variable analysis, the presence of the epithet should not be taken as a counterexample:

(26) <u>jo laRkii khaRii hai</u> vo badmaash cor hai
REL girl standing is that rascal one thief is
"Which girl is standing, that rascal is a thief."

Under the analysis proposed here the relative clause can still bind the variable in the NP **vo badmaash** "that rascal". The only condition is that the individual denoted actually be in the extension of rascals.

Let us examine next what types of noun phrases are permissable as bound elements in a correlative construction. The first question has to do with the difference between (27a-b):

(27) a. <u>jo laRkii khaRii hai</u> vo **laRkii** lambii hai
REL girl standing is DEM girl tall is
"Which girl is standing, that girl is tall."
b.* <u>jo laRkii khaRii hai</u> **laRkii** lambii hai
REL girl standing is girl tall is
"Which girl is standing, girl is tall."

The reason given for this contrast in grammaticality in Chapter II invoked the principle of non-vacuous quantification, saying that a bare NP in Hindi cannot function like a bound variable while the demonstrative element inside the noun phrase in (27a) allows it to be bound. Differentiating between a bare NP (which in Hindi is a definite) and a deictic NP (which is also definite) is not easy from the semantic point of view.

Take a theory of definites such as Heim (1982) where definites are treated as free variables, anchored to familiar variables in the discourse, and their descriptive content presupposed. The motivation for doing this comes from sentences like (28), where the definites have the quantificational force of antecedents that do not c-command them:

(28) Every man who owns a donkey beats it.

The theory provides an interpretation for (28), which is equivalent to the following:

(28') $\forall xy[man(x)\ \&\ donkey(y)\ \&\ own(x,y)]\ [beat(x,y)]$.

If we consider the Hindi version of (28) we see that bare NPs are possible, suggesting that their semantics would be similar to the semantics of English definites:

(29) [$_{NP}$ har aadmii [$_{CP}$jis-ke paas ek gadhaa hota hai]]
every man REL with one donkey be
[$_{VP}$ gadheko marta hai]
donkey beats

Under the theory of definites we are considering, this would mean that the Hindi bare NP is semantically a free variable, just like the English definite NP. But then, notice that we lose an explanation for the ungrammaticality of (27b). If definites and deictics both correspond to free variables there is nothing to distinguish the two.

A theory of definites which treats them as quantificational would clearly fare much better. Under such an approach, the variable denoted by the definite would not be free for binding from outside. It would be possible, then, to distinguish deictics and definites on this basis. Schematically put, (27a) would have the general form of $Q_i\ \lambda x_i\ (tall(x_i)\ \&\ girl(x_i))$ while (27b) would have the form $Q_i\ \lambda x_i\ (tall(\iota x(girl(x)))$. It is clear that the first is a legitimate case of quantification while the second involves vacuous quantification.

The problem with a simple quantificational view of definites, however, is that the bound variable reading of sentences like (28) is lost. For this reason, Cooper (1983) proposed that the translation of a definite should include a free property variable. On his account, "the girl" translates into $\lambda PP(\iota x(girl(x)\ \&\ P(x)))$. The value of the property variable P is determined by context and may be composed of free relational and individual variables. For example, in interpreting (28), a contextually salient value for P would be the relation 'be-owned-by-y' where y is free. The full translation would be (28"):

(28") $\forall y[(man(y)\ \&\ \exists x\ (donkey(x)\ \&\ own(y,x))\ \text{-->}\ beat\ (y, \iota z(donkey(z)\ \&\ is\text{-}owned\text{-}by\text{-}y(z)))]$.

Thus even within a quantificational theory of definites, a bound variable reading becomes possible.

With this in mind let us reanalyze the Hindi facts. Since Hindi bare NPs also have a bound variable reading in contexts like (29), the simple quantificational view cannot be correct. What we need is something like Cooper's theory which would yield the following translation for (27b): $Q_i\ \lambda x_i\ (tall(\iota x(girl(x)\ \&\ P(x)))$. The problem can be now be restated in the following way. Why is it not possible for P to contain an individual variable x_i that could be bound by the quantifier?

In order to address this, let us consider the context in which the correlative would be used. Recall that the relative clause itself denotes a unique individual. In order for the relative clause to be felicitous, however, the context would have to contain more than one individual who is a girl, but just one who is standing. That is, it is the restriction provided by the predicate in the relative clause that has to be crucial in guaranteeing uniqueness. This is the normal felicity condition for relative clauses which are not used non-restrictively (Partee 1975). Turning now to the bare NP in the main clause, the most likely value for P would be the contextually salient property of being the standing girl. That is, P could be the identity relation between the individual denoted by the relative clause and the individual bound by the iota: $Q_i\ \lambda x_i$ (tall(ιx(girl(x) & is-identical-to-x_i(x))). However, the property of being a girl is the same as the property of being a self-identical girl. The iota can only be defined if there is a unique girl in the domain of discourse but, of course, that would be a situation in which the relative clause could not be felicitously used. Thus we can account for the bound variable reading of a bare NP in a conditional but not in a correlative if we assume Cooper's theory of definites combined with a restriction against interpreting the context variable as the property of self-identity.

Finally, I would like to consider the interpretation of numerals when they occur inside the wh phrase. In Chapter IV I discussed the syntactic issue in connection with Williamson's (1987) observation that internally headed relative clauses have an indefiniteness restriction. I suggested that within the DP analysis of noun phrases (Abney 1987), the wh operator could be generated in the head of DP. Since this is the position where other strong determiners are generated the possibility of a wh operator coocurring with strong determiners is ruled out.[12] But weak determiners are allowed since they occur inside NP, i.e. N" in the old system. It was also noted that numerals inside correlatives, and perhaps all internally headed relatives, had a definite reading. For example, (30) has an "exactly two" reading, which can be verified by the impossibility of continuing (30) with "... and two are sitting."

(30) $[_{CP}[_{Det}$jo$[_{N''}$ do laRkiyaa]] [IP t_i khaRii hai]]
REL two girls standing are
"Which two girls are standing"

A fairly plausible interpretation for this relative clause would treat "two" as an adjective (see Partee (1987) for discussion). The interpretation for the relative clause would be $\underline{\lambda P P\ \forall x(x=\iota y[2\text{-}girls(y)\ \&\ stand(y)] \rightarrow P(x))}$. This yields the right result since in a model with three standing girls a,b and c the iota operator will not be defined. Specifically, the predicate 2-girls will pick out the set of those individuals who have two atomic i-parts, i.e. {a+b, a+c, b+c} but there will be no unique maximal individual in this set. If only

---

[12] Of course, I am making this claim for languages in which the wh operator is overt. Languages like Lakhota do not have a wh morpheme so it is harder to posit the same structure. Note, however, that Williamson admits that some semantic operation would be needed to nominalize the clause. As such, it does not seem implausible to suggest that there may be a phonologically null operator in head of DP in those languages.

two girls, a and b are standing, on the other hand, the relevant set will be {a+b} which will satisfy uniqueness.

While treating the numeral as an adjective has obvious advantages for relative clauses with one REL element, I am reluctant to claim that this is its interpretation. The problematic aspect of this view surfaces when we consider a multiple correlative like (31):

(31) <u>jin do laRkiyõNE jin do laRkõKO dekha</u> unhõNE unKO pasand
REL two girls REL two boys saw DEM DEM liked
"Which two girls saw which two boys, they liked them."

The interpretation procedure would allow for the relative clause to denote multiple bijective pairings between groups of two, for example {<a+b,c+d>, <e+f,g+h>}. It is not clear, however, whether the sentence actually has this interpretation. In general, it seems that the addition of a numeral affects the possibility of the bijective interpretation. Compare, for example, (32a-b):

(32) a. Which girl saw which boy ?
b. Which one girl saw which one boy ?

In English questions the contrast is fairly obvious. This is also true of Hindi questions. I do not know whether the possibility of a bijective reading is completely ruled out in correlatives but it is quite clear that the availablity of that reading is reduced to an extent that is not allowed by an analysis of numerals as adjectival. I do not think that this issue can be resolved by adopting a different analysis of multiple wh structures, such as Higginbotham and May (1981). The problem is more with the proper treatment of numerals. At this point I do not have an alternative worked out so I will leave this as an open problem.

In conclusion, I would like to sum up the basic claims of this chapter. The left adjoined relative clause is treated as a quantifier of polyadicity $\succ$ 1, binding n-place relations. The iota operator yields a unique individual who may be singular or plural. In the first case, we get a definite reading, in the second, a universal reading. The analysis of correlatives has a lot in common with a quantificational analysis of definite descriptions as well as with English free relatives. The most striking difference with these more familiar constructions comes when we take into account the bijective readings of multiple correlatives. In order to account for them we move from an analysis of the relative clause in which we have the properties of a unique individual, to one in which there is a kind of universal quantification over individuals which is restricted to uniqueness. This allows for a uniform treatment of single as well as multiple correlatives.

CHAPTER VI

CORRELATIVES IN DISCOURSE REPRESENTATION THEORY

6.1. Correlatives as Quantificational Structures

The primary task in the semantic analysis of correlatives, as we saw in Chapter V, is the characterization of the link between the wh NP inside the relative clause and the demonstrative inside the main clause. In the generalized quantifier treatment of the previous chapter this was done by defining the wh NP as a two-place operator whose full semantic value became available at the relative clause level. Specifically, the relative clause was interpreted as a generalized quantifier binding the variable denoted by the demonstrative in the main clause. Since the relative clause meaning was built up from the meaning of the wh NP, the link between the non c-commanding wh NP and the demonstrative could be thought of as an indirect link, while the link between the c-commanding relative clause and the demonstrative could be characterized as the standard syntactic binding of operator-variable relations. A consequence of taking this line was that relative clauses had to be treated as quantifiers of n >= 1 polyadicity due to the existence of multiple correlatives.

While there are several studies of the formal properties of polyadic quantification (see van Benthem (1989) for discussion and references), its relevance to natural language remains an open question. Previous proposals in the literature, such as Higginbotham and May (1981), claim that polyadic quantification is at work in Bach-Peters sentences and multiple wh questions. In both constructions a polyadic quantifier is built out of a series of monadic quantifiers by a transformation called absorption which optionally applies at LF. The formation of polyadic quantifiers being dependent on the existence of monadic quantifiers, however, one could argue that polyadic quantification does not correspond to basic natural language expressions (see Neale (1988) and Engdahl (1986) for analyses not involving absorption). Hindi left adjoined relatives, we saw, could not be analyzed as a result of the absorption of monadic quantifiers at LF. They are ideal candidates, therefore, for being considered natural language correlates of polyadic quantifiers. But if polyadic quantifiers are marked expressions in the world's languages, it may be worthwhile to see if the semantic properties of correlatives can be characterized in some other way.

A framework which appears promising in this connection is Discourse Representation Theory, developed by Kamp (1981) and Heim (1982) for dealing with anaphoric dependencies in sentences such as the following:

(1) a. If a man owns a donkey, he beats it.
b. Everyman who owns a donkey beats it.

In each case, the interpretation of the pronoun it is dependent on the meaning of a non c-commanding antecedent **a donkey**. In addition, **a donkey** seems to have universal rather than existential force. These aspects of the meaning of the sentences in (1) is captured in a Discourse Representation Structure like the following:

(1) c.

<table>
<tr><td>x
y
man(x)
donkey(y)
own(x,y)</td><td>=></td><td>beat(x,y)</td></tr>
</table>

This representation is interpreted as having a universal quantifier which binds all the free variables inside the antecedent and the consequent. In (1a) the universal quantifier is implicit while in (1b) it is provided by the determiner "every". In either case, the quantifier functions like an unselective binder which quantifies over pairs of men and donkeys that they own. (1c), therefore, is equivalent to (1d):

(1) d. $\forall_{xy}$ [(man(x) & donkey(y) & own(x,y)) --> beat(x,y)]

There are two aspects of DRT that are relevant to the problem of correlatives mentioned above. It is able to characterize anaphoric dependencies even in the absence of an appropriate syntactic configuration and it can quantify over pairs of individuals without resorting to the notion of polyadic quantification. If a DRT based approach can account for correlatives we will have an alternative to a semantics in which polyadic quantification needs to be posited. We will see in this chapter, however, that though the semantic properties of correlatives can be captured in DRT, it is not possible to do so without incorporating the notion of polyadic quantification somewhere in the grammar.

As a starting point, consider an algorithm suggested by Andrews (1985) for translating multiple correlatives from Hindi to English. According to him, their meaning can be rendered by replacing the wh NP with an indefinite and recasting the sentence as a conditional. At a descriptive level at least, the suggestion here is that correlatives could be treated as conditionals in the DRT framework. Using this insight about the meaning of correlatives, we might propose the following quantificational structure for (2):

(2) jo laRkiyãã khaRii hãĩ ve lambii hãĩ
REL girls standing are DEM tall are
"Which girls are standing, they are tall."

(2) a

```
which girls are standing, they are tall.

 x
 girls(x)    ->
 stand(x)          tall(x)
```

This DRS treats the wh NP as an ordinary indefinite which introduces a new variable. The demonstrative is taken as a definite anchored to the variable represented by the wh NP. An implicit universal quantifier binds both variables, thereby establishing an anaphoric link between them. Assuming the usual interpretation for DRS's, (2a) says that every individual who is a girl and is standing is tall.

This analysis easily extends to correlatives with more than one wh element. Take, for example, the multiple correlative in (3) and the DRS in (3a):

(3) jin laRkiyõne jin laRkõ kesath khela, unhõne unko haraya
REL girls REL boys with played, DEM DEM defeated
"Which girls played with which boys, they defeated them."

(3) a

```
which girls played with which boys, they defeated them

 x  y
 girls(x)
 boys(y)            ->
 play-with(x,y)           defeat(x,y)
```

This says that every girl who played with a boy defeated him.

Attractive though this analysis seems, it does not work. While it captures the meaning of correlatives with plural morphology, like

(2) and (3), serious problems surface when we consider their singular counterparts.

Let us look at the singular version of (2) first. Compare (2) with (4):

(4) jo laRkii khaRii hai, vo lambii hai
REL girl standing is, DEM tall is
"Which girl is standing, she is tall"

(4) a. which girl is standing, she is tall.

```
 ___________        ________
| x         |      |        |
| girl(x)   |  ->  |        |
| stand(x)  |      | tall(x)|
|___________|      |________|
```

(4) has a strong uniqueness implication which is absent in (2). The analysis, as it stands, does not capture this since it assigns both a universal reading.

The DRS's for the two sentences differ minimally in that the conditional inside (2a) has a plural predicate "girls" while the one inside (4a) has a singular predicate "girl". Let us take the theory of plurals in Link (to appear) and Landman (1989) which includes groups in the domain of individuals. We can assume that the singular predicate "girl" can only be predicated of singular individuals and the plural predicate "girls" only of plural individuals.

This in itself is not enough though. Since the quantification is universal, the two sentences will come out equivalent. For example, if we have a model in which there are two standing girls, a and b, the DRS in (4a) will pick out the set {a,b} while the DRS in (2a) will pick out {a+b}. But we do not want (4a) to be embedded in such a model. What we need to find is some way of restricting the interpretation of singular correlatives to models in which the antecedent is uniquely satisfied.

One option would be to consider such a restriction part of the pragmatics of the use of the singular as opposed to the plural. This solution, however, turns out to be implausible when we consider the semantics of multiple relatives. Recall that a sentence like (5) has two singular wh NPs, but it differs from (3) in allowing for multiple pairings between girls and the boys they play with.

(5) jis laRkine jis laRke kesath khela, usne usko haraya
REL girl which boy with played DEM DEM defeated
"Which girl played with which boy, she defeated him"

It would be completely ad hoc to suggest that the use of one singular NP signals uniqueness but the use of more than one such NP does not.

Recall also that there is a further complicating factor in the semantics of multiple correlatives. Though judgements for sentences like (5) are delicate, there is a clear feeling that pairings between girls and the boys they play with are bijective, in the sense of Higginbotham and May 1981 (see Chapter V for arguments supporting this view of multiple wh structures). (5) clearly does not refer to doubles, for example, in which two girls play with two boys. This would not be represented in the DRS for (5).

Thus, two problems remain in an analysis of correlatives which treats wh NPs as indefinites bound by a universal quantifier. There is no principled way of accounting for the variation between a universal reading for a plural construction and a unique reading for the singular construction. There is also no account for the switch from uniqueness in the single correlative to bijection in the multiple correlative.

We can capture these two important distinctions if we abandon the view that wh NPs are indefinites and include a uniqueness requirement for them. An adequate characterization of uniqueness in correlatives can be in terms of maximality.[1] This modification will yield the following DRS for (4).[2]

(4) b. which girl is standing, she is tall.

```
x
girl(x)
stand(x)                              =>   tall(x)

y              y = x
girl(y)   =>    or
stand(y)       y < x
```

The DRS in (4b) interprets the relative clause with respect to a unique maximal individual. Since (4) has singular morphology, the maximality clause will be satisfied in a model only if there is exactly one individual who is a girl and is standing. If there are two standing girls in a model, say a and b, a will not satisfy the larger antecedent since there will be some y, namely b, who is also a standing girl but is neither identical to a nor an i-part of a.

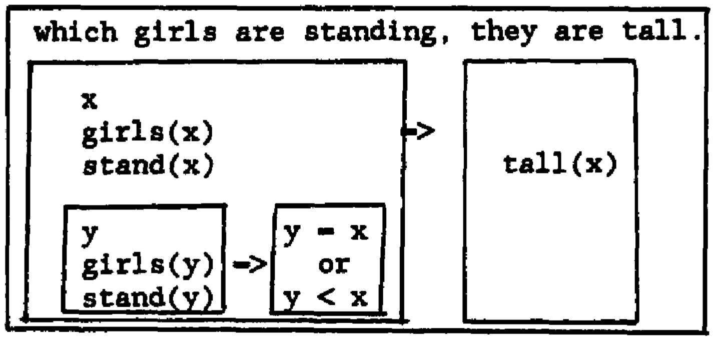
[1] I will take uniqueness to be an inherent feature of wh NPs. An alternative would be to let wh NPs be ordinary indefinites. The demonstrative, being a definite linked to the wh NP, could force maximality to be accommodated in the antecedent, as in the analysis of conditionals in Kadmon (1987). The reason for not adopting this is that a Hindi relative clause functions like a definite description in English. For example, it has a definite meaning when used as a short answer to a question. As such, it seems more plausible to analyze it as inherently unique. It should be noted, however, that we cannot tell whether the short answer contains a null argument which the relative clause binds: [[relative clause]$_i$ [pro$_i$]].

[2] The symbol < stands for "is an individual part (i-part) of".

Similarly, b will not satisfy the larger antecedent since a will not be an i-part of it. So we see that introducing maximality into the representation ensures uniqueness in spite of universal quantification.

Now, consider the DRS for (2), the plural counterpart of (4):

(2) b



This DRS too requires the conditions in the relative clause to hold of a unique individual. This individual being plural, however, the conditions will also hold of all its i-parts. In a model with two girls standing, a and b, the only individual to satisfy the topmost antecedent will be the i-sum of a and b i.e a+b. But we can infer from it that a and b both individually satisfy the antecedent. Thus a quasi-universal reading is available for plural correlatives in spite of the restriction to uniqueness.

The next step is to see if the uniqueness requirement we have introduced can be used to capture the bijective reading of multiple correlatives such as (5). One way of including uniqueness would be the following:

(5) a. which girl played with which boy, she defeated him.

```
x y
girl(x)
boy(y)
play-with(x,y)            =>    defeat(x,y)

u v
girl(u)
boy(v)                    =>    u = x or u < x
play-with(u,v)                        &
                                v = y or v < y
```

The problem with (5a), of course, is that it can only be interpreted in a model which has a single girl who plays with a single boy. For example, take a model in which there are two girls a and b who play with two boys c and d respectively, i.e. the play relation between girls and boys is bijective. (4a) cannot be embedded into this model due to the uniqueness requirement. The pair <a,c> cannot satisfy the topmost antecedent since the pair <b,d> will satisfy the embedded antecedent but b is not an i-part of a and d is not an i-part of c. As mentioned earlier, (5) must allow for multiple pairings of this kind. So we obviously need some other way of incorporating uniqueness.

A DRS for (5) which encodes uniqueness separately for each wh NP yields the right results.

(5) b. which girl played with which boy, she defeated him.

```
x y
girl(x)
boy(y)
play-with(x,y)                    =>  defeat(x,y)

u                      u = x
girl(u)           =>    or
play-with(u,y)         u < x

v                      v = y
boy(v)            =>    or
play-with(x,v)         v < y
```

This DRS allows for multiple pairings though nothing prevents it from being embedded into models with only one relevant pairing. When embedded into models with more than one relevant pairing, the embedded conditionals will ensure that uniqueness for each wh NP is relative to assignment of value to the other wh NP. For example, in the model where there are two relevant pairs of individuals <a,c> and <b,d>, the interpretation allows for both since a and c are unique with respect to each other and b and d are unique with respect to each other. Note that this formulation of the uniqueness requirement ensures that (5b) cannot be embedded into models in which the relation "play" between girls and boys is non-bijective. For example, if a plays with c and d, <a,c> will not satisfy the topmost antecedent since <a,d> will satisfy one embedded antecedent but d will not be an i-part of c. The representation thus captures the ambiguity between the unique and bijective readings of (5).

By including uniqueness into the representation, then, we have accomplished both goals. We have accounted for the universal/unique variation between plural and singular correlatives like (2) and (4), and the unique/ bijective variation between single and multiple correlatives like (4) and (5). Correlative constructions, we will therefore assume, are universally quantified structures in which wh NPs denote the maximal individuals of whom the predicates in the relative clause hold.

We have considered so far two implementations of treating correlatives within DRT. The first implementation equates them with conditionals in Heim (1982) and Kamp (1981). The second implementation brings them in line with the analysis of conditionals in Kadmon (1987). This seems to accord Andrews' statement the status of a valid claim. There are, however, good reasons why we should not take the connection between correlatives and conditionals too literally. I will show below that the two structures do not have the same properties.

One significant difference between correlatives and conditionals is shown by (6) and (7).[3] A correlative construction requires a one to one correspondence between wh NPs and demonstratives but a conditional does not require a demonstrative for each indefinite in the antecedent:[4]

(6) a.* jo laRkii bol rahi hai, meri khush hai
REL girl speaking is, Mary happy is
"Which girl is speaking, Mary is happy."

b. jab koi laRkii boltii hai, meri khush ho jati he
when some girl speaks Mary happy becomes
"When a girl speaks, Mary feels happy."

(7) a.* jo laRki jis laRke kesath khelti hE, vo khush hoti he
REL girl which boy with plays, DEM happy is
"Which girl plays with which boys, she is happy."

b. jab koi laRki kisi laRke kesath khelti he,
when some girl some boy with plays
vo khush hoti hai
she happy is
"When a girl plays with a boy, she feels happy."

(6) and (7) show that unlike the anaphoric link in conditionals, the anaphoric link in correlatives is not optional. Thus we need a way of

---

[3] Recall also that the main clause can contain a bare NP in the case of conditionals but not in the case of correlatives.

[4] For some apparent counterexamples to this see Chapter IV.

forcing the implicit universal quantifier to bind the same number of variables in the antecedent as in the consequent. This is not easy to do within the theory.

In earlier versions of DRT, adverbs of quantification and implicit quantifiers were treated differently from ordinary quantifiers in not having to bind a variable. That is, they could be vacuous. This accounted for the optionality of anaphora in conditionals. In a recent extension of the theory, Kratzer (1989) has argued that these quantifiers are also subject to the ban on vacuous quantification. She suggests that they must bind variables in the antecedent as well as the consequent in order to be licensed. The so-called optionality of donkey anaphora is shown to be sensitive to the distinction between stage and individual level predicates. Since stage level predicates have a spatio-temporal location they always provide a variable for the quantifer to bind, making it possible for individual variables to be absent. Individual level predicates require the presence of individual variables in both clauses since they do not provide a spatio-temporal variable for the quantifier to bind.

This account, however, does not help us in connection with correlatives. The predicates in (6)-(7), for example, are stage-level. In Kratzer's system (6a), for example, would be represented as [$\forall_{1x}$ [speak(x, at 1)] [mary is happy(at 1)]].[5] Since the quantifier

---

[5] The DRS's so far follow Kamp (1981). The equivalent tripartite representation of Heim (1982) in which there is an operator, a restrictor and a nuclear scope is also used in this chapter. In Heim's representation the operator denotes the type of quantification, the restrictor corresponds to the antecedent and the

binds variables in both clauses it is not vacuous and the sentence is incorrectly predicted to be well formed. In the case of multiple correlatives, all that would be needed is a stage-level predicate or one demonstrative in the main clause to license the quantifier. This, of course, is not the case, as shown by (7a). Thus there does not seem any way of enforcing anaphora in correlatives at the level of discourse representation.

The only plausible way of accounting for the facts, then, is to consider the relative clause a quantificational phrase in the syntax. The relative clause in (6a), for example, would be a quantifier with the index of the wh NP on it. It would be vacuous, however, since it would not be coindexed with a variable inside its scope domain. In order to account for multiple correlatives we would assume that the relative clause carries the indices of all wh NPs inside it. For a quantifier to be non vacuous it would have to be coindexed with the same number of variables inside the main clause as the indices on it. (6a) and (7a) would be ruled out as cases of vacuous quantification at a level prior to discourse representation, i.e. we would have to rule out cases of vacuous quantification in the syntactic component. It seems somewhat counterintuitive to charaterize what is essentially a semantic notion in syntactic terms but this is a move that we are forced to make since DRT, at least in its current forms, does not incorporate the notion of generalized quantifiers.

So we see that though correlatives and conditionals may have similar semantics they need to be distinguished at some level of

---

nuclear scope to the consequent.

linguistic representation. The distinction that is needed makes the DRT based account equivalent to the generalized quantifier account developed in Chapter V. In both cases we have to recognize that polyadic quantification is operative in correlatives. Thus there is no advantage to be gained in giving up an analysis in terms of generalized quantifiers. In the rest of this chapter, however, I will use the DRT based account to discuss some semantic properties of correlatives not considered so far, since they touch on issues which have been studied at greater length within DRT. I wish to emphasize though that it is also possible to analyze these properties within the theory of generalized quantifiers.

6.2. Absolute vs. Relativized Uniqueness

In this section I would like to return to the connection between Hindi correlatives and English free relatives made in Chapter IV and explore certain aspects of their semantics not touched upon above. But before introducing them I will compare Hindi correlatives with English free relatives and show that they are semantically similar. I hope that the comparison with a familiar construction will make the semantic discussion of correlatives more accessible.

Take the Hindi correlative (8a) and the corresponding English free relative (8b):

(8) a. jo vo likhtii hai, mai vo pasand kartii hũũ
REL she writes I DEM like
"What she writes, I like that."

(8) b. I like what she writes.

The syntactic analysis that I have assumed for Hindi correlatives is that of a relative clause adjoined to the main clause at D-structure:

(8) c. $[_{IP}$ $[_{CP}$ what she writes$]_i$ $[_{IP}$ I like that$_i$]]

English free relatives differ in occupying an argument position at D and S-Structure but it was suggested that being quantificational expressions they would be subject to Quantifier Raising. If so, (8b) would have the following LF representation:[6]

(8) d. $[_{IP}$ $[_{NP}$ what she writes$]_i$ $[_{IP}$ I like t_i]]

The claim, then, is that correlatives and free relatives become parallel at LF. Of course, certain differences between the two must be kept in mind. For example, since free relatives originate in argument position the option of multiple relativization of the kind exemplified by (3) and (5) is not available in English. Nevertheless, the two structures are isomorphic at the level at which interpretation is defined.

Given this structural parallelism, one expects the two to be semantically similar and this is in fact true. For example, the variation between unique and universal readings in correlatives is also typical of English free relatives. This is reflected in analyses such as Cooper (1983) that treat free relatives as ambiguous between a definite and a universal. Jacobson (1988), however, argues that the variation in readings is not due to lexical ambiguity. She analyses free relatives as definite descriptions, denoting the unique maximal individual who satisfies the definite description. Since English free relatives normally do not contain heads, they do not specify singular or plural individuals and come out as being ambiguous.

---

[6] The categorial status of the English free relative is controversial. Though I have represented them as NPs, I do not wish to argue against the possibility of their being CPs.

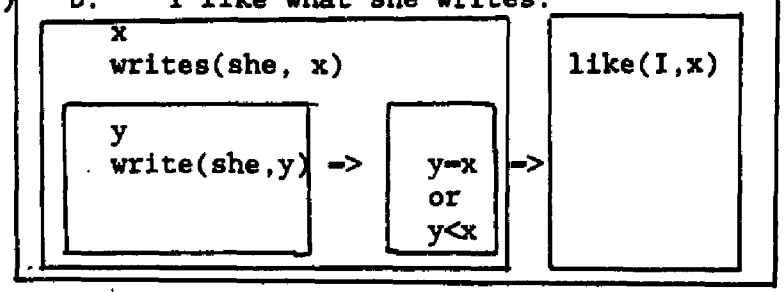
A comparison of Jacobson's analysis of free relatives with the analysis of correlatives developed in the previous section is worth making. Cast in DRT, a free relative like (8b), on Jacobson's account, would be something like the following:

(9) a. ∃ [like (I,x)]

where the variable x is not bound by a quantifier but anchored to an old variable in the domain of discourse, and the descriptive content of the free relative presupposed.

This looks radically different from the DRS for correlatives which has universal quantification:

(9) b. I like what she writes.



Note, however, that as far as single correlatives go, there would be no problem in assuming Jacobson's analysis. The variation between unique/universal readings is captured in both accounts. The real motivation for treating correlatives as having universally quantified structures comes from multiple correlatives like (4). As we saw, these structures must allow for multiple pairings between individuals. Treating the wh NPs as ordinary definites which pressuppose their descriptive content will not accomplish this result. Universal quantification restricted by uniqueness is needed in order to capture this reading.

Recasting Jacobson's analysis along the lines of the analysis of correlatives seems to me fairly innocuous. Replacing (9a) with a representation like (9b), for example, would not go against the spirit of her analysis and would have the advantage of accounting for similar cross-linguistic phenomena in a uniform way.

I have argued so far for encoding a uniqueness requirement into the representation of correlatives and free relatives. The apparent ambiguity between unique and universal readings is captured by distinguishing between unique plural and unique singular individuals. The universal reading is derived by inference when the individual denoted by the relative clause is plural. The primary data I have used are "internally headed" correlatives since the common noun makes it transparent whether we are dealing with singular or plural individuals.

I want to turn now to a potential counterexample to the claim of uniqueness. A sentence like (10) seems to violate the uniqueness requirement.

(10) <u>jo laRkii patrika nikalti hai</u>, usko inam milta he
REL girl magazine takes out DEM prize given is
"Which girl edits magazines, she is given prizes"

It is possible, though not necessary, for (10) to be interpeted in models where more than one girl edits magazines even though the relative clause has a singular common noun. (10) means roughly that any girl who edits magazines is given prizes. In spite of this I want to argue against abandoning the uniqueness requirement. Notice that the possibility of a non-unique reading for (10) is dependent on its generic interpretation. That is to say, when (10) is interpreted non-generically the relative clause must refer to a unique girl.

Further proof that the non-unique reading is linked to genericity can be seen in (11):

(11) <u>jo laRkI patrikA nikalti hai</u>, usko kal inam mila
REL girl magazine takes out DEM yesterday prize got
"Which girl edits magazines, she got a prize yesterday."

The predicate in the main clause is episodic so that the possibility of a generic reading is ruled out. As expected, the relative clause requires a unique referent. We have to conclude, that uniqueness must be retained in the representation. The explanation for the apparent absence of uniqueness in (10) can be linked to genericity. While non-generic sentences are evaluated at the actual world, or at least at one world, genericity typically involves evaluating a sentence in a plurality of worlds. As such, we might say that uniqueness remains a part of the representation of correlatives but its satisfaction is relativized to the worlds at which the sentence is evaluated. There is, of course, a problem with testing the reality of relativized uniqueness with generic sentences. Since these refer to possible worlds intuitions about uniqueness are not easily determined.

Let us take another kind of example where absolute uniqueness seems to be missing in order to see if we can intuitively verify the idea of relativized uniqueness.

(12) <u>jo laRki inDia Tude nikalti thi</u>, usko inAm miltA tha
REL girl India Today took out DEM prize given was
"Which girl edited India Today, she was given prizes."

One reading of (12) says that there was a unique girl who edited India Today and received prizes. This is the one that is captured straightforwardly by the DRS's proposed in section 6.1. There is, however, a non-unique reading which becomes salient if we embed the correlative within a phrase like angrezi raj ke zamane me "in the days of the British Raj". This allows for several girls to have edited India Today. The difference between this case and (10), however, is that we can test our intuitions about uniqueness. The tense-aspect in (12) allows the correlative to be evaluated at different times in the past but it is understood that at any given time only one girl was the editor of India Today. For example, the sentence would not allow for two girls to be joint editors of the magazine. Thus we see that a correlative always involves uniqueness. When the tense-aspect forces it to be evaluated at a particular world we get absolute uniqueness, when it allows evaluation at different worlds we get uniqueness relative to each world.

Pertinent to this discussion is a similar observation in Jacobson (1988). She comments that interpreting free relatives in terms of a unique maximal object takes care of the variation between unique and universal readings but it does not fully account for the absence of uniqueness in modal contexts, generic type contexts or sentences which have some kind of overt or hidden quantification over times. It seems to me that a notion of relativized uniqueness goes some way in doing so. It is worth mentioning that the variation between absolute and relativized uniqueness also holds of definite descriptions in sentences like "The president of the United States gave the opening speech yesterday" vs. "The president of the United States gives the opening speech". The fact that correlatives and free relatives share this feature with definite descriptions, then, actually supports the analysis being argued for here.

6.3. The Semantics of Hindi bhii/English -ever

I will now introduce another aspect of the semantics of correlatives which is sensitive to the distinction between absolute and relativized uniqueness described above.

Hindi correlatives can have a particle **bhii** which functions very much like the morpheme -ever in English free relatives. It can have the effect of making the identity of the individual denoted by the relative clause irrelevant. Or it can have a reading akin to free choice "any". While intuitions are fairly clear on which meaning the particle has in a particular construction, it is not a simple matter to characterize its semantics so that the two readings can be derived in a principled way. For example, if we considered **bhii** a spell out of the implicit universal quantifier, the reading which makes identity irrelevant would remain unexplained. Conversely, if we took the identity reading as its basic meaning it would leave unexplained the free choice reading. The problem should be familiar from semantic discussions of the role of -ever in free relatives. What determines the particular reading -ever will induce in a given sentence remains an open question.

I want to suggest here that the semantics of **bhii**, and by extension that of -ever, is sensitive to the distinction between absolute and relativized uniqueness. I will suggest that **bhii** typically has the identity reading but just in case the correlative allows for relativized uniqueness it can have a free choice reading.

Perhaps, it is worth clarifying that the two meanings of **bhii** is seen here in terms of the difference between the polarity sensitive and the free choice use of an item like "any" in English. But before getting any further into the analysis, let us first investigate the intuition that is to be formalized.

Consider versions of (10)-(12) with **bhii** added to them:

(13) <u>jo bhii laRki patrika nikalti he</u>, usko inam milta he
REL ever girl magazine takes out DEM prize given is
"Whichever girl edits magazines, she is given prizes"

(13), like (10), can be interpreted in two ways, generically or non-generically. If we keep the two readings constant, we can test the effect of adding **bhii**. If the interpretation is non-generic, (10) requires absolute uniqueness. The addition of **bhii** in (13) then says that the identity of that individual is not significant. If it is interpreted generically, (10) allows for relativized uniqueness and the addition of **bhii** in (13) yields a free choice reading.

Now consider (11) and (14):

(14) <u>jo bhii laRki patrika nikalti he</u>, usko kal inam mila
REL ever girl magazine takes out DEM yesterday prize got
"Whichever girl edits magazines, she got a prize yesterday."

We saw that unlike (10), (11) required absolute uniqueness since it could not be interpreted generically. As expected, the addition of **bhii** in (14) only yields the identity reading. Finally consider (12) and (15):

(15) <u>jo bhii laRki inDia Tude nikalti thi</u>, usko inam milta tha
REL ever girl India Today took out DEM prize given was
"Whichever girl edits India Today, she prize is given."

As expected, if (15) is embedded inside an adverbial like "in the days of the British Raj" the reading in which it is evaluated over different times in the past becomes evident and **bhii** gives it a free choice reading. Otherwise, it has an identity reading.

The facts can be summed up in the following way. **bhii** is not ambiguous between an identity reading and a free choice reading. The identity reading is the only reading available when the correlative requires absolute uniqueness, the free choice reading the only one when relativized uniqueness suffices. The presence or absence of these readings follow from the effect of tense and aspect on uniqueness, an independently established distinction in the semantics of correlatives.

I have indicated above that a uniform account of **bhii** may be possible. I have also suggested a similarity with the semantics of "any". Two things need to be done before the semantics can be characterized any further. Some justification for thinking of the dichotomy associated with **bhii** in terms of polarity sensitive and/or free choice items needs to be given. And an account of the free choice and polarity sensitive distinction has to be decided upon before the variation in the meanings of **bhii** can be explained.

The particle **bhii** can occur with ordinary indefinites in polarity sensitive contexts but not elsewhere:

(16) mãĩ kisi-ko bhii nahĩ janti
I someone not know
"I don't know anyone at all."

(17) mãĩ kisi-ko bhii dekh sakti hũũ
I someone see can
"I can see anyone."

(18)* mãĩ kisi-ko bhii dekh rahI hũũ
I someone am seeing
"I am seeing anyone"

This suggests at least that it is not implausible to think of the role of **bhii** in relative clauses in the same terms as English "any". Let us see what insights about "any" can be used to describe the behavior of **bhii**.

Since free choice "any" and polarity sensitive "any" are known to be subject to different syntactic and semantic constraints, they are often considered distinct (Carlson (1981)). Kadmon and Landman (1990), however, propose a unified account of the two. They suggest that the item "any" is subject to a semantic criterion of "widening" and a functional criterion of "strengthening". The so-called ambiguity results from the effect of widening in a particular context:

Widening: In an NP of the form **any** CN, any widens the interpretation of the common noun along a contextual dimension.

Strengthening: **any** is licensed only if the widening that it induces creates a stronger statement, i.e. if the statement on the wide interpretation entails the statement on the narrow interpretation.

Let me try to extend their analysis to correlatives. For all practical purposes "-ever" can be substituted for **bhii** in following these examples.

Let us consider (12) ("which girl edits India Today, she got prizes"), first on the non-generic interpretation. We know that it will require absolute uniqueness. The speaker of this sentence, then, clearly has a uniqueness presupposition although she may or may not know the identity of the unique individual. She can use it referentially to denote a particular individual.[7] She can also use

[7] The speaker may, of course, have a false presupposition.

it attributively without having a specific individual in mind. Let us suppose that this distinction is represented in the DRS. On the referential use the DRS for (12) will include an identity statement, x=c where c would be a constant whose value would be contextually specified. If the speaker thinks that Mary is the editor of the magazine, for example, the antecedent would contain an identity statement linking the referent of the relative clause with the variable denoted by Mary. This would be missing from the attributive use of (12):

(19)

```
x c
girl(x)
ed-of-I.T(x)                    =>   got prizes(x)
x=c
 y                 y=x
 girl(y)       =>  or
 ed-of-I.T(y)      y<x
```

(20)

```
x
girl(x)
ed-of-I.T(x)                    =>   got prizes(x)

 y                 y=x
 girl(y)       =>  or
 ed-of-I.T(y)      y<x
```

I would like to claim that (15) ("whichever girl edited India Today, she got prizes"), on the non-generic interpretation, differs from (12) in allowing only the attributive use. The absence of a restricting statement about identity in a correlative with bhii fulfills the semantic criterion of widening, in the sense of Kadmon and Landman (1990). This widening is along a dimension of identity. It remains to show, of course, that widening in correlatives is licensed by strengthening.

Let us see how widening along the dimension of identity strengthens the statement. If **bhii** strengthens a correlative then (15), the version with **bhii**, should entail (12), the version without **bhii**. To see if it does, let us check the entailment relations between (19), the referential use of (12), and (20), its attributive use.

Take two scenarios, one in which Mary was actually the editor of India Today and got prizes. In the second scenario Sue was the editor. She got prizes but Mary did not. The speaker has heard that the editor of India Today got prizes but mistakenly believes Mary to have been the editor. In the first scenario, (19) and (20) will both be true. In the second scenario, (20) will naturally be true. (19) will also be true in this scenario even though there is a false presesuppostion about identity. The antecedent being false, the conditional will automatically become true. (20) entails (19) since whenever it is true, (19) has to be true regardless of the accuracy of the identity presupposition.

Now take the following scenario. Mary was not the editor of India Today but she got prizes. Sue was the actual editor but she never got prizes. The speaker knows that Mary got prizes and mistakenly believes her to have been the editor of India Today. In this scenario, (19) will be true, albeit vacuosly. (20), however, will be false since Sue will satisfy the antecedent but not the consequent. We see that the inference from (19) to (20) is contingent upon the accuracy of the identity presupposition. Thus (19) does not entail (20).

We are now in a position to decide whether the use of **bhii** results in strengthening. (15) which is the version with **bhii** has only the DRS in (20) while (12), the version without it, can have (19) or (20). Since (20) logically entails (19) or (20), we can conclude that the presence of **bhii** has the effect of widening and that this widening is licensed by strengthening.

Let us turn now to see what effect **bhii** has on a correlative which is interpreted generically. Let us test this with (10) ("which girl edits magazines, she gets prizes") which is also ambiguous in that uniqueness can be satisfied in the absolute sense or relative to worlds of evaluation. On the first reading, the addition of **bhii** widens along the dimension of identity, as discussed above. It is the free choice reading we must now consider. The opposition between referential and attributive readings is not relevant here. Since the context is generic, we are dealing here with possible or typical situations, not actual ones and the speaker cannot be expected to have any presuppositions about identity. In this case, the widening can only be along the lines of what counts as a relevant situation for evaluation. Like all generics, (10) allows for exceptions. Its truth will not be affected by a situation in which a girl who edits magazines does not get prizes, if that situation is atypical in some way. We can say that adding **bhii** to a generic statement narrows down the range of possible exceptions. It seems to include all situations, even atypical ones which would normally be left out of consideration.

In this sense the free choice reading in (13) makes a stronger statement than (10).[8]

While more work is needed to make precise the conditions under which the requirement of absolute uniqueness is replaced by a requirement of relativized uniqueness, I have shown that there is a correlation between the type of uniqueness involved and the meaning a particle like Hindi **bhii**, and by extension English -ever, will have.

6.4. Quantificational Variability in Correlatives

In this section I want to discuss an aspect of the semantics of correlatives which is somewhat problematic for an account based on uniqueness. A correlative with a temporal adverb in the main clause is ambiguous between a reading in which the adverb modifies the matrix verb and one in which it acts like a quantifier binding the variables represented by the wh NP and the demonstrative:

(21) jo larkii mehnat kartii hai vo zyaadatar safal hoti hai
REL girl effort does DEM mostly successful is
"Which girl makes an effort, she is mostly succesful"

The first reading is expected; it is the second reading that we are interested in. Here **zyaadatar** "mostly" acts like an adverb of quantification. (21), on this reading means something like "most girls who make an effort are successful". Not unexpectedly, the same ambiguity is there in free relatives. For example, (22) has two readings, the normal temporal meaning and the determiner like meaning.

(22) Sue mostly likes what Mary writes.

[8] The actual implementation would depend on the way in which generics are treated. For present purposes, Kadmon and Landman's (1990) demonstration would work.

The determiner like meaning of adverbs in indirect questions has been called the quantificational variability effect by Berman (1989). The variable reading of free relatives like (21) was pointed out by Kratzer (1988) as a problem for Jacobson's analysis of free relatives. Since Jacobson treats free relatives as uniquely denoting objects, it is not possible to capture the variable reading of a sentence like (21). It would have, on Jacobson's approach, a DRS like (21a):

(21)a. $\exists$ [Mostly (like (s,x))], the descriptive content of the free relative would be presupposed information.

Since the variable represented by the free relative is already anchored there is no way of obtaining the quantificational force associated with "mostly".

Kratzer (1988) and Berman (1989) propose that free relatives have a tripartite quantificational structure with an implicit universal quantifier, the relative clause in the restrictor and the main clause in the nuclear scope. The variable reading arises when the universal is replaced by an overt adverb of quantification.

Although the representation I have argued for in connection with correlatives and free relatives has an implicit universal quantifier which could be replaced by "mostly", it cannot yield the variable reading in any obvious way. Consider the DRS (21) would have on my account:

(21) b. $most_x$ [write(m,x) & $\forall_y$ [write(m,y)][y=x or y<x]] [like(s,x)]

Since x denotes a unique maximal individual (singular or plural) and a quantifier like "most" is defined on a number of individuals it is difficult to see what (21b) can mean.[9]

To give up this account and follow Kratzer and Berman in treating the wh NP like an ordinary indefinite would solve the problem of variable readings for correlatives and free relatives but bring back the problems discussed in section 6.1. Though there does not seem, at present, a simple way of deriving the variable reading, I am reluctant to give up the analysis developed above because the semantic intuitions it can account for are, to my mind, subtle but very real. What I will do instead is show that the alternative approach fails in accounting for some important facts about the variable readings of correlatives. Given its failings, its success with some cases should not be taken as conclusive evidence against the present analysis.

Consider a multiple correlative like (22):

(22)* kal tiin baje jis laRkine jis laRke-ko dekha
yesterday at 3 o'clock REL girl REL boy saw
usne zyadatar **usko** pasand kiya
she mostly him liked

The adverb **zyaadatar** "mostly" cannot modify the matrix verb because it is stative. The ungrammaticality of the sentence shows that the variable reading is not available either. This is unexpected on Berman's account since (22) should have the following structure:

(22a) Most $_{x,y}$ [girl(x) & boy(y) & saw(x,y,at 3 yesterday)] [liked(x,y)]

[9] One of the adverbs Berman uses is "for the most part". I think this determiner is not defined on a number of individuals but on parts of an individual. So, "For the most part, I liked War and Peace" is not accounted for by Berman. It is quite possible that **zyaadatar** and "mostly" can sometimes have this meaning.

Multiple correlatives allow for several pairs of individuals who can satisfy the conditions in the restrictor, so that a variable reading is predicted. Thus, in this case, the account fails empirically.

There are other problems with Berman's analysis. Take an indirect question analyzed by him:

(23) Prof. Jones mostly knows who cheats on the exam.
(23) a. Most_x [cheat-on-exam(x)] [know(p.j.,x)]

This says that most people who cheat on the exam are such that Prof. Jones finds them out. As pointed out by Gennaro Chierchia (p.c.) if (23) quantifies over individuals, as (23a) claims, it is not required that there be a sufficient number of occasions at which students cheat. All that is needed is a sufficient number of individuals who satisfy the restrictive clause. The facts, however, are different. It is not enough that there be several students who cheat, a sufficient number of occasions are needed.

An alternative approach stemming from a suggestion in Chierchia (1988) takes adverbs as quantifying not over individuals but over occasions, where occasions can be thought of as space-time chunks. In his account, (23) would have the following representation:

(23) b. Most o [relevant occasion (o)]
[know(p.j., which students cheat at o]

Suppose there are three contextually relevant occasions o1, o2 and o3. At o1 and o2 there are three students, two of whom cheat and Prof Jones finds them out. In o3, there are fifteen students, 14 of whom cheat but Prof. Jones doesn't find out. (23a) predicts (23) to be false in this situation while (23b) predicts it to be true. Intuitions favour (23b), suggesting that Berman's account of variable readings may not be viable. More generally, it casts doubt on the standard approach within DRT of treating adverbs as quantifying over individuals.

There is an immediate advantage of quantifying over occasions instead of individuals with respect to variable readings. Variable readings are also possible with definite descriptions like (24):

(24) Sue mostly likes <u>the things Mary writes</u>.

Treating the head of the definite description as a free variable which can be bound by the implicit quantifier, as in Berman's account, seems somewhat problematic since simple definites are never free variables. (25) does not have a variable reading:

(25) Sue mostly likes <u>the boys</u>.

The descriptive generalization is clear. Variable readings are available only if the phrase has a verbal complex.[10] An account based on occasions might be better equipped to capture the difference between simple definite NPs which do not get a quantificational force and free relatives and definite descriptions that do.[11]

There is another advantage in quantifying over occasions. Notice that (23), in addition to requiring a plurality of occasions, requires these occasions to be temporally differentiated. So for example, (26) does not have a variable reading because the episodic nature of the

---

[10] Though note that reduced relatives and concealed questions also display variable readings.

[11] An account based on individuals would have to deal with this by distinguishing between local and global presupposition accommodation.

verb rules out the possibility of interpreting the sentence with reference to occasions spread over time:

(26) Yesterday between 3 and 4, Prof. Jones mostly found out which students cheated on the exam.

This restriction can be enforced more easily in a theory which relates adverbs of quantification to occasions, and thus can be affected by the tense and aspect of the verb, than in a theory that takes them to quantify over individuals.

Let us see how Chierchia's account would apply to the variable readings of correlatives. Let us take the DRSs for (21), modified suitably:[12]

(21) jo larkii mehnat kartii hai vo zyaadatar safal hoti hai
REL girl effort does DEM mostly successful is
"Which girl makes an effort, she is mostly succesful"

(21a) $Most_o$ [relevant occasion(o)][[girl(x) & work-hard at o(x) & max(x)] [successful(x)]]

This says that most relevant occasions are such that the maximal individual at that occasion who is a girl and works hard succeeds. Presumably, what counts as a relevant occasion will be contextually specified. For example, a likely value for it could be occasions in which there is a hard working girl.

The only difference between Chierchia's representation for free relatives and the one for correlatives is that the nuclear scope in (21a) also has a tripartite structure. Though the adverb of quantification binds occasions, the relative clause inside the correlative quantifies over individuals. This is necessary in order

[12] I use the predicate 'max' as abbreviation for the embedded conditional which guarantees maximality.

to maintain the distinction between conditionals and correlatives, discussed in section 6.1. A similar modification would be needed if free relatives were interpreted after being quantifier raised at LF. Thus it seems possible to account for the variable reading of correlatives within DRT if the standard theory is modified to have adverbs of quantification bind occassions rather than individuals while maintaining that the quantification within the relative clause is over individuals.

In conclusion, I have argued for two things in this chapter. I have given a DRT based account of correlatives, showing that in order to fully capture their semantics it is necessary to incorporate the idea that they bind argument positions inside the main clause. This amounts to recognizing polyadic quantifiers in the syntactic component of the grammar. As such, there seems no particular advantage in moving from the analysis in terms of generalized quantifiers developed in Chapter V. Secondly, I have discussed certain aspects of their semantics and shown that they support two key ideas of my analysis of correlatives, namely that they are analogous to free relatives and to definite descriptions.

CHAPTER VII

THE SCOPE OF HINDI WH

7.1. The Data and the Issues

I would like to turn now to an analysis of Hindi questions. Unlike relative clauses, which have been the focus of attention for a long time, questions in Hindi have been largely ignored. There is very little theoretical discussion of question formation in Hindi or any other South Asian language. Dasgupta (1980) deals with Bangla questions, Gurtu (1985), Mahajan (1987) and Davison (1984) and (1988) with Hindi, and Wali (1988) with Kashmiri and Marathi. Some of this literature is unpublished. As such, my investigation of the topic is intended also as an introduction to a type of wh phenomenon that does not follow known patterns of question formation. Drawing on Srivastav (1989), I will show how the interpretation of Hindi questions can be derived from properties of Hindi phrase structure. My attempt will be to make explicit the factors governing the interpretation of Hindi wh as well as to place Hindi question formation within the general theory of questions. We will see that a proper understanding of Hindi questions leads us to review current theoretical assumptions about the scopal properties of wh elements.

Let us begin by seeing where Hindi fits into the current typology of wh languages. In general, two language types are recognized with respect to question formation strategies -- languages in which the wh word occurs in clause initial position and those in which it remains in-situ. The first is exemplified by English (1a), the second by Chinese (1b):

(1) a. What did Lisi buy ?
    b. Lisi mai-le sheme ?
       Lisi bought what
       "What did Lisi buy ?"

Within the GB framework (1a) is analyzed as the result of S-Structure movement of <u>what</u> from an A to an A' position, specifically to spec of CP. (1b) appears to lack such movement but Huang (1982) showed that, in fact, Chinese and English do not differ in that respect. Huang argued that wh expressions in any language would have to move to spec of CP in order to ensure interpretation since they are quantificational expressions. While this occurs at S-structure in English it happens at LF in Chinese. The difference between English and Chinese, then, is not in the presence or absence of wh movement but in the level at which such movement takes place. (1a-b), on his account, have distinct S-structure representations but are identical at LF:

(1) c. $[_{CP}$ what$_i$ $[_{IP}$ Lisi buy $t_i]]$

Huang's analysis of Chinese thus provides strong argument for a universal account of question formation strategies in natural language.

Of course, languages are not parameterized simply in terms of the level at which wh-movement takes place. English, for example, has LF movement of wh in addition to movement at S-structure. Thus in a sentence with multiple wh only one wh moves at S-Structure while the others move at LF.

(2) a. Where$_i$ did Mary buy what t_i ?
b. $[_{CP}$ what$_j$ where$_i$ [mary buy t_j t_i]]

In (2a) there is one wh in spec of CP and one in-situ but at LF the wh in-situ also moves and adjoins to spec of CP, as shown in (2b). There are languages like Romanian in which all whs must move at S-Structure so that the option of movement at LF is never exercised. The difference between English and Romanian is that English does not allow multiple wh to be present in spec position at S-structure while Romanian does. There are other languages, such as Italian, in which multiple whs are disallowed altogether, presumably, due to a language specific constraint against the presence of multiple wh in spec at any level. Though languages display considerable diversity in question formation strategies it seems possible to have a uniform theory of question formation based on certain universal principles, namely the necessity for scope bearing elements to move to A' positions combined with a parameterization of the possibility of cooccurence of multiple wh in spec of CP.

Turning to Hindi, it is not immediately clear if the interpretation of Hindi questions fits into the general pattern. In simple sentences Hindi wh's do not move to clause initial position:

(3) a. tum <u>kahãã</u> jaa rahe ho
you where are going
"Where are you going?"
b. tum <u>kisKO</u> pasand karte ho
you whom like
"Whom do you like?"
c. tumNE <u>kisKO</u> kitaab dii
you ERG who ACC book gave
"Whom did you give the book to?"
d. tumNE usKO <u>kyaa</u> diyaa
you ERG him ACC what gave
"What did you give him?"

On the basis of examples like (3) we would think that Hindi is an in-situ language and we would expect the scopal properties to pattern like Chinese rather than English. The behavior of Hindi wh in embedded contexts, however, alerts us against viewing Hindi simply in terms of Chinese. Consider (4) and (5):

(4) tum [kyaa karnaa] jaante ho
you what to-do know
"What do you know to do?"

(5) tum jaante ho [ki usNE kyaa kiyaa]
you know that he ERG what did
"You know what he did."
NOT "What do you know he did?"

In (4) the complement is a non finite clause, which in Hindi occurs to the left of the verb. Since (4) is a direct question, we assume that the wh moves to matrix spec. In (5) the complement is finite and occurs to the right of the verb. The sentence has to be interpreted as an indirect question, so we assume that movement to matrix spec is blocked.

The examples in (4) and (5) warn us against taking the Hindi wh to be like the Chinese wh. The Chinese counterpart of (5), for example, is ambiguous between a direct and an indirect question interpretation:

(6) ni zhidao ta zuo-le sheme
you know he did what
"What do you know he did?"
AND "You know what he did."

The ambiguity of (6) is explained in Huang's account by the fact that the wh may move at LF to the embedded spec position or to matrix spec since the matrix verb **zhidao** know can take a + or - wh complement.

In English too the verb **know** selects either + or - wh complement yielding (7a) or (7b):

(7) a. Who$_i$ does John know t'_i t_i will come?
b. John knows who$_i$ t_i will come?

Since wh-movement is obligatory at S-structure and wh movement at LF does not originate from operator positions (Chomsky 1986b), the scope of English wh is transparent at S-structure.

The Hindi wh in (5), however, is in an A position at S-Structure so it is not immediately clear why matrix scope is blocked. Thus while Hindi appears to be like Chinese in leaving wh in situ at S-Structure, it is not a simple analogue of Chinese. Finite clauses are scope islands in Hindi but not in Chinese. The first task in an analysis of Hindi questions, then, is determining the factors which distinguish the scopal properties of Hindi wh in-situ embedded in finite complements from those of Chinese wh in-situ in similar contexts.

Another interesting fact about Hindi questions has to do with the strategy employed to get direct question interpretation in contexts like (5). It has been noted by Gurtu (1985) and Mahajan (1987) that though Hindi does not allow overt wh movement in simple cases like (3), such movement is possible in sentences like (8):[1]

(8) <u>kyaa</u>$_i$ tum jaante ho ki usNE t_i kiyaa
what you know that he ERG what did
"What do you know that he did?"

This is unexpected given the standard view of movement. Huang has argued that LF movement is less restricted than S-Structure movement. Thus while topicalization in Chinese may not move elements out of a

---

[1] The extraction strategy is somewhat controversial and speakers do not always accept sentences like (8). This issue is addressed in section 7.4.

relative clause at S-Structure, there is no problem with such movement at LF:

(9) a.* Lisi$_i$ ni zui xihuan [[wo piping t_i] de wenzhang
Lisi you most like I criticize DE article
"Lisi is the person such that you like the articles where I criticized him ?"

b. ni zui xihuan [[wo piping shei] de wenzhang
you most like I criticize who DE article
"Who is the person such that you like the articles where I criticized him ?"

The Hindi facts seem to suggest that LF movement may be more restricted than overt movement since LF movement from finite embedded clauses is blocked, as in (5), while S-Structure movement is permitted, as in (8). If a universal theory of questions is to be maintained we need a principled way of accounting for wh movement in Hindi without losing the insights about the movement properties of wh in languages like Chinese and English.

We see from this brief survey of Hindi questions that there are several issues that must be addressed. The first issue that I will discuss is what makes finite complements islands for extraction, while non-finite complements not only allow but force extraction. The analysis I will provide will suggest that it is not possible to maintain the view that subjacency does not obtain at LF, as stated in Chomsky (1986b).[2] I adopt instead the claim in Fiengo et al (1988) that subjacency applies at LF though its effects are largely invisible. The Hindi facts, I will show, are one visible manifestation of the existence of subjacency at LF. Finally, I will

---

[2] See also Longobardi (to appear) for evidence against this claim.

focus on the apparent contradiction between the possibility of extraction out of finite clauses at S-structure and its impossibility at LF. I will show that, in fact, the so-called extraction is not wh movement to spec position but adjunction to IP, a kind of topicalization. I will further show that this topicalization occurs at a derivational stage where the finite clause is not a scope island.

7.2. The Scope of Embedded Wh

In this section I want to consider the scope properties of wh in embedded contexts. It was noted in connection with (4) and (5) that non-finite complements yield direct questions for the wh elements embedded inside them while finite clauses necessarily yield indirect questions. Due to examples like these it has sometimes been assumed that finiteness is the relevant factor in determining scope (Mahajan (1987), for example) but if we look at the examples, we notice that in addition to a difference in finiteness, the complements also differ in position. Non-finite complements precede the verb, finite complements follow it. It has to be established, therefore, which is criterial for blocking scope in (5), finiteness or the postverbal position. I will propose that finiteness, in itself, does not determine scope. It is its postverbal position that is relevant.

The crucial example comes from extraposed non-finite clauses. As noted by Davison (1988) sentences like (10b), unlike those in (10a), do not yield direct questions.[3]

---

[3] Why it should not yield an indirect question reading will be dealt with a little later.

(10) a. tum [PRO kyaa paRhnaa] caahte ho
you what to-read want
"What do you want to read?"

b.* tum t_i caahte ho [PRO kyaa paRhnaa]$_i$
you want what to-read
"What do you want to read?"

One way of describing the scope facts in (10a-b) is the following. The complement originates inside VP, specifically to the left of V, as in (10a). Extraction of wh from this position is licit. Optionally, the complement may be scrambled to the right of VP. Let us assume that it is adjoined to IP. The resulting configuration yields a scope island.

(11) $[_{CP}\ [_{IP}\ [_{IP}\ [_{VP} \ldots t_i \ldots]]\ [_{CPi}]]]$

It should be pointed out that moving a non-finite complement to a post-verbal position does not lead to ungrammaticality, per se. For example, if (10b) contained a referential term like **War and Peace** instead of a question word like **kyaa**, the sentence would be completely grammatical. Thus it is not the fact that the complement is extraposed that creates ungrammaticality but the movement of wh out of an extraposed complement.[4] It is quite clear from (10b) that it

---

[4] There are examples of sentences in which the wh intervenes between the main verb and the aux of the matrix verb and the non-finite verb follows the aux, where wide scope is not blocked:

(i) tum caahte kyaa ho paRhnaa
you want what aux to-read
"What do you want to read ?"

I will not deal with such sentences since I think they involve scrambling of a special kind sort. Perhaps the wh is scrambled out of the non-finite phrase to the right of the verb **cah-** before the non-finite clause is extraposed. When the verb raises to INFL it is raised alongwith it. The rest of the non-finite phrase subsequently adjoins to the right of IP. For now, it suffices to note that the whole complement phrase does not occur postverbally in this case, the wh phrase does not have to move out of the postverbal phrase.

cannot be finiteness which is at issue in blocking wide scope readings of embedded wh.

Generalizing from cases of non-finite complementation to finite complementation, it seems reasonable to suggest that it is the position of the complement that is responsible for the narrow scope reading of the wh in (5). Let us accept as a descriptive fact that finite clauses are always postverbal. A legitimate question to consider, at this point, is whether they originate in preverbal position and are obligatorily extraposed or whether they are generated in adjunct position. Consider (12), a variant of (5), in which an overt NP appears in the preverbal position:

(12) tum <u>yeh/yeh baat</u> jaante ho ki usNE <u>kyaa</u> kiyaa
you this/this matter know that he ERG what did
"You know what he did."

Intuitively, **yeh** "this" stands in place of the finite clause. In this sense it is a pleonastic. Hindi being an SOV language in which case and theta role are assigned to the left, we conclude that the pleonastic **yeh** is in argument position and absorbs case and theta role in (12).[5] The actual complement is base generated in adjunct position and forms a chain with the pleonastic argument, as shown in (12'):

(12') $[_{CP}\ [_{IP}\ [_{IP}\ [_{VP} \ldots \underline{\text{this}}_i \ldots]]\ [_{CP}]_i]]$

If we consider (5), the version without an overt NP in preverbal position, there are two possible analyses, as shown in (5'):

---

[5] The question of whether expletives can occur in subcategorized positions will be discussed in Chapter VIII.

$(5')\ [_{CP}\ [_{IP}\ [_{IP}\ [_{VP} \ldots \underline{t}/\underline{pro}_i \ldots]]\ [_{CP}]_i]]$

The complement could be extraposed, in which case it would be coindexed with a trace in preverbal position. Or it could be a base generated adjunct coindexed with pro. The data leave the choice between the two analyses underdetermined.[6] In either case, the explanation for the scope facts would not be affected.

Within the framewok of Barriers a maximal projection can be a barrier either inherently or by inheritence. Movement across two barriers is ruled out. The actual complement in (11), (12') and (5'), for example, is in adjunct position. This means that it is not L-marked by the verb and is therefore a blocking category and a barrier. The IP dominating it is not itself a barrier, IP being defective in this respect, but it inherits barrierhood from the CP which it dominates. Movement of wh to matrix spec thus involves crossing two barriers, a Subjacency violation. The explanation for the Hindi facts follows the standard account for ruling out extraction out of adjuncts (Chomsky 1986b).[7]

Leaving aside the implications of this account for the existence of Subjacency effects at LF for the moment, this account answers the question why finite complements are scope islands but it raises

---

[6] We will see that an extraposition analysis is needed to explain cases where wh extraction out of these clauses does occur at S-structure. This will be discussed in section 7.4.

[7] Note that an ECP-based account is not possible since the wh we are dealing with is in object position. Its trace therefore would be lexically governed and hence properly governed.

another question. Why cannot finite complements occur in argument position?

Recall that in connection with correlatives we saw that quantificational relatives, which are CPs in Hindi, are also prevented from appearing in argument positions. Questions like (5) seem to be another instance where finite CPs are not able to appear in argument positions. Both facts can be explained by invoking the Case Resistance Principle (CRP) proposed by Stowell (1981) which disallows finite clauses from appearing in cased positions. Let us see how CRP applies to the construction at hand.

Hindi is a language in which the canonical object position is to the left of the verb. For example, ordinary objects occur to the left of the verb and display case-marking:

(13) a. raam aadmiiKO / jaunKO jaantaa hai
Ram man ACC John ACC knows
"Ram knows the man/John"

b. raam jaun KE BAARE ME jaantaa hai
Ram John about knows
"Ram knows about John."

It seems quite clear that case and theta role assignment is to the left in Hindi. Since the category of a finite complement is CP, the CRP predicts that it cannot appear in the cased position to the left of the verb. The only possibility is for it to be a structural adjunct linked to a pleonastic in argument position, as in (12') or (5').[8]

[8] We have then two types of adjoined CPs in Hindi. In the case of left adjoined relatives, the argument position is marked by the demonstrative **vo** or its variants. In the case of right adjoined finite complements the argument position is marked by the demonstrative **yeh** and its variants. I assume the difference here to be

Invoking the CRP in Hindi might seem problematic, at first, for an analysis of non-finite complementation since CRP also disallows infinitives from appearing in cased positions, but we saw in (4) that non-finite complements do appear in the canonical object position in Hindi.

Traditionally, Hindi non-finite complements have been considered analogous to infinitives, i.e., they have been thought of as left branching CPs (Subbarao(1984), Mahajan (1987), Davison (1984) and (1990)). The proposal I want to make is that this approach to non-finite complementation is incorrect. Non-finite complements are not infinitives of category CP, but actually gerundive constructions which are of category IP.[9] The CRP does not bar these complements from appearing to the left of the verb since gerunds are nominalized expressions which can take case.

It is easily verified that Hindi non-finite complements have the typical characteristics of gerunds. For example, they behave like noun phrases in terms of distribution and case marking, as demonstrated by the following:

(14) a. raam [ghar jaanaa] caahtaa hai
Ram house go-NAA NOM wants
"Ram wants to go home."

b. raam RaviiKO [jaane]KO/KE LIYE kahegaa
Ram Ravi ACC go-NAA ACC/FOR will say
"Ram will tell Ravi to go."

---

of semantic types. Roughly, vo would be of a generalized quantifier type, while **yeh** would be of a propositional type.

[9] Baker (1985) and Milsark (1988) treat the gerund as an IP whose head is a +N category. An analysis in which the gerund is treated like an NP would also be compatible with the present analysis.

c. raamKO [kaam karne]KII ikshaa hai
Ram DAT work do-NAA GEN desire is
"Ram has desire of doing work."
-' "Ram wants to work"

d. raamNE usKO [jaane]KAA hukm diyaa
Ram ERG he ACC go-NAA GEN order gave
"Ram gave him an order of going"
-"Ram ordered him to go'"

In (14a) the gerundive suffix **-NAA** has nominative case, i.e. it has no inflection. In (14b) it can take accusative case marking or the postposition **KE LIYE** and the gerundive suffix itself is in oblique case **-NE**. In (14c-d) the gerund displays genitive case, again with the **-NAA** in oblique case. An ordinary noun phrase like **laRkaa** "boy" would show identical morphology if it occurred in similar contexts. Even though the natural English translations of the sentences in (14) uses an infinitival, the morpheme **-NAA** seems to be closer to the nominal suffix **-ing** that we see in gerunds.

A further similarity with gerunds is that subjects of Hindi non-finite complements, when overt, show genitive case:

(15) a. raam [ramaaKAA ghar par rahnaa] pasand kartaa hai
Ram Rama GEN house at stay-NAA likes
"Ram likes Rama's staying at home."
b. raam [ramaaKE aane]KE BAARE ME jaantaa hai
Ram Radha GEN come-NAA about knows
"Ram knows about Radha's coming."

The variation between a controlled PRO, as in the examples in (14), and a genitive overt NP in subject position is typical of gerunds, not ordinary infinitives. As such, an analysis of Hindi non-finite complements as gerunds seems fairly plausible. Their occurrence in case marked positions is therefore predicted by the CRP.[10]

A consequence of this analysis of non-finite complementation is that the interpretation of wh embedded inside them is explained. Consider (4), repeated below:

(4) tum [kyaa karnaa] jaante ho
you what do-NAA know
"What do you know to do?"

Gerunds are usually analysed as projections of IP not CP (Baker (1985), Milsark (1988)). If the claim here is correct there will be no spec position inside the gerund that the wh could move to. In order to be interpreted, then, the embedded wh will have to move to matrix spec. Note that this movement is licit since the gerund, being in complement position, is L-marked by the verb and does not constitute a barrier.

(16) shows further proof that there is no landing site for wh inside the complement:

(16) *tum [kyaa karnaa] puuch rahe ho
you what do-NAA asking are
"You are asking what to do."

The matrix verb **puuchnaa** "to ask" requires a +wh complement but the complement, being a gerund, does not have a spec position to which the

---

[10] It seems that Hindi may not have infinitives at all. For example, the complements of ECM verbs never have verbs:
(i) ravii [jaunKO apnaa dost] maantaa hai
Ravi John ACC self's friend considers
"Ravi considers John his friend."
(ii)* ravii [jaunKO apnaa dost honaa] maantaa hai
Ravi John ACC self's friend be-NA considers
"Ravi considers John to be his friend."
This suggests that the complement must be an adjectival phrase rather than a infinitival.

wh can move. The selectional restrictions of the matrix verb are not satisfied and the sentence is ruled out. The impossibility of narrow scope readings for wh's embedded inside non-finite complements is thus predicted under the view that it is a gerund. As we saw, (4) and (16) cannot be interpreted as an indirect question. The absence of narrow scope readings cannot be accounted for in any of the earlier analyses such as Mahajan (1987) or Davison (1984) since they represent the non-finite complement as being a CP.

To sum up so far, I have linked the interpretation of wh in embedded contexts to the phrase structure of the language. Non-finite complements being gerunds appear in argument position and force wide scope readings of wh, finite complements appear in adjunct position and yield narrow scope readings.

7.3. Subjacency Effects at LF

The explanation for the absence of wide scope readings of wh in finite complements developed in section 7.2 turns crucially on the assumption that Subjacency applies at LF. This, however, is not the standard view of subjacency and needs to be justified.

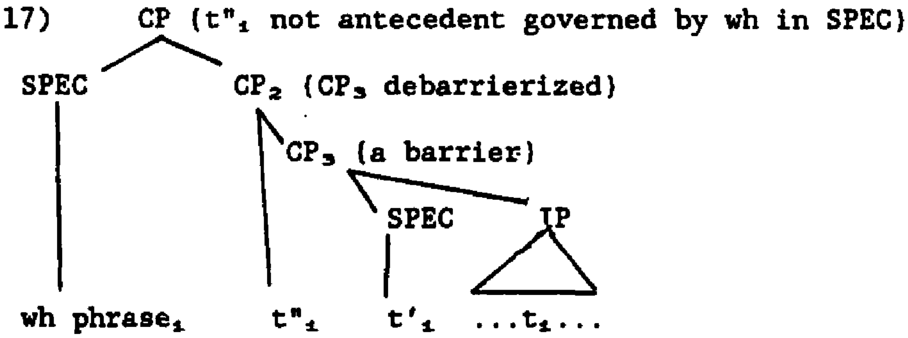
Chomsky (1986b), following Huang's (1982) account of Chinese, assumes that Subjacency obtains at S-structure but not at LF. Huang bases his claim on the fact that Chinese wh can take scope outside an island as long as its trace is properly governed. That is, movement of lexically governed wh phrases like subject and object NPs is free while that of adjuncts is contingent upon antecedent government. Since the Chinese wh remains in-situ till LF, this suggests that subjacency is a constraint on movement only at S-structure and that LF movement is subject only to the ECP. We have seen that Hindi wh, which is also in-situ, cannot escape a scope island even if its trace is lexically governed. This means that subjacency and not just the ECP constrains movement at LF in Hindi and we need some principled way of reconciling the facts of Hindi with what is known about movement in languages like Chinese.

A possible solution is provided by Fiengo et al (1988) who claim that Subjacency obtains at LF though its effect is not visible. Briefly, they contend that an adjunct clause, which is potentially a barrier for movement, may be debarrierized by adjunction. Since adjunction is freer at LF than at S-structure, adjunct clauses in in-situ languages are not scope islands. In fact, any wh can be extracted out of an adjunct as far as subjacency is concerned. Because adjunction prevents antecedent government, however, LF extraction out of adjuncts is restricted to those expressions whose traces are lexically governed.[11] Thus Chinese allows extraction of arguments but not adjuncts out of adjuncts. This is represented schematically in (17):

---

[11] This follows a suggestion in May (1985) who argues that in an adjunction structure, the top segment of the node consisting of n segments is an absolute barrier for government. At the same time, it is assumed that only complete categories (nodes with all segments included) constitute barriers for Subjacency and the Constraint on Extraction Domains introduced in Huang (1982).

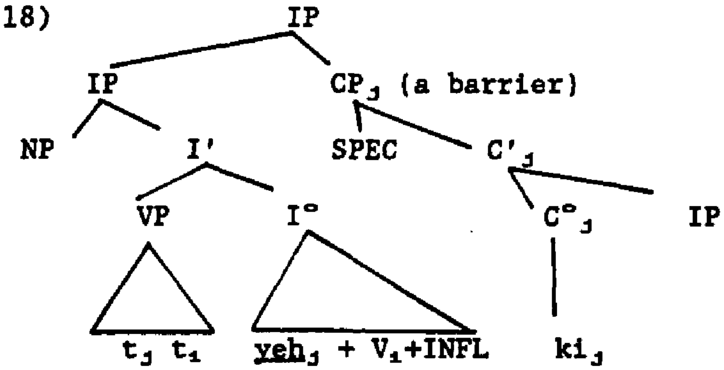
(17)



Since Subjacency applies only vacuously at LF, the interpretation of Chinese wh in-situ appears to be constrained only by ECP though both subjacency and the ECP are, in fact, operative.

In Hindi we saw that arguments as well as adjuncts cannot be extracted out of complements which are in adjunct position. The line of reasoning suggested by Fiengo et al obviously cannot be applied directly to Hindi. The visibility of subjacency effects at LF in Hindi can be explained, however, if we assume that the head of the postverbal complement must be properly governed by the inflected verb in order for it to share a theta role with the pleonastic object. This may be motivated in the following way. Pleonastic elements typically bear case but no theta role. The Hindi pleonastic, on the other hand, bears both. Let us assume that the pleonastic cannot retain theta role and must transfer its theta role to a coindexed element with semantic content and that this happens under government. If the pleonastic moves at LF to INFL, the theta role can be transferred to the adjoined CP if its head is properly governed by the matrix INFL:

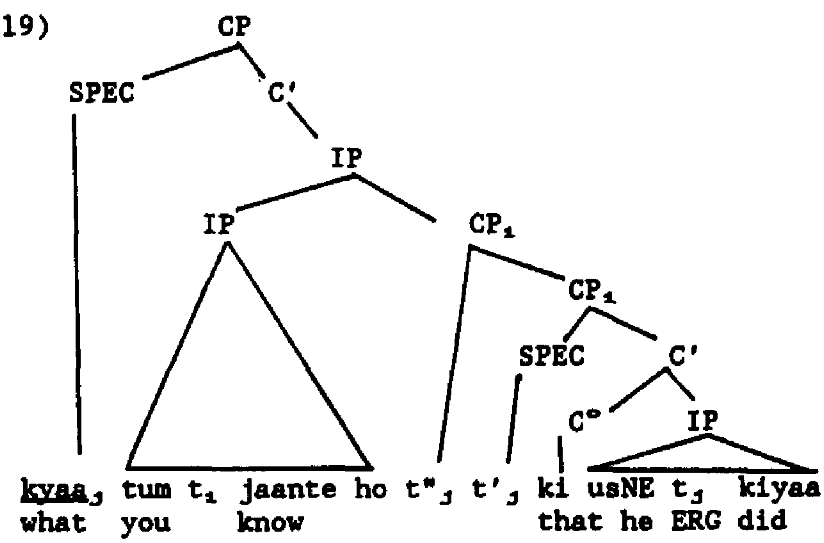
(18)



According to Chomsky (1986b) a category A properly governs a category B iff it (a) theta governs it, (b) case marks it or (c) antecedent governs it. In the case of the Hindi postverbal complements under discussion this amounts to a requirement of antecedent government, case and theta marking being leftward in Hindi. This shows why CP$_j$ is an absolute barrier for movement of wh from embedded spec to matrix spec. In order to debarrierize the CP, adjunction is required. As a consequence of this adjunction, however, the requirement of government between I° and C° can no longer be satisfied.

Let us demonstrate this with an ill-formed LF for (5) in which the embedded wh has moved to matrix comp:

(19)



In order to void Subjacency, the wh in the lower SpecCP must first adjoin to CP. The CP is then debarrierized and movement of t''_j to matrix comp becomes licit. Though t''_j is not antecedent governed the trace t_j is lexically governed, hence properly governed. There is thus no ECP violation involved as far as the trace of the wh goes. However, the LF is ruled out because the head of the complement C° is no longer properly governed by the inflected verb, since adjunction prevents antecedent government. The complement therefore remains a scope island.

There is some independent motivation for suggesting that proper government of the head of the complement is needed in the case of finite clauses. An intriguing fact about Hindi is that such clauses cannot be conjoined if there is an overt complementizer:[12]

(20) a.* usNE kahaa ki anu aayii aur ki ravii gayaa
she ERG said that Anu came and that Ravi left
"She said that Anu came and that Ravi left."

b. usNE kahaa ki anu aayii aur ravii gayaa
she ERG said that Anu came and Ravi left
"She said that Anu came and Ravi left."

The ungrammaticality of (20a) follows, in the account suggested above, from the fact that the two **ki**'s in the heads of the conjoined CPs are not properly governed by the inflected verb. The CP dominating the two conjuncts blocks antecedent government in the same way that the

[12] Other finite clauses, such as those preceded by **kyokii** "because" and **agar** "if", can be conjoined. Since these do not form pleonastic-argument chains they would not be subject to the requirement of proper government that is proposed here.

topmost CP node inside the complement in (19) blocks it.[13] (20a) is not a problem since the conjunction is at the level of IP. Thus it seems possible to maintain that subjacency effects do obtain at LF and their visibility in Hindi postverbal complements is a reflex of an independent requirement of proper government.

If this approach to the phenomenon is on the right track, we predict that there will be a difference between Hindi postverbal complements in adjunct position and ordinary adjuncts in Hindi. While the former are absolute islands for extraction, the latter should display the argument-adjunct asymmetry familiar from studies of Chinese. This prediction is indeed borne out.

Take (21a-b) in which we have an adverbial phrase:

(21) a. vo [raamKO dekhne ke baad] ghar gayii
she Ram see-NAA after home went
"She went home after seeing Ram."

b. vo [kisKO dekhNE ke baad] ghar gayii
she who see-NAA after home went
"Who did she go home after seeing?"

It is possible to extract the object wh phrase in (21b) by first adjoining it to the adverbial phrase and debarrierizing it. This prevents antecedent government of the intermediate trace but since the original trace is lexically governed the status of the intermediate trace does not yield an ECP violation if we assume the procedure for checking ECP violations argued for by Lasnik and Saito (1984).

[13] Note though that it is possible to conjoin two **ki** clauses if a pleonastic is repeated in the second conjunct:

(i) usNE kahaa ki anu aayii aur yeh bhii ki ravii gayaa
she said that Anu came and this too that Ravi left
"She said that Anu came and also that Ravi left."

Next consider an adjunct out of which an adjunct wh is extracted:

(22) a. usNE [bas SE jaate samai] usKO dekhaa
she bus by going time her saw
"She saw her while going by bus."

b.* tumNE [kaise jaate samai] usKO dekhaa
you how going time her saw
"How did you see her while going ?"

Extraction here is not possible. In the process of debarrierizing the adjunct clause, the intermediate trace is not antecedent governed from matrix spec. Since the original trace is not properly governed this yields an ECP violation. Thus we see quite clearly that adjuncts in Hindi behave exactly like adjuncts in Chinese. The case of postverbal complement clauses is special in that proper government of its head is needed for theta role to be transferred from the pleonastic to the actual complement. Explaining the impossibility of extraction out of finite complements in terms of ECP is intuitively satisfactory since the effect is too strong to be a simple subjacency effect; it has the feel of an ECP violation.

Quite clearly, then, it cannot be said that the difference between Hindi and Chinese is that subjacency applies at LF in one and not the other. Apart from being completely stipulative, it would not explain the difference between Hindi postverbal complements which are absolute islands for extraction and ordinary adjuncts in Hindi which allow extraction of lexically governed noun phrases. The facts can be explained only if we accept that subjacency is universally operative at LF as well as at S-structure, though its effects are largely invisible due to the possibility for debarrierization through adjunction.

7.4. The Extraction Strategy

Let us now turn to the extraction strategy of forming direct questions noted in (8) and repeated below as (23):

(23) <u>kaun</u>$_i$ tum socte ho ki t_i aayegaa
who you think that will come
"Who do you think will come".

According to Gurtu (1985) and Mahajan (1987) extraction at S-structure is used in Hindi in order to question out of a finite clause. From a theoretical point of view, the existence of this strategy poses a problem since the wh, if left in-situ is unable to take wide scope. The claim of extraction in (23) amounts to claiming that wh movement at LF is more restricted than wh movement at S-Structure. This flies in the face of research into languages like Chinese and English which display the opposite results (Huang 1982). Neither Gurtu nor Mahajan provide any explanation for the facts of Hindi within the general theory of wh movement. Before trying to explain the Hindi facts, however, let me make a clarification about the extraction strategy in Hindi.

Though Mahajan and Gurtu state that extraction is used in Hindi to get wide scope readings of wh embedded inside finite complements, the strategy is quite controversial. Often native speakers do not accept the data. I agree with Gurtu and Mahajan, however, that this strategy is available in Hindi but I do not think it is the primary strategy for questioning out of embedded finite clauses. The primary strategy used for questioning out of a finite complement, it seems to me, is the scope marking strategy illustrated below:

(24) tum kyaa jaante ho ki kaun aayegaa
you what know that who will come
"Who do you know will come?"

This strategy will be discussed in Chapter VIII. In this chapter we will focus on the extraction strategy. The first question that needs to be addressed, of course, is the validity of this strategy. If it is indeed an available option in Hindi, why is it difficult for speakers to accept the data?

I believe that acceptability of sentences such as (23) has much to do with intonation. If read with normal intonation, they usually sound bad but properly emphasised they become acceptable. For example, if (23) is read with stress on the matrix subject the sentence is accepted by most native speakers. The point to settle, then, is what the role of stress could be in influencing judgements. Let us examine what (23) means. This sentence is not a simple direct question, it has a contrastive meaning. An accurate translation would be something like "Who do you (as opposed to others) think will come?" It is possible that the questioner already has some information with regard to the value of "who"; it is not the new information the questioner is seeking. (S)he is interested in the value of "who" with respect to the opinion "you" holds -- hence the focus on "you" rather than on "who". In this sense, (23) does not represent the standard procedure for forming direct questions. While its meaning is that of a direct question, there is also a contrastive aspect to its meaning, indicated by stress.

I propose that sentences like this involve topicalization of the embedded wh. While ultimately the wh must move into spec position in order to be interpreted, at S-Structure the wh moves from the lower clause and is adjoined to the matrix IP.

One immediate advantage of this is that we can get the following fact, noted in Mahajan (1987):

(25) ravii soctaa hai <u>ki kaun</u>$_i$ tum soctii ho ki t_i aayegaa
Ravi thinks that who you think that will come
"Ravi wonders who you think will come"

In this sentence, the complementizer **ki** "that" occurs before the extracted wh. This is to be expected if the wh is IP adjoined under topicalization. In an analysis where (23) and (25) represent standard long distance wh movement, an explanation is needed to explain the order of wh and complementizer in (25).

Mahajan (1987) suggests that in Hindi **ki** "that" is in pre spec position. The possibility of a complementizer preceding spec has been proposed by Suner (1988) for Spanish. Thus it may be possible for languages to have the following structure C'[C$^{\circ}$ [CP SPEC C']] but it is not immediately clear that there is any motivation for such a structure in Hindi.

Consider the fact that in relative clauses, wh tends to move in the syntax. Normally, there is no complementizer but it is possible to get sentences in which the two cooccur. Unlike (25), however, wh precedes the complementizer in these cases:

(26) a. vo baat <u>jo ki</u> tum nahĩĩ kah saktii
that matter which that you not say can
"The thing which you cannot say."

b. ek laRkii <u>jisKO ki</u> sab pasand karte hãĩ
one girl who ACC that all like
"A girl whom everyone likes."

This order cannot be explained by an analysis which has **ki** in pre spec position and casts doubt on an analysis that derives the order **ki kaun** "that who" in (25) from a structure in which C° precedes spec. The facts are better explained if **ki** is considered an ordinary complementizer, and (23) and (25) cases of wh topicalization. Assuming that wh movement of jo in (26) is to spec position the opposite order of wh and complementizer in relative clauses is explained.

While it is not standard to propose adjunction to IP for wh expressions, proposals have been made to this effect for other languages. For example, S-Structure adjunction of wh has been claimed for some of the Slavic languages, namely Serbo-Croatian, Polish and Chech (Rudin 1988) as well as for Chinese (Tang (1988)). Tang, for example, has shown that though Chinese wh typically remains in-situ, it may move at S-Structure. She argues that this movement, however, is not to spec position but to an IP adjoined position since the semantic and syntactic properties of such S-Structure movement are distinct from those of LF movement. For a Chinese sentence like (23), Tang suggests that the value of "who" draws from an already known set of possible entities. While it is not clear to me that the difference in meaning between in-situ wh and topicalized wh in Chinese corresponds exactly to the non-contrastive vs. contrastive reading I claim for Hindi, I find it suggestive that there is a semantic distinction between S-structure movement and LF movement of wh expressions in Chinese as well as in Hindi.

Thus I agree with Gurtu and Mahajan that Hindi wh may be extracted but I differ from them in the characterization of such movement. I do not consider it the normal or standard procedure for forming direct questions, though it ultimately does yield a direct question meaning. At LF further movement into spec position is probably required. Interestingly enough, however, LF movement can undo extraction and it may still be possible to get an indirect question reading for (23), such as "You wonder who will come".[14] For example, suppose that I am trying to guess what you are thinking, I might say (23) with this intended reading. This would fit in with an analysis of (23) as topicalization rather than movement to spec since topicalization can be undone (Saito 1985). While there are still several issues to be explored as to the interaction of wh-topicalization and sentence intonation, I believe that this approach has enough merit to enable us to discuss the properties of wh extraction in Hindi. It was determined in section 7.2. that Hindi finite complements are scope islands because they are syntactic adjuncts. The question raised by sentences like (23) was how a wh could be extracted out of a scope island. An analysis of the sentence as involving wh-topicalization by itself does not answer this question.

---

[14] I would like to thank J. Abe for pointing this out.

Let us first establish that the strategy under discussion involves real extraction. It can be shown, for example, that it obeys subjacency. The sentences in (27)-(28) show that it is not possible to extract a wh out of a complex noun phrase in Hindi:

(27) a. tum jaantii ho ki [vo larkaa [jisne anuKO maaraa]]
you know that that boy who Anu beat
yahãã rahtaa hai
here lives
"You know that the boy who beat Anu lives here."

b.* kisKO$_i$ tum jaanti ho ki [vo larkaa [jisNE t_i
who ACC you know that that boy who ERG
maaraa]] yahãã rahtaa hai
beat here lives
"Who is the person such that you know that the boy who beat him lives here?"

(28) c. usNE kahaa ki [yeh baat [ki anu yahãã hai]]
he ERG said that this fact that Anu here is
ravii jaantaa hai
Ravi knows
"He said that Ravi knows the fact that Anu is here."

d.* kaun$_i$ usNE kahaa ki [yeh baat[ki t_i yahãã hai]]
who he ERG said that this matter that here is
ravii jaantaa hai
Ravi knows
"Who is the person such that he said that this matter that he is here is wrong."

The examples in (27-28) establish that subjacency is operative in Hindi at S-structure. If topicalization out of complex NPs is not possible in these cases, we have to see how it is possible to extract the wh from a postverbal complement. Recall that we have established that such complements are scope islands.

Notice, in this connection, that extraction never cooccurs with a pleonastic in the matrix:[15]

---

[15] It should be noted that more standard kinds of topicalization are also possible out of Hindi finite complements as long as there is no overt pleonastic.

(29)* kaun$_i$ tum yeh/kyaa socte ho ki t$_i$ aayegaa
who you this what think that will come
"Who do you think will come ?"

Let us take the presence of a pleonastic element in argument position as evidence that the complement is base-generated in adjunct position. This suggests that in extraction structures the complement need not be base generated in postverbal position but could be moved from a preverbal position.[16] Topicalization is possible in this case because the complement originates in the preverbal position which is an L-marked position. Wh-extraction from this position is licit since there are no barriers crossed. Subsequently, the finite complement moves to an IP adjoined position to satisfy Case Resistance, yielding the following structure:

(23') [$_{CP}$who$_i$[$_{IP}$[$_{IP}$you t$_j$ think][$_{CP}$that t$_i$ will come]$_j$]].

Sentences like (23), therefore, do not present any evidence that S-Structure movement in Hindi is less restricted than LF movement.

To conclude this chapter, I have provided an account for the scope of embedded wh in terms of the phrase structure of Hindi. Non-finite complements, being gerunds, appear in L-marked positions and therefore yield wide scope readings. Finite complements appear in adjunct position and are linked to pleonastics in argument position. Since the complement itself does not occur in an L-marked position, it does not allow extraction of wh. The facts of Hindi have been presented as concrete evidence that, contrary to standard assumptions,

---

[16] Of course, there is the possibility of there being a pro in argument position. Thus the absence of an overt pleonastic does not rule out base-generation of the complement in adjunct position. It only allows for an extraposition analysis.

Subjacency cannot be considered to be simply an S-structure phenomenon. It must also be recognized at LF. An approach to the way Subjacency operates at LF was suggested which made it possible to give an account of the difference in the scopal properties of Hindi wh in-situ and wh in-situ in other languages. Finally, the case of so-called S-structure extraction out of Hindi finite complements was analyzed as an instance of topicalization rather than movement to spec. It was also shown that at the point in the derivation when such topicalization takes place, the complement is in an L-marked position and is not yet a scope island.

CHAPTER VIII

PLEONASTC WH OPERATORS IN HINDI

8.1. The Scope Marking Strategy

In Chapter VII we saw that a wh expression in Hindi embedded inside a finite complement cannot take scope outside the complement if it is left in-situ. In this chapter we turn to the strategy Hindi employs to get wide scope readings in such contexts. In Davison (1984) the following type of construction was discussed:

(1) tum <u>kyaa</u> jaante ho ki usNE <u>kyaa</u> kiyaa
you what know that he ERG what did
"What do you know that he did?"

This construction, which we will call the scope marking strategy, has a wh expression in the matrix clause and another in the embedded clause. The question is always interpreted in such a way that the embedded wh has matrix scope. The matrix wh marks, as it were, the scope of the embedded wh.

It is not immediately obvious how the scope marking strategy in (1) should be analyzed within a theory of questions based on wh movement. There is a dependency between two distinct wh words which cannot be accounted for in terms of syntactic or LF movement of wh. We need some way of linking the two so that the scope of the lower wh is passed up. This type of wh construction is not unique to Hindi. It is also found in Indic languages like Kashmiri and Bangla as well as in Romani and certain dialects of German. However, this construction has not received enough attention and there is no established analysis for it (see Wali (1988), van Riemsdijk (1983) and McDaniel (1989)).

In this chapter I will focus on the scope marking strategy in Hindi, providing a syntactic and semantic account of its basic features. I will then compare the analysis to other analyses proposed in the literature.

Let us begin by familiarizing ourselves with some of the properties of the scope marking strategy. The examples in (2) like those in (1) yield direct questions:

(2) a. tum kyaa jaante ho ki vo kahãã gayii
you what know that she where went
"Where do you know that she went?"

b. tum kyaa socte ho ki vo gayii yaa nahĩĩ
you what think that she went or not
"Do you think she went or not?"
= "In your opinion, did she go or not?"

In each of the sentences above we see that the matrix clause has a wh **kyaa** "what" in object position, regardless of the wh in the embedded clause. I will refer to this as a pleonastic wh since its only function is to pass up the scope of a wh which occurs inside a scope island. It is otherwise semantically vacuous. (2a-b), for example, are direct questions which require an answer to provide values for the embedded wh only, not for the wh of the matrix clause. In (2a) the questioned element is the embedded **kahaa** "where" and in (2b) it is the yes/no operator.

If this description of the matrix wh in the scope marking strategy is correct, the following is predicted:

(3) a.* tum kyaa jaante ho ki usNE yeh kiyaa
you what know that he ERG this did
"What do you know that he did this ?"

b.* tum kyaa puuch rahee ho ki kaun aayegaa
you what are asking that who will come
"What are you asking that who will come?"

(3a) is ungrammatical because there is no wh in the embedded clause whose scope the pleonastic can extend. (3b) is ungrammatical because the pleonastic extends the scope of the embedded wh thereby making the complement -wh. The selectional restriction of the matrix verb is not satisfied since **puuchna** "to ask" requires a +wh complement. In fact, the class of verbs that can occur in the matrix clause of the scope marked sentence is exactly those which allow wh extraction from their complements in languages like English. That is, it must be possible for the pleonastic to extend the scope of the wh inside the complement.

As expected, a series of pleonastics can result in an unbounded extension of the scope of the embedded wh:

(4) tum <u>kyaa</u> jaante ho ki vo <u>kyaa</u> soctaa hai
you what know that he what thinks
ki <u>kaun</u> aayegaa
that who will come
"Who do you know that he thinks will come?"

Thus at a descriptive level it it quite clear what the scope marking strategy involves but we need a formal account of it. Specifically, we need to characterize the pleonastic in such a way that the two facts noted above can be derived. It should be possible to rule out sentences in which the embedded clause does not contain a wh and it should be possible to show that the embedded wh cannot have narrow scope.

In order to come to an understanding of the formal properties of the scope marking strategy, let us focus on a basic case like (1), repeated below as (5b), and compare it to a parallel sentence which does not yield a direct question:

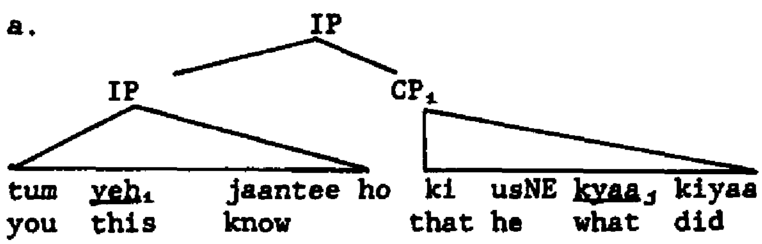
(5) a. tum yeh jaante ho ki usNE kyaa kiyaa
you this know that he ERG what did
"You know what he did."

b. tum kyaa jaante ho ki usNE kyaa kiyaa
you what know that he ERG what did
"What do you know that he did ?"

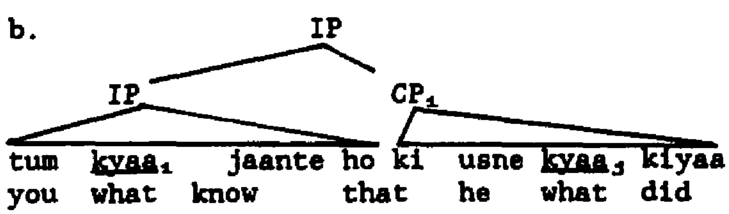
Sentences like (5a) were analysed in Chapter VII as having a pleonastic in the object position linked to a complement in adjunct position. The complement being a CP cannot appear in argument position so the pleonastic serves to absorb case and theta role. Given the obvious similarity between the two structures, we can draw some conclusions about (5b). **Kyaa** "what", like **yeh** "this", is a pleonastic in argument position linked to the actual complement, which is in adjunct position. Being a wh expression as opposed to a referential expression, however, **kyaa** differs from **yeh** in being an operator. (5a) and (5b), under this view, will have similar S-structures (6a-b)) but distinct LFs (7a-b)):

(6) S-Structure Representations of (5a-b):

a.

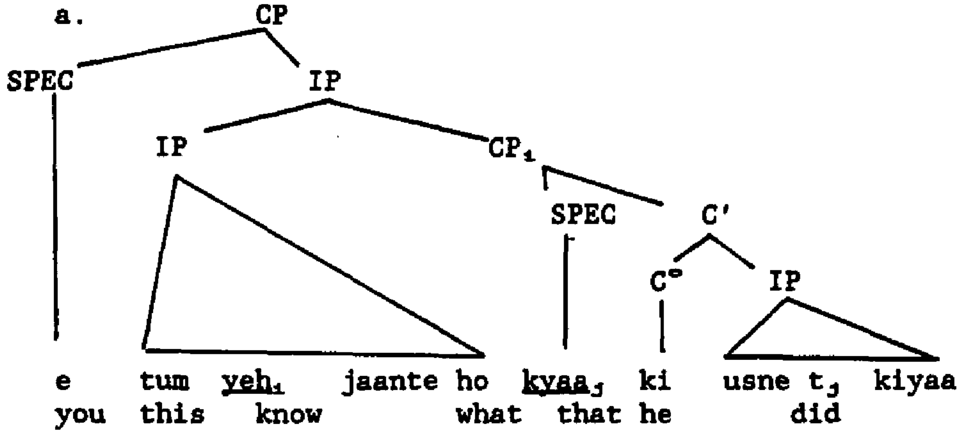


b.

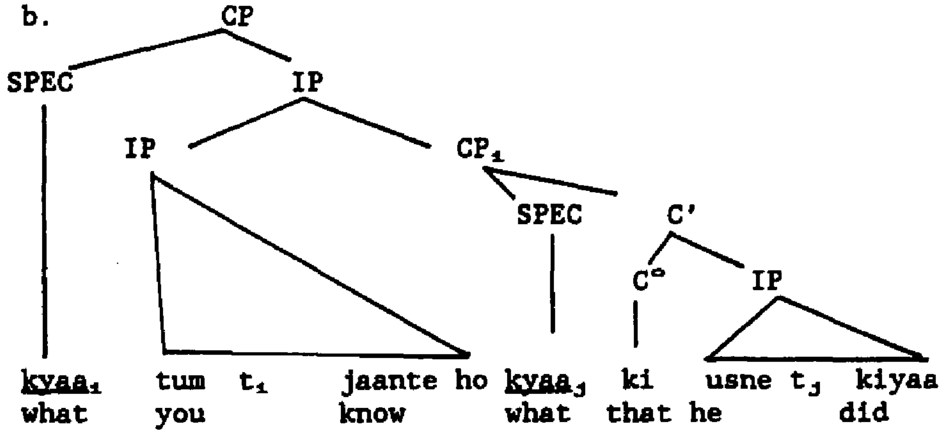


(7) LF Representations of (5a-b):

a.



b.



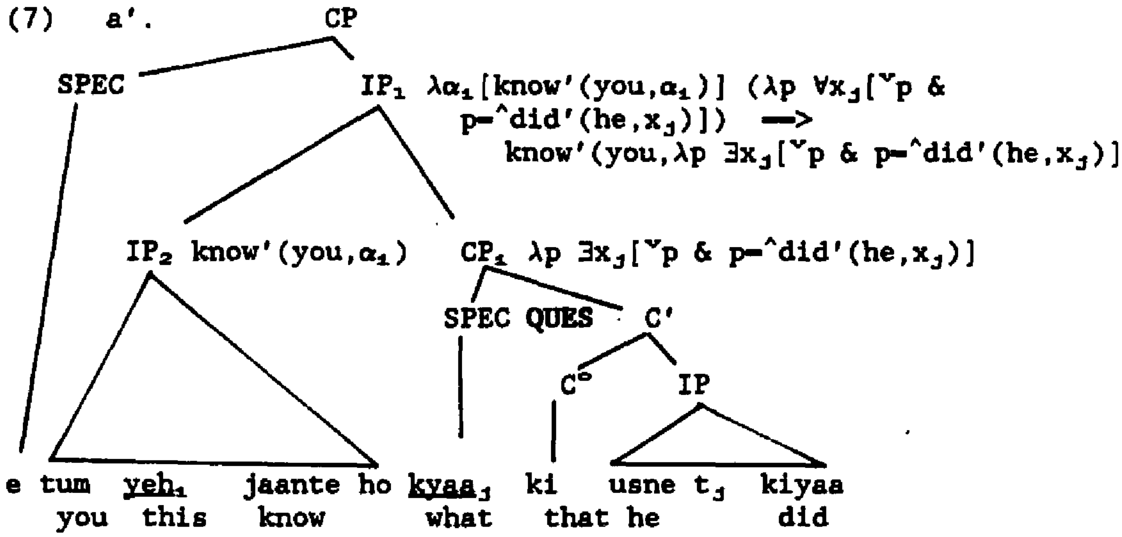
Let us consider the difference between (7a) and (7b). The wh in the lower clause moves to the lower SpecCP in both structures. As discussed in the previous chapter, further movement is blocked since the clause is in adjunct position. In addition, the interrogative pleonastic **kyaa** "what" moves to matrix comp in (7b). The crucial difference, then, is that there is an operator in the matrix spec of (7b) but not (7a). This operator binds its trace, but note that the trace itself is coindexed with the complement in adjunct position. Now the wh element in the spec of the embedded CP and the head of the CP can be identified under spec-head agreement, so that the pleonastic can be said to indirectly bind the embedded wh. The only assumption needed to make the proposal work, is to say that a wh expression in spec can be interpreted as an operator binding a variable (its own trace) or a variable binding another variable (an analogue of the intermediate trace in long distance movement cases). Note, however, that the particular interpretation that a wh in spec has can be determined by examining the structure in which it appears. In (7a) the wh in the lower clause will only be interpreted as an operator. If it were to be interpreted as a variable, this variable would not be bound, there being no operator in the matrix comp. In 7(b), on the other hand, the wh in the lower comp can only be interpreted as a variable bound by the pleonastic operator. If it were to be interpreted as an operator binding the trace in the lower clause, the pleonastic operator would become vacuous since it is not possible for one operator to bind another. The LFs in (7), we see, yield unambiguous readings for (5).

An alternative suggested to me by Y. Kitagawa (p.c.) is that the complement in adjunct position may replace the pleonastic at LF in (5b). Notice, however, that such an approach will not yield the right results. If expletive replacement takes place at LF in (5b), it will also occur at LF in (5a). This will mean that the complement in (5a) will end up in the L-marked preverbal position, from where movement of wh to matrix clause will be possible. This, of course, incorrectly predicts a direct question reading for (5a).

If we take the LFs in (7) as the level which feeds into semantics the effect of expletive replacement can be obtained without forgoing the status of the complement as a syntactic adjunct. This can be demonstrated by adopting a familiar semantics for questions, such as Karttunen (1977). Karttunen analyzes direct and indirect questions as the set of propositions which jointly constitute the complete true answer to the question. A wh phrase is understood to have two semantic components, an ordinary pronoun meaning and a question operator. The pronoun marks the position bound by the wh phrase and is interpreted in situ as a variable. The question operator, which takes as argument a sentence meaning, is held in store till that point in the tree where a sentence meaning becomes available (see Engdahl (1986) for details). The operator, let us refer to it as **QUES**, lifts the sentence into a set of propositions, existentially quantifying over the variable inside the sentence with which it is coindexed. The question thus denotes the set of propositions which hold of the sentence denoted by the IP for some value of the variable.

Applying this schema to the syntactic framework being used here, one could say that the trace of a wh corresponds to a free variable, i.e. it has a pronoun meaning, while the wh in spec of CP corresponds to the operator **QUES** which converts the sentence meaning available at the IP level into a question meaning, as described above. I assume that intermediate traces do not have any semantic function. They can be thought of as analogues of the signal that allows a wh to remain in store in systems that do not use a theory of movement. Given this, the LF in (7a) would be interpreted in the following way:

(7) a'.



The semantics for the indirect question denoted by CP_1 follows the Karttunen-style semantics outlined above in a straightforward way. What needs to be clarified is how the indirect question in adjunct position combines with the matrix clause. IP_2 will denote an open sentence if the pleonastic **yeh** is taken to be a free propositional variable. This is quite plausible, given that **yeh** is always linked to a clause.[1] IP_2 can then combine with the adjunct by abstracting over this position and taking the meaning of the adjunct as argument. Lambda conversion will be legitimate since the pleonastic and the adjunct will have the same semantic type.[2] Two applications of lambda

---

[1] For example, the pleonastic **yeh** cannot be linked to a noun phrase:

(i)* tum yeh jaantii ho ek bhashaa
you this know one language
"You know one language."

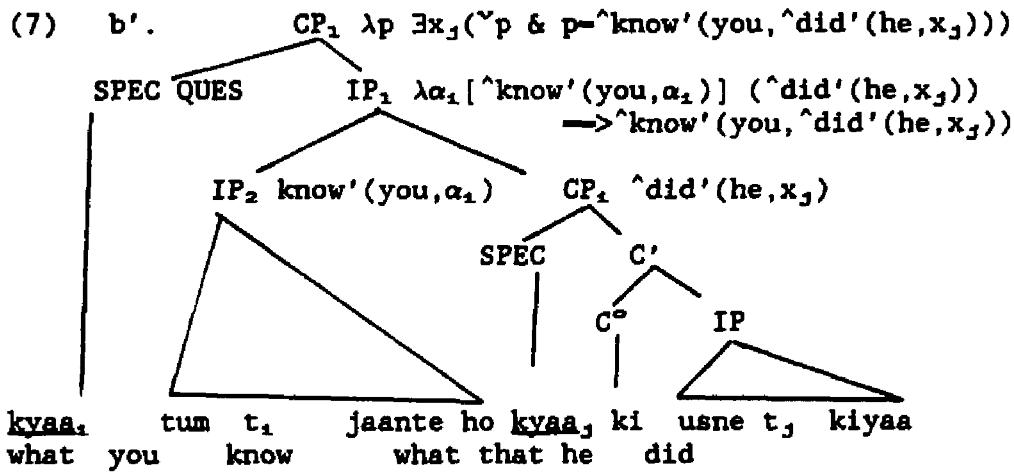
The semantic type of the demonstrative **yeh** "this" is that of a clause. **kyaa**, we will see, is also clausal.

[2] Strictly speaking the semantic type of **yeh** varies between a proposition and a set of propositions. In a semantics like Karttunen, this ambiguity is encoded in the type of the matrix verb. There are systems, such as Groenendijk and Stokhof (1984) in which indirect questions denote propositions and the matrix verb has only one type. The choice between the two does not affect the discussion here.

conversion will yield the indirect question reading that we want for (5a).

(5b) can also be interpreted using similar mechanisms. We need, however, to make explicit the semantics that we want to associate with the pleonastic wh operator. I will assume that the pleonastic wh is composed of two parts, just like an ordinary wh. That is, its trace marks a free variable while the raised wh in spec is the question operator that I have called **QUES**. Now, **QUES** must bind a variable, just like any operator, in order to be non-vacuous. The point to settle, however, is whether binding the variable denoted by its own trace can satisfy the prohibition again non-vacuous quantification. Let us look at the interpretation tree to get the full picture:

(7) b'.



As suggested earlier, the wh in spec of CP_1 has the status of an intermediate trace and CP_1 denotes an open sentence with x_j free. IP_2 is interpreted as an open sentence with a free propositional variable marking the trace of the pleonastic wh. It combines with CP_1 by abstracting over this variable and taking the meaning of CP_1 as argument. This is analogous to the procedure we used in (7a). Once lambda reduction takes place we get ${}^{\wedge}know'(you, {}^{\wedge}did'(he, x_j))$.

Let me clarify, at this point, what I take to be the status of the pleonastic operator with respect to variable binding. I assume that the operator is a question operator and that it yields a set of propositions, just like other question operators. However, it differs from them in a crucial way. Since the index on the pleonastic is a clausal index, that part of the wh quantification rule which existentially binds individual variables is not determined by the pleonastic. If there is an individual variable inside its scope domain it will be existentially bound by the wh quantification rule. It is in this sense that **kyaa** is pleonastic while ordinary wh's are not. This means that the question operator in (7b) can existentially quantify over x_j in the embedded clause. We see, then, that (7b) can be interpreted as a direct question without moving the embedded wh out of an island.[3]

An advantage of taking this approach to the scope marking strategy is that it allows for a pleonastic wh to be linked to more than one wh in the embedded clause. In (8), for example, there are two wh expressions in the lower clause and both have matrix scope.[4]

---

[3] It should also be pointed out that this approach to the pleonastic operator explains why a scope marker must be linked to a +wh complement (cf. (3a)). Since its own trace does not provide a variable for it to bind, it has to be linked to an appropriate element in the embedded clause.

[4] Hindi **socnaa** can take a + or a -wh complement. In the first case it would be translated as English "to think", in the second as "to wonder". The two possibilities are shown in (i)-(ii):

(i) mãĩ soc rahii hũũ ki ghar jaaũũ
I am thinking that home go
"I am thinking that I may go home" (-wh)

(ii) mãĩ soc rahii hũũ ki kyaa kiyaa jaayee
I am wondering that what should do
"I am wondering what to do" (+wh)

(8) tum <u>kyaa</u> socte ho [ki <u>kisne</u> <u>kyaa</u> kharidaa]
you what think that who what bought
"For which x and y, you think x bought y."

This can be accounted for if we take the pleonastic to be a polyadic operator which can bind any and all variables inside its scope domain simultaneously. This is not hard to motivate. A pleonastic wh being different from an ordinary wh in being linked to a clause rather than a noun phrase, it does not carry the index of any individual variable. In (8), then, the pleonastic will be able to bind both wh's in embedded spec.

In the account of the scope marking strategy given above, we see that a non-movement analysis of embedded wh can be maintained without any problem, as long as we think of the pleonastic wh operator as a polyadic quantifier which needs to be linked up with individual variables.

8.2. Other Analyses of Scope Marking

In this section I want to compare the analysis of the scope marking strategy given above with three others known to me. In Davison (1984) and (1988) the terms "pro S" and "interrogative expletive" are used to describe the Hindi pleonastic **kyaa**. She describes its function as re-establishing "connectedness" in terms of Kayne (1983), thereby making it possible for the embedded wh to take wide scope. Crucially, her LFs for (5a-b), repeated below, are similar with respect to the pleonastic elements, since she considers **kyaa** to be simply a placeholder and not an operator:

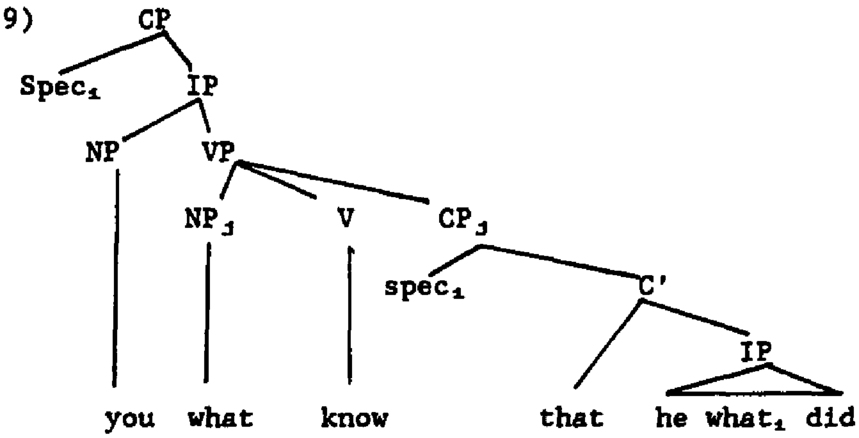
This is contrary to claims in Mahajan (1987) and Davison (1984).

(5) a. tum yeh jaante ho ki usNE kyaa kiyaa
you this know that he what did
"You know what he did."

b. tum kyaa jaante ho ki usNE kyaa kiyaa
you what know that he what did
"What do you know that he did ?"

Davison's LF for (5b), for example, would be the following:[5]

(9)



In this account **kyaa** is only a placeholder which somehow allows a wh embedded inside CP_j to move to matrix spec. It does not force this movement. This means that it should be possible for the wh to take narrow scope, as noted by Davison. We have seen, however, that (5b) does not have an indirect question reading. Thus, her account of the Scope Marking Strategy fails to account for an important property of the construction, namely the necessity for the embedded wh to take wide scope.[6]

The second account of Scope Marking is van Riemsdijk's (1983) for certain dialects of German. As seen below, German employs a strategy

---

[5] It is not completely clear to me whether the wh in the embedded clause moves to the matrix spec or if its index is transmitted in her account.

[6] We also saw in the previous chapter that Davison does not account for the fact that wh inside non-finite complements do not have narrow scope readings.

similar to the one in Hindi. The difference is that German also allows extraction of wh so that there are three equivalent forms of the direct question in (10).

(10) a. was glaubst du, was Peter meint,
what think you what Peter believes
mit wem Maria gesprochen hat
with whom Maria spoken has

b. was glaubst du, mit wem Peter meint dass
Maria gesprochen hat

c. mit wem glaubst du, dass Peter meint dass
Maria gesprochen hat

"With whom do you think that Peter believes Maria has spoken ?"

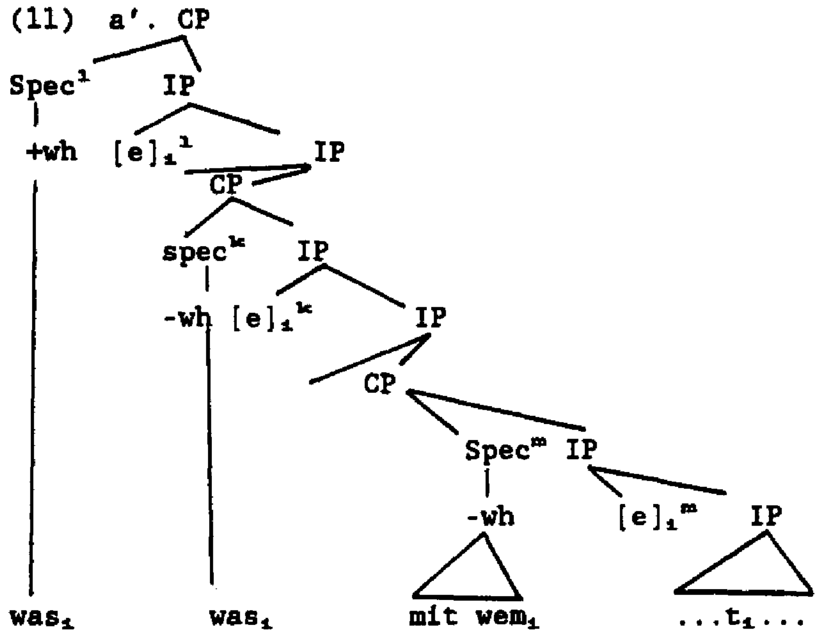
van Riemsdijk analyzes these within the "L-model" of grammar proposed in van Riemsdijk and Williams (1981), as opposed to the T-model of Chomsky and Lasnik (1977) being followed here. In this model the LF rule of Quantifier Interpretation precedes Wh-movement, assigning an index to a quantified phrase and adjoining an empty category with the same index to a containing IP node. By extending the ECP to include pleonastic **was** "what" among the set of scope markers, he forces movement of the wh phrase to a position from where it can govern the empty category. (11) encodes a biuniqueness relation between operators and variables:

(11) a. Every scope marker (or its trace) must
govern its scope index.

b. Every scope index must be governed by a
scope marker (or its trace).

On this account, (10a) would have the representation in (10a'), where the indexed categories adjoined to IP are a result of quantifier indexing and the position of wh determined by ECP, as given in (11). While (11) forces wh movement of ordinary wh's, scope markers are simply generated in a position from which it can govern its scope index.

(11) a'.



As we can see, (11) requires a one-to-one correspondence between operators and variables, thereby yielding the right interpretation for (10).

While van Riemsdijk's analysis can account for much of the Hindi facts it will not account for (8) in which a single pleonastic must bind two variables. The account, which is otherwise compatible with mine, needs to be modified anyway since the German facts are analogous (see McDaniel (1989)). The modification would have to separate pleonastic scope markers which can govern more than one index from ordinary wh which can govern only one. Such a modification, however, would weaken the tight connection between scope markers and other operators that van Riemsdijk claims and bring it in line with the analysis I am arguing for.

There is, however, a fundamental difference between van Riemsdijk's analyis and mine which might help in evaluating the two proposals.[7] The pleonastic wh (or scope marker as van Riemsdijk calls it) marks the object position of a superordinate clause in my account while in his account it is a base generated element which is only there for quantifier interpretation. A rather significant fact about the scope marking strategy in German is that pleonastic operators cannot be long distance moved, as shown by the ungrammaticality of (12):

(12)* $\underline{\text{was}_1}$ glaubst du [$\underline{t_1}$ dass Peter meint
what think you that Peter believes
[$\underline{\text{mit wem}_1}$ Maria gesprochen hat]]
with whom Maria spoken has

In (12) the pleonastic has been long distance moved and since its trace satisfies the version of ECP provided by van Reimsdijk the sentence should be grammatical. The reason for its ungrammaticality is not obvious. I should mention here that van Riemsdijk does not consider examples like this. McDaniel (1989), who does discuss such cases, suggests a functional reason for ruling this out. According to her there would be no way of distinguishing ungrammatical cases like (12) in which the intermediate spec contains a trace of the scope marker from grammatical cases like (10c) where the true wh phrase has been long distance moved. I find this rather weak and not very convincing. If a language can allow variations like (10a-c) there is no reason why it could not allow the variation between (10c)-(12). It

[7] I would like to emphasize, of course, that I do not wish to make claims specifically about German since I have not studied in any detail the scope marking strategy nor the phrase structure of German. The comparison with van Riemsdijk, as with McDaniel which follows, assumes some essential similarity. I am quite aware that there may be differences of detail that might require modification of my claims.

seems to me, therefore, that the impossibility of long distance movement of scope markers in German remains unexplained in both accounts.

A possible way of capturing this fact may be in terms of the analysis developed for Hindi. Suppose that finite complements in German surface in an IP adjoined position but are coindexed with a trace in argument position. That is, at S-structure the finite complement would be a scope island. We have to reconcile this, of course, with the fact that German does allow long distance extraction of wh embedded inside such complements. We can see that wh extraction would be legitimate if it occurred before extraposition since at that point the complement would not be a scope island.[8]

Suppose that in addition to this, German also allows complements to be generated in adjoined position, as long as they are linked to pleonastics in argument position. The presence of pleonastics like **es** "it" or **was** "what" could be taken as evidence of a complement generated in adjunct position and we would expect them to be scope islands.[9] This, of course, means that subjacency is a constraint on movement not representation.

---

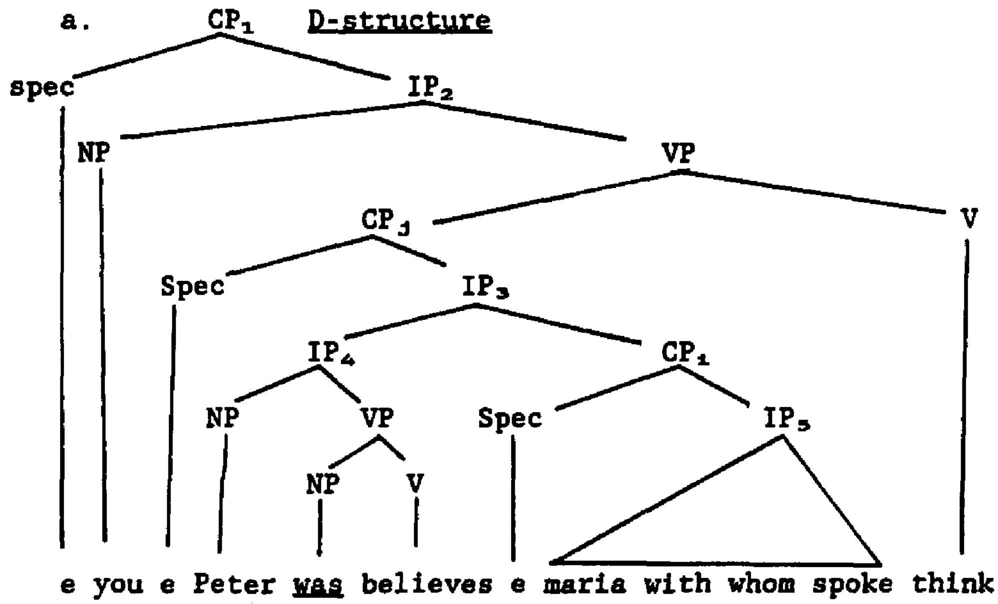
[8] We would not have to resort to rule ordering since the alternative derivation in which the complement is moved to adjunct position before wh extraction would be simply filtered out as ungrammatical.

[9] Interestingly enough, M. Bierwisch (1971) notes the ungrammaticality of topicalization when a pleonastic is present:

(i) Ihn habe ich (*es) versucht zu treffen
him have I it tried to meet
"I have tried to meet him."

The only possible derivation for the ungrammatical (12) under these assumptions would be the following:

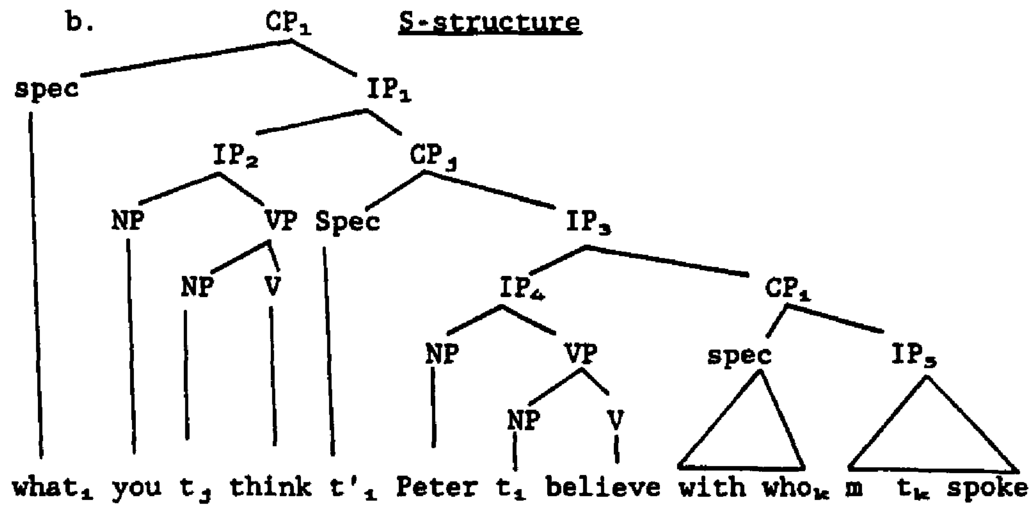
(12') a.



In this derivation the complement of the matrix verb "think ", i.e. CP_3 "Peter what believes Maria with whom has spoken" is generated in argument position. At this point extraction out of this clause does not violate subjacency since it is L-marked by the verb. CP_3 contains a pleonastic wh operator with index i, which is linked to the finite clause CP_1 generated adjoined to IP_4. Suppose this moves to the matrix spec leaving behind a trace in the object position of IP_4 and an intermediate trace in spec of CP_3. This movement would be completely licit.

Now, due to the CRP CP_3 will have to be moved from argument position and extraposed and adjoined to IP_2. We will get the following representation:

(12′) b.



There are no problems with this derivation. That is, there is no syntactic reason for the ungrammaticality of long distance movemement of pleonastic was so far. So the question remains why (12) is bad.

Let us turn to the next step in the representation which is the semantic interpretation of (12′b). We get the following steps in the translation:

(12″)
a. CP_i = ^spoke′(Maria,with x_k) {x_k a free wh variable which needs to be bound.}
b. IP_4 = ^believe′(Peter,α_i) {α_i a propositional variable}
c. IP_3 = ^believe′(Peter,^spoke′(Maria,with x_k)) {after lambda conversion}
d. CP_j = ^believe′(Peter,^spoke′(Maria,with x_k))
e. IP_2 = ^think′(you,β_j) {β_j a propositional variable}
f. IP_1 = ^think′(you,^believe′(Peter,^spoke(Maria, with x_k))) {after lambda conversion}
g. CP_1 = QUES [^think′(you,^believe′(Peter,^spoke′(Maria,with x_k)))] ⟹ λp [$^{\vee}p$ & p=^think′(you,^believe (Peter,^spoke(Maria,with $\underline{x_k}$)))]

If we consider (12″g) we see what the problem is. The question operator being pleonastic can, of course, bind any variable inside its scope domain if it is local but x_k is not in its local domain. There are no intermediate traces with index k to effect long distance binding between x_k and the pleonastic operator. What we end up with is an operator which is vacuous in that it binds no individual variable locally and a variable which remains locally unbound. Thus the impossibility of long distance movement of **was** is explained.

Of course, this explanation is valid only if the assumptions that I have made about German phrase structure hold up. At this point I would like to note the ungrammaticality of (12) as a problem for competing analyses and suggest the derivation in (12′) and (12″) as a promising line of inquiry rather than a claim. It is worth pointing out that the question of long distance movement of the Hindi pleonastic **kyaa** is moot since it is in situ at S-structure. At the level of LF the finite complement is already a scope island so that there is no possibility of extracting any wh, pleonastic or otherwise.

Finally, let me turn to a recent study, already referred to above, of the scope marking strategy. McDaniel (1989) gives an extensive account of the phenomenon of scope marking in German and Romani. She introduces a range of data which would take me too far afield to present here. For purposes of this comparison I intend to summarize the basic ideas in her analysis and see if it can be extended to cover the Hindi facts.

McDaniel shares with van Riemsdijk the view that German **was** is not generated in argument position. In this respect both analyses are crucially different from the one I am proposing for Hindi.[10] McDaniel describes it as an expletive operator which forms a wh-chain

[10] Of course, for Hindi the claim that the pleonastic starts out in argument position is transparent since it remains in-situ.

with the embedded wh, thereby allowing it to have wide scope. Chain formation, according to her, must conform to the following:

(13) If a language has syntactic wh-movement, then, for every Cspec x of a [+Wh] CP, there must be a Wh-chain such that its head is in x; and for every wh-phrase y in A' position, there must be a Wh-chain which contains y and whose head is in the Cspec from which y takes scope.

She motivates the use of a scope marker by invoking a restriction against Case Inheritance in German, given below:

(14) Case Inheritence Restriction (McDaniel's (20),p.574)
In the configuration ...x...[CP ...y....] x may not inherit structural case from y.

The CIR in (14) applies only to tense-independent phrases. Non-finite complements are left out because they are considered to be defective categories headed only by C'.[11] The scope marking strategy, according to McDaniel, saves possible violations of the CIR.[12]

Now since **was** can be linked to more than one wh in the embedded clause, McDaniel has to make it possible for the Wh-chain to contain a **was** coindexed with two distinct indices. She does this by appealing to the idea proposed by Higginbotham and May (1981) that quantifiers may be absorbed into a single polyadic quantifier. Thus a chain of the form [CP was_{i-j} [IP...[CP wo_i welche $gedichte_j$ [IP...]]]] is well-formed since i-j is a single index formed by absorption. According to her, absorption has to apply at S-structure in languages which have the scope marking strategy since **was** has to be linked up at that

---

[11] This is because non-finite clauses do not yield indirect questions. Again, the parallel with Hindi is interesting.

[12] It is not clear to me how she accounts for the fact that in many cases the scope marking strategy alternates with the normal extraction strategy.

point. In fact, she claims that the coindexation between the scope marker and the embedded wh is also an instance of absorption, so that languages with and without the scope marking strategy can be separated in terms of the availability of absorption and the presence of an A' expletive in the lexicon. Thus, languages like English which lack multiple wh movement at S-structure and A' expletives as well as languages like Polish which have multiple wh movement but no A' expletive will lack the scope marking strategy.

There are several problems with this approach. For example, the way in which McDaniel uses the notion of absorption in linking up was to the embedded wh is not standard. Specifically, it deviates from the definition of absorption in Higginbotham and May (1981) in two important respects. First, syntactic adjacency between two monadic quantifiers was taken to be a necessary condition for quantifier absorption. McDaniel clearly wants to abandon this requirement of syntactic adjacency since she wants to absorb a scope marker in a higher spec with a wh in a lower spec. Once we allow for this, there is no reason why two ordinary wh's originating in two different clauses should not also be similarly absorbed. This, of course, will lead to unwanted consequences. For example:

(15) a. Which girl knows which book Mary bought?

b. Jane knows that Mary bought War and Peace and Sue knows that she bought Portrait of a Lady.

The infelicity of (15b) as an answer to (15a) clearly shows that absorption between the matrix wh and the wh in embedded spec cannot be posited.[13] McDaniel's conception of absorption, however, leaves open the possibility of absorption in structures like (15a).

There is, it seems to me, another, more fundamental, problem with her use of absorption. Absorption is defined semantically on quantifiers each of which binds one variable. The resulting category has the semantic type of an operator, the only difference is that this operator simultaneously binds all the variables that were bound by the individual operators prior to absorption. Now, in the analysis she presents the scope marker does not bind any variable. The operator formed by absorbing the scope marker and an embedded wh binds all and only the variables bound by the embedded wh. That is, absorption has no impact on polyadicity. This means that absorption for McDaniel is nothing more than simple coindexation. Thus there seems no point in linking up the existence of scope marking with the availability of multiple wh movement since the two obviously involve very different syntactic and semantic operations.

Another problem, noted by her, is that the scope marking strategy is also available in certain dialects of German which do not have multiple wh movement at S-structure. In these dialects **was** can be linked to two wh in an embedded clause, but the two embedded wh are not in spec of CP; one is in spec of CP, the other in situ (McDaniel's ft.23). She proposes accounting for this by parameterizing the types of absorption possible in natural languages. This dialect, according to her, allows "partial" absorption at S-structure, i.e. the

---

[13] In Chapter IX I provide an analysis for pair list answers that does not depend on absorption. Pair list readings for questions like (15) are nevertheless ruled out.

absorption that coindexes was with an embedded wh, but not "complete" absorption which would allow multiple wh to cooccur in spec. The problem, it seems to me, with McDaniel's approach stems from the way in which coindexing of scope markers and embedded wh is conceived. Parameterizations of the sort suggested by her have little explanatory power since they are not precise enough to base predictions on.

It is also difficult to apply her approach to Hindi since the rules and principles she gives are specifically geared towards languages with wh movement in the syntax. Perhaps, it can be extended to account for Hindi but it would involve adding further stipulations on the types of absorption and the level at which they apply. The fact that it does not make any cross-linguistic predictions makes the enterprise of making it fit the Hindi facts rather unappealing. I hope to have pointed out, though, that her analysis has several unclarities and may not be theoretically sound even for German and Romani. I will therefore leave my discussion of McDaniel's analysis at this point, adding only though that her data indicates significant correlation between Hindi and German and Romani. I should point out though that, as far as I can tell, my analysis of scope marking would apply to the data she discusses.[14]

---

[14] There is only one sentence from German in McDaniel (1989) that my analysis cannot account for:

(i) $\underline{\text{Wo}}_i$ glaubst[$_{IP}$ du[CP $\underline{\text{was}}_j$ [IP Hans behauptet
where think you what Hans claims
[CP[<u>welche Gedichte</u>]$_j$ [IP Goethe jeweils $\underline{t}_j$ $\underline{t}_i$
which poems Goethe wrote
geschrieben hat]]]]]?
at various times
"Where do you think what Hans claims which poems Goethe wrote at various times."

To sum up, I have discussed three accounts of scope marking, other than the one I have presented, namely Davison (1984), van Riemsdijk (1983) and McDaniel (1989). In each case I have tried to clarify the respects in which my analysis differs from theirs. I would like to reemphasize the essential respect in which my analysis differs from all of them. The pleonastic, in my view, originates in argument position and is linked to a [+wh] complement in adjunct position. Being an operator, it raises to spec from where it must bind an argument position in order to satisfy the ban on vacuous quantification. Its own trace is not sufficient for this purpose since it is of a propositional type. The only way it can bind an NP position is indirectly, via coindexation with the adjoined complement and through spec-head agreement with the wh(s) in the embedded specCP. This forces the embedded wh to be interpreted not as an operator but as a variable. Pleonastic replacement does not occur at LF, thereby ensuring distinct representations for constructions with interrogative and non-interrrogative pleonastics at the level which feeds into the semantics. This is needed in order to ensure that interrogative pleonastics yield unambiguous direct questions while non-interrogative pleonastics yield only indirect questions.

Since I would take **was** to indicate that the most deeply embedded clause is generated in adjoined position it should not be possible to extract **wo**. If (i) is a direct question which requires answers to **wo** "where" and **welche gedichte** "which poems" and not a kind of echo question, I would take this to indicate that scope marking works very differently in languages like Hindi and German.

8.3. Some Remaining Issues

In this section I would like to discuss some questions about Hindi phrase structure that remain open. Let me begin with the question of finiteness and directionality, an issue that is relevant to the analysis of Hindi relative clauses as well as questions. We saw that in both cases finite structures do not occur to the left of the head while non-finite structures do. The same is true of noun complements. The relevant examples are repeated below:

(16) a. ek nachtii hui laRkii
one dancing girl
"a dancing girl"

b. ek laRkii jo naach rahii thii
one girl who was dancing
"a girl who was dancing"

(17) a. raam ke aane-ki baat
Ram's coming-of matter
"the fact of Ram's coming"

b. yeh baat ki Ram aayegaa
this fact that Ram will come
"The fact that Ram will come"

(18) a. raam uskaa yahãã aana nahĩĩ pasand kartaa
Ram his here coming not like
"Ram does not like his coming here."

b. raam pasand nahĩĩ karta ki vo yahãã ayee
Ram likes not that he here come
"Ram does not like that he come here."

I have linked the inability of a finite structure to appear to the left of a head to the Case Resistance Principle, which says that a category whose head is a case assigner cannot appear in a cased position because of a resulting feature clash. Stowell suggests that it is the feature +tense in finite clauses which cannot take case.

There is, however, another factor which may be relevant in this connection. Notice that CPs are right branching structures while case and theta role assignment is leftward in Hindi, as was noted earlier. This suggests that there may be a structural reason relevant to the direction of complementation/noun modification, separate from Case Resistance. Let us take the noun modifiers in (16). The prenominal participial construction is a head final construction while the postnominal finite relative clause is head initial. This means that in the first case the head noun **laRkii** "girl", and the participial head of the modifier **naachtii hui** "dancing" are adjacent when the modifier occurs to the left. In the second case, the head noun could not be adjacent to the wh operator in the relative clause if it occurred to the left. Wayne Harbert (p.c.) has suggested that there may be a general requirement for head-head adjacency in such structures. A case in point is the following examples in English where the head of the modifier, **proud** is required to be adjacent to the noun it modifies, namely **girl**:

(19) a. A girl proud of her father.
b.* A proud of her father girl.

In the case of noun modification, the relevance of adjacency is quite clear. As noted in Chapter II, syntactic adjacency between the head and the wh operator in a relative clause seems to be generally required. We might extend this to noun complements like (17), and say that the head of the **ki** clause is similarly required to be adjacent to the noun.

This adjacency requirement can explain the impossibility of extraction out of complex NPs:

(20) a.* [vo kitaab jo kisnee likhi] sabse achi hai
that book which who wrote all-than good is
"Who is the person such that the book he wrote is best ?"

b.* [vo baat ki usne kyaa kiyaa] sab jaante hai
that fact that he what did all know
"What is the thing such that all know he did it?"

The relative clause in (20a) is a barrier for the wh in-situ and the complex NP inherits barrierhood. The relative clause can only be debarrierized through adjunction at LF but that will mean that the head noun **kitaab** "book" and the wh **jo** will no longer be adjacent. The ungrammaticality of (20a) is therefore accounted for. Similarly, we can say that adjacency would be lost if the wh inside the **ki** clause in (20b) were to be extracted. There seems, then, good grounds for upholding an adjacency requirement and thereby predicting the postnominal position of modifiers which are CPs. It is not clear, however, that adjacency is also required with finite complements of verbs.

Consider the following examples in which there is a postverbal finite clause and an extraposed relative clause:[15]

(21) a. vo laRkaa jaanta hai [ki aaj chutti hai]
that boy knows that today holiday is
jo kal aayaa thaa
who yesterday came

b. vo laRkaa jaanta hai jo kal aayaa thaa
that boy knows who yesterday came
[ki aj chutti hai]
that today holiday is
"The boy who had come yesterday knows that today is a holiday"

[15] Though the wh operator in (21a) is not adjacent to the head noun, it is coindexed with a trace in the postnominal position which is.

While (21a) is perhaps more natural, (21b) in which the finite complement follows the extraposed relative is also acceptable. This means that adjacency between the matrix verb and the complement is not necessary.

Another reason why a requirement of strict adjacency cannot be maintained is that a finite complement may have wh embedded inside it. This wh, as we saw, takes narrow scope. This shows that at LF, there can be an element in spec of CP intervening between the head of CP and the inflected verb. Thus sentential complementation and noun phrase modification are subject to different constraints. This is not surprising, since there is a fundamental difference between the two cases, i.e. between noun modification structures like (16)-(17) and sentential complementation structures like (18). The first involves a predication relation while the second only requires the complement to form a chain with the pleonastic element to the left of the verb. The first may require strict syntactic adjacency while the second may require locality of a different kind.

In Chapter VII I suggested that a locality requirement for postverbal complements was needed in order to block the wh from taking wide scope. Under a modified view of subjacency an embedded wh could be extracted out of the finite complement, which is a syntactic adjunct and hence a barrier, by first debarrierizing the CP. The process of debarrierization, however, prevents the head of the CP from being properly governed by the inflected verb. The requirement of proper government has to be met in order for theta role to be transferred from the pleonastic to the postverbal CP. Thus the postverbal complement remains a scope island.

I have indicated above that the head initial character of finite structures may provide an alternative to Case Resistance as an explanation for their occurrence after the head rather than before. This aspect of the structure of finite clauses has also been noted by Wali (1988) for Marathi and Davison (1990) for Hindi. Wali notes, for example, that Marathi finite clauses which have a complementizer at the end can occur in the preverbal position and Davison notes that in Dakhini Hindi where the **ki** "that" occurs at the end of the clause also appears in argument position.[16] Without getting into the details of their analyses, we can see the descriptive generalization. In spite of this, I am reluctant to abandon the explanation based on case resistance for the following reasons.

Since finite complements of verbs are subject only to a requirement of proper government, there would be nothing to prevent them from occurring to the left of the verb if case were not at issue. Moreover, not all right branching structures are prohibited from cased positions. Consider the structure of ordinary noun phrases in Hindi. In the traditional analysis of the noun phrase they are left branching structures and would naturally pattern differently. Though this is the analysis followed in this dissertation, reference has been made to an

---

[16] Dakhini allows wh extraction out of such finite clauses, which is expected if the clause is in the canonical object position. In Marathi, however, extraction depends not just on the fact that the complementizer is to the right but also on the particular complementizer involved. The absence of wide scope readings with a complementizer like te, even though the clause is in object position, is not explained in my analysis.

analysis in which the head of the noun phrase is the determiner (Abney 1987). Under the DP hypothesis Hindi noun phrases would be right branching structures.

(22) ravi-ne [us chote larke]-ko d̃aaTaa
Ravi that small boy ACC scolded
"Ravi scolded that small boy."

In (22) the determiner **us** is the head of the noun phrase, but it is not adjacent to the case assigner, namely the verb **daaTaa** "to scold". The fact that noun phrases but not CPs can occur in cased positions cannot be simply a matter of directionality if the structures of DP and CP are indeed parallel. The relevant difference between the two may be that the head of DP allows case to percolate down to the noun. That is, the verb must discharge case to the head noun and it is able to do so because the determiner as well as ordinary adjectives can take case features. This is shown by the fact that the determiner, the adjective and the head are all in oblique case in (22). In the case of finite structures we could say that the head of CP, namely C_o, does not allow case to percolate down and that even if it did the assignment of case to I° would result in a feature clash. Thus, though there may be a correlation between the head initial character of finite structures and the case resistance, at this point I do not have an explicit account of it.[17] For this reason I have adopted the notion of case resistance as presented in Stowell (1981).

[17] Davison (1990) tries to correlate directionality and case resistance but there are serious problems with some of her assumptions. For example, she generates **ki** in spec of CP. This is problematic since it is unclear where embedded wh's would move to, as they must in order to have a narrow scope reading.

The second issue that I want to touch upon is the impact of CRP on wh extraction in languages like English and Chinese. The CRP predicts that finite complements of verbs such as "know" in any language cannot appear in the direct object position. And if the account for Hindi generalizes we would predict that all finite complements would be scope islands. This, of course, is simply not the case. Chinese, for example, readily allows extraction out of finite complements at LF, as shown by (23), repeated below:

(23) ni zhidao ta zuo-le sheme
you know he did what
"What do you know he did?"
"You know what he did."

One possibility is to say that CRP does not apply to Chinese. Another is to consider the absence of CRP effects on wh extraction as a reflex of some independent aspect of Chinese phrase structure. If we follow Huang (1989) in analyzing the complement in (23) as a CP dominated by NP, a principled explanation for the difference between Hindi and Chinese suggests itself. If the CP is dominated by NP the CRP will obviously not apply and the complement will remain in the position L-marked by the verb. Wh extraction therefore does not involve a subjacency violation.

A more problematic case is the effect of CRP on wh extraction in English. Stowell argues that the finite complement in English is actually extraposed to the end of V′ and forms a chain with a trace which is in object position and absorbs case. In Hindi we saw that finite complements are adjoined to IP. Being in adjunct position, they do not allow wh extraction since they are not L-marked by the verb. The first fact that needs to be explained is why finite clauses in languages like English allow wh extraction, as demonstrated by (24):

(24) What$_i$ does everyone [know t_j [that he did t_i]$_j$] ?

Appealing to the CRP in order to explain the position of complementation and hence the scope facts for Hindi obviously calls for an explanation of the difference in extraction between Hindi and English. One possibility is that extraction in English precedes extraposition, so that the difference between the two languages becomes apparent only because of the level at which wh extraction takes place. That is to say, wh extraction occurs at a point in the derivation when the complement is still in the L-marked position.

It is worth noting that there are constructions in English which have an overt pleonastic and that these constructions do not allow wh extraction. If these complements are base-generated in adjunct position, as the presence of the overt pleonastic suggests, the absence of wh extraction is predicted under the present account:

(25) a. Mary expects it that John will hire Bill.

b.* who$_i$ does Mary expect it$_j$ [$_{CP}$that John will hire t_i]$_j$?

Constructions like this have been argued by Postal and Pullum (1988) to involve pleonastics in subcategorized positions. Thus there seems to be a close connection with the Hindi data. However, there are also some differences which warns us against conflating the two cases.

For Hindi, I suggested that wh extraction is ruled out of finite clauses which are islands because the head of the complement must be properly governed by the inflected verb in order for it to inherit theta role from the pleonastic. The process of extraction involves adjunction, something which prevents proper government of the head of CP by the inflected matrix verb. A piece of supporting evidence was the fact that two finite clauses could not be conjoined. The CP dominating the two conjuncts interfered with the requirement of proper government. Now, if the reason for ruling out extraction in cases like (25) was the same, we would predict something similar for English. This obviously is not the case, as shown by (26):

(26) Mary expected it that John would hire Bill and that Sue would hire Jane.

Clearly, then, English finite clauses even when they appear in adjunct position do not need to be properly governed by the inflected verb. We must look for another reason for ruling out extraction.

One difference between English and Hindi is that in English the complement and the pleonastic are both within the same maximal projection, namely VP (Stowell 1981). Since the pleonastic is identified with the complement in adjunct position by the time the VP is interpreted, one can speculate that because of this the dependency between the two elements does not involve elements in I°.

This, of course, raises another question. If finite clauses in English move from direct object position to a VP adjoined position in order to avoid CRP, why cannot Hindi finite clauses do the same? The only expected difference would be that this adjunction in Hindi would be to the left of VP rather than the right but we would not predict this to affect the extraction facts. It is unclear to me why head final languages like Hindi would disallow adjunction to the left of VP resulting in the finite complement being attached to IP. This too is left for future research.

I showed in the previous chapter that Hindi wh phenomena presents several problems for current assumptions about the syntax of questions. In particular, the existence of pleonastic elements in argument position linked to actual complements in adjunct position was critical to the interpretation of wh embedded in finite complements. This chapter introduced a type of construction which could not be explained within the standard theory. An analysis for the scope marking strategy was made possible by incorporating the notion of pleonastic wh operators which need to bind variables in a lower clause in order to avoid being vacuous.

The investigation of Hindi questions in these chapters introduces data that challenge standard assumptions. In that sense, it raises more issues than it resolves. In the next chapter, we will consider another problem that the Hindi data present for current syntactic and semantic accounts of questions.

CHAPTER IX

THE SEMANTICS OF HINDI QUESTIONS

9.1. The Issues

In the previous chapter I discussed the syntactic properties of Hindi questions. In this chapter I want to turn to semantic issues. There are two problems in particular that I want to address here. The first problem is one that I discussed in connection with relative clauses. It has to do with the fact that a question with a wh expression of the form "which N'" has a uniqueness implication whereas a question with more than one such NP has a bijective reading. The relevant English examples are given in (1). The Hindi facts are identical:

(1) a. Which girl saw John ?
    b. Which girl saw which boy ?

This phenomenon is well-known but it has not been sufficiently addressed in some of the important semantic theories of questions. In Chapter V I gave a semantics for relative clauses which accomplished the switch from a unique reading for a relative clause with one wh NP to a bijective reading for those with more than one. In this chapter I want to extend the semantics for relative clauses to questions. In the first part of this chapter I will review four theories of questions, namely Higginbotham and May (1981), Karttunen (1977), Engdahl (1986) and Groenendijk and Stokhof (1984). I will focus primarily on this aspect of their analyses though I will try to give some idea of their position within the general theory of questions. I will then propose a semantics that captures the switch from uniqueness to bijection noted in (1) above and show how it differs from earlier accounts.

The second problem I want to address arises specifically from our discussion of Hindi questions in Chapter VII. A recognised heuristic for analyzing questions is in terms of their answers. For example, the question in (2) is considered ambiguous since it can be answered in two ways, as was noted by Baker (1970).

(2) a. who knows [where Mary bought what]
b. John does.
c. Well, John knows where Mary bought the book andBill knows where she bought the pen.

Under current assumptions, the individual answer in (2b) represents the reading in which only **who** is in matrix spec while the pair list answer in (2c) represents the reading in which **what** has also moved to matrix spec.

If we look at the Hindi counterpart of (2), given in (3), we see that it too allows for a pair list answer:

(3) a. kaun jaantaa hai ki merine kahãã kyaa kharidaa
who knows that Mary where what bought
"Who knows where Mary bought what?"

b. ravii

c. ravii jaantaa hai ki merine kahãã kitaab
Ravi knows that Mary where book
khariidii aur raam jaantaa hai ki usne kahaa
bought and Ram knows that she where
kalam khariidaa
pen bought

Given the standard approach to pair list answers, we would conclude that (3) should be associated with two LFs, on a par with (2). This, however, is a problem. In Chapter VII we saw that Hindi wh expressions inside finite complements cannot take scope outside the embedded clause. This is illustrated by the impossibility of a direct question interpretation for (4):

(4) ravii jaantaa hai merine <u>kahãã</u> <u>kyaa</u> khariidaa
Ravi knows Mary where what bought
"Ravi knows where Mary bought what."

The facts of Hindi clearly suggest that an alternative analysis of pair list answers for questions like (2) and (3) is called for. In the second part of this chapter I present an analysis of pair list answers, showing that they can be treated adequately without forcing the scope interaction between two wh expressions that the movement analysis depends on.

This chapter is organized as follows. In section 9.2 I review the way in which the problem of uniqueness vs. bijection is addressed in current semantic theories. In section 9.3 I present a semantics for questions that I believe makes the right distinctions. In section 9.4 I turn to the issue of pair list answers with embedded questions and show that there are several problems, other than the one mentioned above, with the standard view. In section 9.5 I outline an alternative approach to pair list answers. In section 9.6 I discuss a problem which remains in all theories of questions.

9.2. Uniqueness vs. Bijection: A Review

In this section I want to discuss four theories of questions with a view to determining how they treat the issue of uniqueness vs. bijection in questions. The phenomenon I am interested in is illustrated in the following paradigm:

(5) Who is coming to the party ?
(6) Which girl is coming to the party ?
(7) Which girl saw which boy ?

If we follow the standard practice of analyzing questions in terms of their answers, we can determine the following facts. There is no uniqueness presupposition in (5) since it can easily be answered by something like "John" or "John and Bill" or "John, Bill, Mary...", depending on the situation. Equally clear is the fact that (6) implies uniqueness.[1] The only appropriate answer to it should name a single girl such as "Mary". In a situation in which more than one girl is coming to the party, the answer would have to explicitly deny the presupposition of uniqueness "Well, actually more than one girl is coming. Mary, Sue and Joan will be there". Moving on to (7), it is well accepted that it lacks the uniqueness associated with questions like (6). That is, it is very easy to answer the question with mulitple pairs of girls and boys such as "Joan saw Bill and Mary saw John." What is controversial about such questions is whether the relation it characterizes is bijective. That is, is it possible for (7) to be answered with "Joan saw Bill and John" or "Joan and Mary saw Bill?" I argued in Chapter V that, in fact, multiple wh questions have a bijective reading which needs to be accounted for. Without repeating the arguments here I will simply assume that an adequate theory of questions should account not only for the absence of a uniqueness presupposition for multiple wh questions but also for their bijective reading.

---

[1] I leave out of the discussion questions in which a singular wh term cooccurrs with a universal term. Questions like (i) are known to have a pair list reading, akin to multiple wh structures:

(i) Which girl does every boy like?

For present purposes an account based on quantifying in, such as in Groenendijk and Stokhof (1984), will suffice though clearly there are problematic aspects to the account.

It is quite clear from (5)-(7) that a discussion of uniqueness is relevant to a formal account of questions. The point to settle, of course, is whether the uniqueness of wh expressions should be considered part of the semantic representation or whether it should be treated as a pragmatic effect dependent on extralinguistic factors. Although this is a dissertation about Hindi, I will use only English examples since the facts are essentially the same.[2]

The most extensive treatment of unique and bijective readings of questions is Higginbotham and May (1981). According to them a question like (5) has an LF of the form:

(8) For which people x, x is coming to the party.

The question corresponding to this is the set S of theories of the following form: $(\Phi(x),a)$, where D is the domain of individuals and $a \epsilon D$ and $\Phi(x)$ is the LF of (8). Each assignment to x represents a theory. An answer is a sentence that is incompatible, i.e. logically inconsistent, with at least one theory contained in the question. An answer like "John was in the hospital" is inappropriate because it is not inconsistent with any of the theories in the question expressed by (8). "John and Mary are coming to the party", on the other hand, is an appropriate answer assuming that such is the case, because its

---

[2] Hindi wh expressions can be reduplicated:

(i) tumNE kyaa kiyaa
you what did "What did you do ?"

(ii) tumNE kyaa-kyaa kiyaa
you what-what did "What all did you do ?"

I am concerned only with the non-reduplicated basic forms whose semantics are similar to English. The reduplicated forms obviously cancel out any possible uniqueness presuppositions. As such, they do not bear on the issue that I am focusing on.

truth is incompatible with those theories which assign falsehood to (8) when a has the value John or Mary.

Moving on to questions with wh expressions of the form "which N'" such as (6), Higginbotham and May claim that the uniqueness of such questions can be captured by assuming that the singular requires the inclusion in a question only of those theories such that one pair (x is coming to the party,a) is assigned truth. So (6) will be associated with an LF which presupposes that if a theory $T \epsilon S$, then T assigns truth to exactly one individual (x is coming to the party, a) where a is a girl in the domain. This means that the true part of T is a singleton.

Their account of questions can be extended to multiple wh quite easily since theories can be built up recursively. The problem, as they note, is that under the normal extension mulitple wh questions like (7) end up having the same uniqueness presupposition that single wh questions have. That is, the LF associated with (7) (x saw y,(a,b)) assigns truth to exactly one pair of individuals. This, of course, does not capture the bijective reading of (7). In order to do so they propose that a rule of quantifier absorption may apply optionally at LF:

(9) $[WH\iota x$: x a girl$]$ $[WH\iota y$: y a boy$]$ x saw y
$\Longrightarrow$ $[WHx,y$: x a girl & y a boy$]$ x saw y

In (9) two unary quantifiers which are syntactically adjacent are combined to form a single binary quantifier. They then define a semantics for absorbed polyadic quantifiers which yields a bijective reading for (7).

We see that Higginbotham and May encode uniqueness and bijection into the semantics of questions. As such, their account adequately characterizes the paradigm in (5)-(7). The primary reason for not adopting their semantics in Chapter V was the fact that it did not apply to correlatives. We saw that absorption could not be used to interpret relative clauses since polyadic quantifiers under this analysis are built up out of monadic ones. The multiple relatives in Hindi do not have monadic quantifiers which can be an input to absorption. Moreover, there are other reasons why absorption is not an appealing idea. For one thing, it involves a syntactic operation at LF that does not have enough independent motivation. It is also non-compositional in nature since the meaning of the polyadic quantifier is not built up out of the meanings of the unary quantifiers. For these reasons the semantics proposed by Higginbotham and May has not been widely accepted.

A more influential theory of questions was proposed in Karttunen (1977) who argued that a question denoted the set of propositions which jointly constituted the complete true answer to that question.[3] Briefly, in his account the question in (5) would denote the following:

(10) Who is coming to the party? =
$\lambda p\ \exists x\ [{}^{\vee}p\ \&\ p = {}^{\wedge}\text{come-to-party}'(x)]$

That is, the denotation of (5) is the set of true propositions that state that some individual is coming to the party. Thus if John and

[3] The idea that questions denote sets of propositions was originally proposed by Hamblin (1973). Karttunen's contribution was to restrict the set to true propositions.

Mary are coming to the party the question will denote $\{p_1, p_2\}$ where p_1 = $\underline{{}^\wedge j \text{ is coming to the party}}$ and p_2 = $\underline{{}^\wedge m \text{ is coming to the party}}$.

Wh expressions of the form "which N'" would simply add a condition so that only individuals who are in the extension of the common noun would be considered. The translation of (6), for example, would be $\underline{\lambda p\, \exists x\, [girl'(x)\ \&\ {}^\vee p\ \&\ p={}^\wedge come\text{-}to\text{-}party'(x)]}$. This will prevent p_1 from being in the denotation of the question, but it will not prevent another proposition $\underline{{}^\wedge sue \text{ is coming to the party}}$ if this happens to be true in some situation. It is clear that the uniqueness associated with (6) is not part of the semantic representation of a question in Karttunen's theory; it would have to be considered a conversational implicature. It is also obvious that the bijective reading of (7) is not encoded in this semantics. Karttunen was not concerned, of course, with this aspect of the semantics of questions. His primary concern was to solve the problem left open by categorial theories of questions in which the logical type of the question varied with the type of the wh expression. Thus a question with "who" would be of a different type from a question with "when" since one would abstract over an individual variable, the other over a variable of adverbial type. Similarly, constituent questions with one wh differed in type from those with more than one, and all constituent questions were of a different type than yes/no questions. This meant that verbs that embed indirect questions had to be analyzed as belonging to a family of types.[4] By making questions denote sets of propositions,

---

[4] See Hirschbuhler (1978) for a suggestion about resolving the ambiguity by using Parson's notion of floating types.

Karttunen provided a uniform semantics for different types of direct and indirect questions. Due to the intuitive appeal of this idea the propositional theory of questions is now accepted as fundamentally correct.

Engdahl (1986) follows Karttunen in taking questions to denote sets of propositions. She departs from Karttunen, however, in proposing that wh expressions correspond to functional or relational variables rather than individual variables. She draws attention to the fact that questions can be answered with a functional answer. For example, (11a) can be answered by (11b) in which the value of "his" varies with the individual concerned:

(11) a. Which woman does everyman love ?
b. His mother.

This suggests that the universal term takes wider scope than the wh expression. That is, **everyman**, in Karttunen's theory, would have to be quantified in. This move is problematic as noted by Karttunen himself. A technical solution to the problem was given in Karttunen and Peters (1980) but there still remained problems with the general approach to functional readings, as pointed out by Engdahl. She argues, quite convincingly, that functional answers are available even when quantifying in a universal term is factored out. For example, the following can be answered truthfully with a functional answer without having a particular Englishman in mind:

(12) a. Who do you expect an Englishman to admire most?
b. His mother.

In order to account for the functional reading of questions, Engdahl proposes that the wh quantification rule existentially bind a functional variable. Under her account, (11a) would have the following translation:

(12) c. $\lambda p\ \exists f\ [\forall x(woman(f(x))\ \&\ {}^{\vee}p\ \&$
$p={}^{\wedge}\forall z(man(z) \dashrightarrow love(z,f(z)))]$

This includes every true proposition such that there is a function whose range is a woman and for every man, that man loves the individual with whom that function links him. There could, of course, be constant functions from men to a particular woman which would be expressed by the individual answer. Or there could be functions which do not correspond to any natural language description. In such cases, the appropriate answer, according to Engdahl, would be a pair list answer. Thus in Engdahl's system all three types of answers are derived from a single representation.

Turning to the issue of uniqueness in (11a), note that the answer in (11b) suggests that in the particular situation there is only one such function connecting men with the women they love, namely the function "mother-of". There could, of course, be situations in which men may love their mothers and their wives. The question would then contain two propositions and the complete true answer would be "His mother and his wife". This clearly is an odd answer, since it does not respect the uniqueness implication present in "which woman". Engdahl seems to suggest that the uniqueness implication in individual and functional answers is rather weak and should be treated in pragmatic terms. Engdahl's view of uniqueness in single wh questions is influenced by the fact that she does not accept that multiple wh structures involve bijection. She thinks of multiple wh questions as cancelling out whatever uniqueness is implied by single wh questions.

By leaving out uniqueness from the meaning of questions, she obtains a reading for multiple wh structures like (7) in which several girls see several boys without any problem. Given her stand on lack of bijection, this is an adequate characterization of multiple questions. As argued in Chapter V, however, I disagree with Engdahl on this point. As such, I consider it a weakness of her theory that uniqueness is not enforced in questions like (6) and that bijectivity is not maintained in questions like (7). In this respect, her theory is equivalent to Karttunen's.

Groenendijk & Stokhof (1984) depart from Karttunen in claiming that questions denote propositions rather than sets of propositions. Their modification of the propositional theory introduces variables over worlds, so that it is possible to abstract and quantify over them. This, as we will see, allows them to represent the meanings of questions as sets of worlds, i.e. propositions. This makes the semantic type of an indirect question the same as the semantic type of a non-interrogative complement. As they point out, verbs like "know" which can take either "that" complements or indirect questions can therefore be analyzed as having a single semantic type. This theory thus yields a simpler treatment of question embedding verbs than one which takes indirect questions to be sets of propositions. Karttunen, for example, needs meaning postulates to show the connection between the verb "know" which takes a proposition and the verb "know" which takes an indirect question.

A second question adressed by Groenendijk and Stokhof is the issue of functional answers discussed by Engdahl. They argue that conflating individual, pair list and functional answers is problematic since the conditions under which one answer becomes available are not the ones under which the others are available. They therefore propose three different representations for the three readings of questions.

Neither of these two points, however, are directly relevant to the issue of uniqueness that I am concerned with here. Let us see how the semantics provided by Groenendijk and Stokhof deals with the problem. According to them, the meaning of a question like (6) would be the following:

(13) $\lambda i[\lambda x\ girl(x)(a)\ \&\ come\text{-}to\text{-}party(x)(a) =$
$\lambda x\ girl(x)(i)\ \&\ come\text{-}to\text{-}party(x)(i)]$

The question in (6), under this account, denotes that set of indices at which the set of individuals who are girls and are coming to the party are identical to the set of individuals who are girls and are coming to the party at the actual world. That is, the question denotes a proposition and not a set of propositions. Note, however, that there is nothing to restrict the set of girls coming to the party at the actual world to one. As in the case of Karttunen and Engdahl, the theory of questions proposed by Groenendijk and Stokhof must rule out non-unique situations in the pragmatics. And like the others, their semantics also does not get the bijective reading of multiple wh structures.

We see then that the three propositional theories of questions discussed are similar in that they do not encode uniqueness and bijectivity in the semantics. This seems to me an inadequacy since it is not clear what conversational principles could be used to get these facts. For example, one could suggest that the use of a singular NP is a pragmatic signal of uniqueness but this would leave unexplained the fact that the same signal is not given in multiple wh structures. Furthermore, it is completely unclear how bijectivity in multiple wh structures could be obtained under a pragmatic approach.

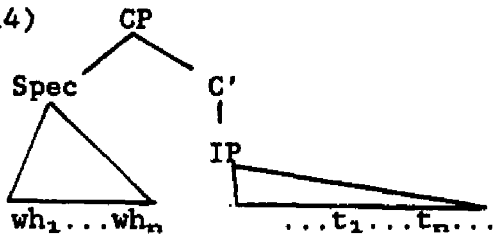
9.3. Uniqueness vs. Bijectivity: The Proposal

It seems to me that a satisfactory theory of questions would be a propositional theory which included uniqueness and bijection in the semantic representation. I will present below a semantics for questions which accomplishes this.

I will follow Karttunen in analyzing questions as sets of propositions. The modification that I make to his theory in including uniqueness and bijection, however, results in a semantics which we will see departs from the original in certain ways. Though I will concentrate on Karttunen's theory of questions, I believe that uniqueness and bijectivity can also be encoded within a system like Groenendijk and Stokhof's and I will briefly show how it can be done.

Let us begin by considering questions like (6) in which the wh expression is of the form "which N'". The question formation rule that I propose is given in (14). I should point out that this schema is essentially the same as the schema I proposed for interpreting relative clauses in Chapter V. This seems to me a positive aspect of the semantics given the similarity between questions and relative clauses across languages:

(14)



$\textbf{QUES*}_n$ $[[wh_1 \ldots wh_n][C']] = \lambda p\ \exists x_1 \ldots \exists x_n\ [x_1 = \iota x_1(N''(x_1)\ \&\ IP) \ldots\ \&\ \ldots\ \&\ x_n = \iota x_n(N''(x_n)\ \&\ IP)\ \&\ {}^{\vee}p\ \&\ p = {}^{\wedge}IP]$

According to (14) $\textbf{QUES*}_n$ takes wh operators in spec and the open sentence denoted by IP and yields a set of propositions. Each wh expression existentially quantifies over an individual variable inside IP, as in Karttunen. However, the iota restricts variable assignments to those that satisfy uniqueness. Applied to (6), (14) yields the following:

(15) $\lambda p\ \exists x[[x = \iota y(\text{girl}(y)\ \&\ \text{come-to-party}'(y))]\ \&\ {}^{\vee}p\ \&\ p = {}^{\wedge}\text{come-to-party}'(x)]$

This formula lets into the propositional set all propositions of the form "x comes to the party" iff x is identical to a unique individual who satisfies the descriptive content of the wh NP and the predicate in the open sentence. In situations where there is no unique individual with the relevant properties, we may assume that the iota picks out a dummy object.[5] There will obviously be no x identical to this object so that the propositional set will be empty. Thus in situations where uniqueness is satisfied, there will be a single proposition in the set, namely the one in which the unique individual is assigned to the existentially quantified variable. In every other situation the set will be empty.

---

[5] See discussion in Chapter V for a similar strategy in evaluating relative clauses in situations where uniqueness is not satisfied.

For clarity, let us evaluate (15) in the following model:

M_1	w1	w2	w3
Girl	Mary, Sue	Mary, Sue	Mary, Sue
Boy	John	John	John
Came	Mary, John	Mary, Sue	
Sing	John		

Let us check if (15) lets in the right propositions into the set. Some propositions to consider would be the following:

p1=^m comes to the party
p2=^j comes to the party
p3=^j sings
p4=^s comes to the party

When evaluated at w1, p1 will be in the set because m is an x such that x is a unique girl who comes to the party and the proposition '^mary comes to the party' is true and has the same value as 'x comes to the party' at all worlds, for x=m.

p2 will not be in the set because the only x that makes the first conjunct true will not make the last conjunct true.

p3 will not be in the set for the same reason as p2 and similarly p4 will not be in the set. This means that at w1, the question "Which girl is coming to the party?" will denote the singleton set containing p1. It is easily verified that at w2 and w3 it will denote the empty set, as suggested above.

Let us turn now to the issue of bijectivity in multiple wh questions and see if (14) gets the results we want. (7), for example, translates into the following:

(16) $\lambda p\ \exists x\ \exists y\ [\ [x=(\iota z\ (girl'(z)\ \&\ saw'(z,y))\ \&\ y=(\iota z\ (boy'(z)\ \&\ saw'(x,z))]\ \&\ {}^{\vee}p\ \&\ p={}^{\wedge}saw'(x,y)]$

This formula will let into the set any proposition of the form "x saw y" iff x and y are the unique pair that satisfy the descriptive content of the wh NPs and the relation expressed by the open sentence. The formula allows for more than one proposition since uniqueness of x is relativized for a value assignment to y and vice versa. Let us test this in a model to see if bijectivity is indeed enforced:

	w1	w2	w3
Girl	Mary, Sue	Mary, Sue	Mary, Sue
Boy	John, Bill	John, Bill	John, Bill
Saw	<m, j> <s, b> <j, m>	<m, j>	<s, b>

Let us consider the following propositions:

p1=^m saw j
p2=^s saw b
p3=^m saw b
p4=^j saw m

When we evaluate (16) at w1 we get the following results:

p1 will be in the set when x=m, y=j.
p2 will be in the set when x=s, y=b.
p3 will not be in the set because the proposition is not true.
p4 will not be in it because the only assignments that make the first conjuct true are x=m, y=j or x=s, y=b. p4 is not identical to ^saw(x,y) for either of these assignments.

Thus we see that the semantics outlined here successfully captures the two things we wanted, uniqueness in the case of single wh NPs with common nouns and bijectivity in the case of multiple wh NPs with common nouns.

So far we have dealt with singular wh expressions with the general form "which N'". It is easy enough to extend this to plural NPs by assuming the theory of plurals in Link (to appear) and Landman (1989) which includes groups in the domain of individuals. As in the case of relative clauses, we simply have to assume that the iota is defined on the supremum of the set rather than on absolute uniqueness and we restrict the interpretation of singular NPs to atomic individuals and that of plural NPs to plural individuals. A question like "Which girls came?" will also denote a singleton set. Specifically, the set which contains the proposition "^x came" where the assignment function gives x the value of the maximal plural individual who is a girl and came. For example, if Mary and Sue came, the only proposition in the set will be "^m+s came". The evaluation of multiple wh questions with plural NPs follows as expected.

Let us now turn to questions with wh expressions of the form "who" and "what". These differ from NPs like "which N" in not having a uniqueness implication. As such, there are two possible ways of interpreting questions with such wh expressions. One possibility is to remove the restriction to uniqueness in the translation. There is an obvious problem in taking this tack. We would have to posit two different question formation rules in the grammar, one which encodes uniqueness and one which does not. Though this can be done technically it seems an undesirable move. It would be preferable if there could be a single rule to interpret both kinds of wh expressions. And in fact, this can be done quite easily. If we retain the restriction to iota but interpret these NPs as lacking a specification about singular or plural individuals I believe we can get the results we want. If (14) were applied to (5), for example, we would get:

(17) $\lambda p\ \exists x\ [x{=}\iota y\ (\text{person-(s)}'(y)\ \&\ \text{come-to-party}'(y))\ \&\ {}^{\vee}p\ \&\ p{=}{}^{\wedge}\text{come-to-party}'(x)]$

If this were evaluated in a model in which two people, John and Mary, were coming to the party the iota would pick out the plural individual j+m. While the proposition "John and Mary are coming to the party" would be in the set, the propositions "John is coming to the party" and "Mary is coming to the party" would not be. If it were evaluated in a model in which only one individual, John, was coming to the party the iota would pick out the atomic individual j. In either case there would be only one proposition in the set. Specifically, "^x came" where x has the value of the maximal individual, singular or plural.

Before concluding this section, let me put the modifications I have suggested in perspective. I have retained from Karttunen the insight that a question denotes a set of propositions but in forcing the existentially quantified variable to be unique I have ensured that single wh questions will always denote singleton sets while multiple wh questions may denote sets with more than one member. We will see in the next section that this result can be exploited in explaining a phenomenon that would otherwise remain elusive.

While I have argued for a modification of Karttunen's theory I do want to point out that a similar modification is also possible within Groenendijk & Stokhof's theory. Briefly, the translations for (5)-(7) would be the following:

(18) $\lambda i\ [\lambda y[y{=}\iota x(\text{person-(s)}(x)(a)\ \&\ \text{come}(x)(a))] =$
$\lambda y[y{=}\iota x(\text{person-(s)}(x)(i)\ \&\ \text{come}(x)(i))]]$

(19) $\lambda i\ [\lambda y[y{=}\iota x(\text{girl}(x)(a)\ \&\ \text{come}(x)(a))] =$
$\lambda y[y{=}\iota x(\text{girl}(x)(i)\ \&\ \text{come}(x)(i))]]$

(20) $\lambda i\ [\lambda y\lambda z[y{=}\iota x(\text{girl}(x)(a)\ \&\ \text{see}(x,z)(a))\ \&$
$z{=}\iota x(\text{boy}(x)(a)\ \&\ \text{see}(y,x)(a))] =$
$\lambda y\lambda z[y{=}\iota x(\text{girl}(x)(i)\ \&\ \text{see}(x,z)(i))\ \&$
$z{=}\iota x(\text{boy}(x)(i)\ \&\ \text{see}(y,x)(i))]]$

In each case the question denotes a proposition. In (18), the proposition is that set of indices at which the unique maximal person who is coming to the party at that index, whether singular or plural, is identical to the unique maximal individual, singular or plural, who is coming to the party at the actual world. The only difference between (18) and (19) is that the latter specifies that the only individuals under consideration are atomic individuals in the extension of the predicate **girl**. The way of obtaining bijectivity in (20) is also familiar. The modification to the original theory involved in achieving uniqueness and bijectivity is minimal. Instead of comparing sets of individuals we now compare sets of maximal individuals only. This amounts to comparing singleton sets in the case of single wh questions and multiple pairs of uniquely linked individuals in the case of multiple wh questions. Encoding uniqueness into the semantics, then, is neutral on the question of whether questions should denote propositions or sets of propositions.

As far as uniqueness and bijectivity is concerned the modification of Karttunen's theory and the modification of Groenendijk and Stokhof's theory are equivalent. In the next section we will see that including uniqueness/bijection into the semantics may be advantageous in dealing with pair list answers in the context of embedded questions. Though I will use the modified Karttunen theory I believe similar results would be achieved within a modification of Groenendijk and Stokhof's theory.

I have not discussed functional readings of questions but I assume that they require quantifying over functional variables. The ambiguity of questions between individual and functional readings assumed here is similar to the one proposed by Groenendijk and Stokhof. I am less sure whether questions have a third reading, namely the pair list reading, as claimed by Groenendijk and Stokhof. Notice that though functional and individual answers can be conjoined, pair list answers are never conjoinable:[6]

(21) a. Who does everyman love ?
b. Mary and his mother.
c.* His mother, and John loves Mary and Bill Sue.
d.* Mary, and John loves Sue and Bill Jane.

This leads me to think that pair list answers do not have the same status as individual and functional answers and that they may be a secondary reading. At this point, however, I have not worked out how this reading could be derived so I will leave this as an open question.

9.4. The Scope Theory of Pair-list Answers

Let us turn now to the second problem with which this chapter is concerned, namely the possibility of pair list answers with embedded questions. It was pointed out by Baker (1970) that a question like (22) could be answered with an individual or a pair list answer:

(22) Who knows where Mary bought what?

Baker proposed that the matrix comp contained a question morpheme which could bind either the wh in the matrix clause or the wh in the matrix as well as the one in the embedded clause. The essential insight of Baker's analysis is maintained within current ways of viewing wh movement. (22) is analysed as having two LFs which differ in the scope of the wh in-situ.

---

[6] This observation is also made in K. Yoshida (1990).

22. a. $[_{CP}$ who $[_{IP}$ . . .$[_{CP}$ what where $[_{IP}$ . . .$]]]]$

b. $[_{CP}$ what who $[_{IP}$ . . .$[_{CP}$ where $[_{IP}$ . . .$]]]]$

(22a), the LF in which "what" moves to lower Spec, yields the individual answer and (22b), the LF in which it moves to matrix Spec, yields the pair-list answer. It is assumed that an answer specifies values for all and only the whs in the matrix spec.

It is an assumption of the standard view that the pair list reading of a question depends on scope interaction between two wh expressions. This means that in English pair list answers with embedded questions will only be available when the embedded question is a multiple wh question. Since the scope of a wh already in spec at S-Structure is fixed at that level, and English has obligatory wh movement, an embedded question with a single wh will never have a pair list reading.

Frameworks that do not involve wh movement and a level of LF, for example Engdahl (1986) and Groenendijk and Stokhof (1984), nevertheless have scope mechanisms which ensure that wh expressions are interpreted at the sentence level. Their interpretation of multiple wh constructions, i.e. constructions with at least one wh in-situ, encode scopal properties via scoping mechanisms such as Cooper's NP-storage (Engdahl 1986) or quantifying-in (Groenendijk and Stokhof 1984). In this sense, all theories of questions use wh movement or analogues of movement to interpret wh in-situ. In the case of sentences like (22), the scoping mechanism that would be employed would, in essence, be similar to the movement analysis of Government and Binding. So for example, at the lowest level the interpretation of "what" would be stored. It could either be unstored at the level of the lower clause, yielding an interpretation corresponding to (22a) or carried up and unstored at the matrix clause level, yielding an interpretation corresponding to (22b). This is stated explicitly in Engdahl (p.224). Thus (22), on her account, would translate as:[7]

(22) d. $\lambda p\ \exists f_1$ [person'(f_1) & $^{\vee}p$ & $p = {}^{\wedge}$know'(f1,$\lambda p\ \exists f_2\ \exists f_3$ [thing'(f_2) & place'(f_3) & $^{\vee}p$ & $p = {}^{\wedge}$buy'(m,f_2,at f_3)]))

e. $\lambda p\ \exists f_1\ \exists f_2$[person'($f_1$) & thing'($f_2$) & $^{\vee}p$ & $p = {}^{\wedge}$(know'(f1,$\lambda p\ \exists f_3$ [place'(f_3) & $^{\vee}p$ & $p = {}^{\wedge}$buy'(m,f_2,at f_3)]))

The difference between (22d) and (22e) is only in the scope of the WH operator corresponding to "what". In the first case the answer specifies values for f_1, i.e. "who"; in the second case it specifies values for f_1 and f_2, i.e. "who" and "what".

Groenendijk & Stokhof do not deal with such sentences but the obvious extension of their semantics would be along similar lines. For the purposes of this discussion, then, one can assume that there is general agreement that pair list readings in the context of embedded questions should be treated in terms of scope interaction between the matrix wh and the embedded wh in-situ. I will try to show that this approach to the problem is flawed.

The primary motivation for rejecting the scope analysis of pair list answers comes from Hindi. Recall the following fact from Hindi:

(23) raam jaantaa hai merine <u>kahaa</u> <u>kyaa</u> khariidaa
Ram knows Mary where what bought
"Ram knows where Mary bought what."

---

[7] The function need not always be a function from individuals to individuals; it can also denote an individual as in (22d-e).

As discussed in Chapter VII, the scope of wh expressions inside finite complements is clause bounded. That is, an LF like (24b) is ruled out.

(24) a. [$_{CP}$ [$_{IP}$ . . .[$_{CP}$ what where [$_{IP}$ . . .]]]]

b.* [$_{CP}$ what [$_{IP}$ . . .[$_{CP}$ where[$_{IP}$ . . .]]]]

With this in mind, consider the Hindi counterpart of (21):

(25) <u>kaun</u> jaantaa hai merine <u>kahaa</u> <u>kyaa</u> khariidaa
who knows Mary where what bought
"Who knows where Mary bought what ?"

This question can be answered with an individual answer as well as with a pair list answer. Given the standard account of questions, we are led to posit two LFs for (25), (26a) for the individual answer and (26b) for the pair list:

(26) a. [$_{CP}$ who [$_{IP}$ . . .[$_{CP}$ what where [$_{IP}$ . . .]]]]

b. [$_{CP}$ what who [$_{IP}$ . . .[$_{CP}$ where [$_{IP}$ . . .]]]]

Notice, however, that (26b) is not an option since wh movement in Hindi is clause bounded, as shown by (23).

The judgements for (23) and (25) are both equally strong. Thus we are faced with a paradox if we analyze pair list answers in terms of scope interaction. The absence of a direct question interpretation for (23) forces us to block movement of wh out of the embedded clause but the presence of a pair list reading for (25) forces the lower clause wh to take matrix scope.

I should point out that the problem does not stem from the particular analysis of Hindi questions presented in Chapter VII. We need only accept it as a descriptive fact that pair list answers are possible just in case the matrix clause contains a wh and the complement is a multiple wh question and that the scope of embedded wh is otherwise clause bounded in order to see that an alternative account for pair list readings than one involving movement, or analogous scope mechanisms, is called for.

Another argument against an account of pair list answers in terms of movement comes from languages in which all wh expressions move to clause initial position at S-Structure. Such a language is Russian. Consider (27):[8]

(27) kto znaet gdje cto Mariya kyupila
who knows where what Maria bought
"Who knows where Maria bought what?"

Even though cto "what" is in the lower spec at S-Structure it is possible to answer the question with a pair list specifying values for "who" and "what". If the scope theory is right, this would mean that there is movement of one wh from the lower spec to matrix spec in (27). Under standard assumptions, of course, LF movement does not originate in A' positions (Chomsky 1986b).

There are languages like Polish, however, in which a wh in clause initial position is able to move at LF and take scope over a higher clause. This is shown by the possibility of a direct question interpretation for questions like (28):

(28) Maria mysli, ze co Janek kupil
Mari thinks that what Janek bought
"What does Maria think that Janek bought?"

Examples like this was noted as a problem by Lasnik and Saito (1984). Rudin claims, however, that the fronted wh in (28) is not in spec but

---

[8] I am indebted to Katya Wyner for the Russian judgements.

in IP adjoined position and LF movement does not involve "comp-to-comp" position.

The possibility of fronted wh's not being in spec is significant for present purposes. If cto "what" in the Russian example in (27) is not in spec, it ceases to be an argument against the scope theory. Rudin does not discuss whether multiple fronting in Russian is a case of multiple movement into spec or movement to IP adjoined position. However, it is clear from (29) that the wh expression is not free to move to matrix spec, since a direct question interpretation is not possible.

(29) Ivan znaet gdje cto Mariya kyupila
Ivan knows where what Maria bought
"Ivan knows where Maria bought what."

The languages that Rudin identifies as having multiple wh movement into spec are Romanian and Bulgarian. Bulgarian supports the Russian results since it also allows for pair list readings with indirect questions:[9]

(30) koj znae kakvo kade e kupila Maria
who knows what where has bought Maria
"Who knows where Mary bought what?"

The evidence from such languages provide concrete evidence that the scope account is not viable.

Thus we see that in contexts like (25), (27) and (30) a pair list answer is possible even when language internal evidence clearly shows that wh movement or analogous scoping mechanisms could not be at work.

---

[9] I would like to thank Franziska Bedzyk for the Bulgarian judgement. Tina Kraskow informs me that the same facts might hold in Romanian.

Based on these considerations, we conclude that the scope theory of pair list answers with embedded questions is cannot be correct. This means that we need a way of deriving these readings which does not depend on scope interaction.

9.5. An Alternative Account of Pair list Answers

Let us see how a pair list answer to (22) can be derived without moving the embedded wh. Assuming that the only LF for it is (22a), repeated below, it will have the translation in (31):

(22) Who knows where Mary bought what?

(22)a. $[_{CP}$ who $[_{IP}$ . . .$[_{CP}$ what where $[_{IP}$ . . .$]]]]$

(31) $\lambda p\ \exists x\ [x = \iota y\ (\text{person-(s)}'(y)\ \&\ \text{know}'(y,P))\ \&\ {}^{\vee}p\ \&\ p = {}^{\wedge}\text{know}'(x,P)]$, where P stands for the indirect question in (32′)

(31′) $\lambda p\ \exists x\ \exists y[x = \iota z(\text{place-(s)}'(z)\ \&\ \text{bought}'(m,y,\text{at } z))\ \&\ y = \iota z\ (\text{thing-(s)}'(z)\ \&\ \text{bought}'(m,z,\text{at } x))\ \&\ {}^{\vee}p\ \&\ p = {}^{\wedge}\text{bought}'(m,y,\text{ at } x)]$

Let us see informally what (31) expresses. One could say that the question in (22) is that set of propositions which expresses a relation between a maximal individual and the set of propositions denoted by the indirect question. Put another way, the question is based on the following relation, $R(X,\mathcal{P})$ where R is the two-place relation "know", X the set of individuals who stand in the 'know' relation to $\mathcal{P}$, and $\mathcal{P}$ the set of propositions linking the things Mary bought to the places she bought them at.[10]

Though the relationship between the members of X and the members of $\mathcal{P}$ is not specified in the semantics, there is a conventional

[10] Note that it would be pragmatically weird to think of buying the same things in different places.

implicature that that the relation distributes down to the members of the two sets, i.e. $\forall x \epsilon X$ & $\forall p \epsilon \mathcal{P}$, $R(x,p)$.[11] Thus, if (22) is answered with "John and Bill know where Mary bought what", we would take it to mean that both John and Bill know the two propositions linking the things Mary bought and the places she bought them at. Note that the pair list answer is appropriate only in situations where the conversational implicature fails, i.e. when every member of X does not know the full set of propositions in the complement clause. We might say that the pair list answer cancels the implicature arising out of the semantic answer $R(X,\mathcal{P})$ by making explicit that the members of X know $\mathcal{P}$ jointly. The distinction between the conventional implicature of the semantic answer and the pair list answer can be understood in terms of the distinction Scha (1981) makes between true distributive and cumulative answers.[12]

In this approach to pair list answers, there is no interaction required between the matrix wh and the embedded wh. As such, the availability of pair list readings for Hindi (25), Russian (27) and Bulgarian (30) is readily accounted for.

This approach has a further consequence of interest. Kuno and Robinson (1972) observe that (32) would not be an appropriate answers to (22):

(32) a. John knows where Mary bought the pen and John knows where she bought the book.

b. John knows where Mary bought the book and the pen.

---

[11] This is parallel to the fact that "The boys know the answers" conventionally implicates that all the boys know all the answers.

[12] I thank Fred Landman for pointing this out.

These answers are actually predicted by the scope theory since the translation of an LF like (22b) has two existentially quantified variables. There is nothing to prevent one of these variables from being anchored to just one object in the world, namely John and the other from being anchored to two, namely the pen and the book.

Under the present account, of course, if X in $R(X,\mathcal{P})$ is instantiated by John, i.e. $X=\{j\}$, it follows that every member of X knows $\mathcal{P}$. The conversational implicature cannot be cancelled since it is entailed in this situation by the semantic answer. Thus the conditions under which the pair list answer becomes available cannot be satisfied.

We have seen why the distributivity-based account rules out pair list answers when the matrix wh denotes a singleton set. Let us now see if there are any constraints on the embedded question. Note that the distributivity-based account of pair list answers has not used so far the modification of Karttunen's theory proposed in section 9.3. For the cases we have considered, it could apply as well within the original theory. If we consider the constraints on embedded questions we see the advantage of using the modified version.

Compare the possibility of a pair list answer for (22) with the impossibility of a similar answer for (33):[13]

(33) Who knows which book Mary bought ?

---

[13] Of course, one can force a pair list answer if one uses "what" instead of "which book" with a lot of pragmatic lead. Out of context, however, a multiple embedded question is readily given a pair list answer but not a single wh question.

Under the scope theory of pair list answers this, of course, is no problem since S-structure movement forces the embedded clause to take narrow scope. In the approach I have suggested, however, the pair list answer is not derived by movement. The difference between (21) and (33) with respect to the availability of pair list answers therefore becomes relevant.

I should also point out that the facts of English are replicated in Hindi. Thus, (34), parallel to (33), lacks a pair list answer in contrast to (25) in which the embedded question has more than one wh expression:

(34) kaun jaantaa hai merine kaun-si kitaab khariidii
who knows Mary which book bought
"Who knows which book Mary bought ?"

Since we are dealing with a wh in-situ in this example, the unavailability of the pair list reading is also relevant to the scope theory but let me deal here with the different predictions of Karttunen's theory and my modification of it within the distributivity based account.

Under Karttunen's account multiple wh questions and single wh questions both denote sets which may have more than one member. That is, (34) could denote $\{p_1,p_2\}$, where p_1 = Mary bought a book and p_2=Mary bought a pen. If the distributivity based account of pair list answers is correct, we would incorrectly predict that (34) could be answered with "John knows that Mary bought a book and Bill knows that Mary bought a pen". Under the modified account, however, this is not possible. (34) is a single wh question which can only denote a singleton propositional set such as {Mary bought a pen+a book}.

Obviously, there is no meaningful sense in which a single proposition can be known jointly by people. Cumulative readings are available only when both arguments of the relation are plurals. Thus adopting the modification suggested for uniqueness and bijectivity also yields an explanation for the absence of pair lists in contexts like (33)-(34).

I would like to address, in this connection, a strawman argument in favor of the movement analysis for Hindi examples like (25) in which a multiple wh is embedded inside a direct question. Suppose that the scope of Hindi wh in embedded contexts is typically clause bounded but just in case there is a wh in the higher clause, it becomes possible to extend the scope of the embedded wh. This would explain, under the scope analysis, why an embedded wh can move to matrix spec in (25) but not in (23), where there is no wh in the matrix clause. To put this in intuitive terms, the absence of wide scope readings of wh in ordinary finite clauses is not ascribed to a constraint in movement per se. Rather, some language specific constraint is posited for Hindi which prevents the matrix spec from being an appropriate landing site unless it is marked +wh by a wh of its own clause. This, however, will not work since it predicts that the embedded wh in-situ in (34) should be able to take matrix scope. There is nothing to stop the embedded **kyaa** "what" from moving to matrix spec since the matrix verb can take + or - wh complements. A pair list reading should then be available. The fact that it does not have this reading suggests that pair list readings in embedded contexts are available if and only if the matrix wh picks out more than one individual, or a plural individual, and the embedded clause is a multiple question.[14]

We have seen, then, that the distributivity-based account of pair list answers accounts for a range of data that the movement account leaves unexplained. I want to turn now to an issue that might appear problematic for it. Under the movement account it was assumed that the pair list provided values for all and only the wh's in matrix spec. This accounted for the fact that the typical answer to (22) spells out the value of "who" and "what". Implicit in the distributivity-based account is the idea that the pair list does not in fact "provide values" for the embedded wh. Rather, spelling out different values for the embedded wh is a way of identifying the different propositions denoted by the indirect question. If this is the right approach to the phenomenon, we would predict that there may be situations in which the propositions could be identified in a different way.

Which wh NPs will be spelt out in the process of identifying the propositions are dependent, it seems to me, on syntactic as well as pragmatic factors. For example, typically the fronted wh is not spelt out. So, if the question is as in (35), a likely pair list answer is the one in (36). If the question is as in (37), the answer is likely to be as in (38):

---

[14] Again, I leave out from consideration questions like "Who knows where Mary bought these books" in which the embedded question has one wh and one universal term. As pointed out by Kuno and Robinson (1972) pair list answers are also possible with them. As suggested in footnote 1, I take single wh questions with universal terms to be equivalent to multiple wh questions in this respect.

(35) Who knows which book Mary bought in which store ?
(36) John knows which book Mary bought in Borealis and Bill knows which book she bought in Dalton.
(37) Who knows in which store Mary bought which book?
(38) John knows in which store Mary bought *War and Peace* and John knows in which store she bought *Satanic Verses*.

If these were the only possibilities it would seem that pair list readings are only influenced by syntactic factors and we would have to admit that the scope theory makes the right predictions. We will see, however, that pragmatic factors are also relevant in deciding if a wh will be spelt out. This issue is important in deciding between the scope theory and the distributivity-based theory of pair list answers. The scope theory, for example, rules out the possibility for a pair list answer to spell out values for all three wh's or for the matrix wh and the wh in spec of embedded CP. There is nothing in the distributivity-based theory that would prevent such answers.

Let us take the question "Who knows where Mary bought what?" and see if a context can be created in which it would be natural to identify the propositions in the embedded clause by spelling out values for "where" instead of "what". Suppose that Mary is a spendthrift and her husband is a tightwad. He comes home and finds several things strewn about and a bunch of receipts from different stores on the table. He gets mad and says, "I'm going to return all these things. Who knows where she bought what?". Mary's mother who happens to be there says, "Don't look at me, I've no idea. But I know that John gave her a ride to Sears so he would know what she bought there and I'm sure Bill knows what she bought at Rhodes because I heard her ask him to take her there."

Take another situation. A patient in a hospital develops complications because he has taken some wrong medicines. It is important to find out what he took when. He is obviously in no state to remember such things. The doctor turns to the nurse in charge and says "Who can remember when he took which medicine ?" She answers, "Well, I'm sure Nurse Jones will remember which medicine he took in the morning because she was on duty then and I think Nurse Williams would remember which medicine he took at night because she is here at that time." Both pair list answers, under the circumstances, seem fairly reasonable.

Taking this a step further, it is also possible to spell out values for all three wh's if the proper context is created. Consider the following situation. Mary has stolen some money and gone on a shopping spree. Her husband John is worried that she will get into trouble if it is discovered that she has been spending a lot of money so he discusses the problem with his trusted friend Bill. He tells him, "You know Mary has been going out to different places with her friends and spending a lot of money. I'm afraid she'll get into trouble if they start talking about it." Bill, trying to reassure him, says, "I'm sure you're worrying unnecessarily. If you can tell me who knows where she bought what I'll tell you if you have any cause for worry." "Well, Sue knows that she bought a fur coat at J.W.Rhodes, Mary knows that she bought a diamond ring from Kay's jewellers, Ann knows that she bought new boots at J.C.Penny ..." "On a waitress's salary!? I think you should get her a lawyer." It seems to me that John and Bill may be paranoid about Mary, but there is nothing wrong with John's answering Bill's question with values for all three wh expressions.

Similarly, take another situation. John is discussing with his lawyer the possibility of being charged with murder. He has confessed that if the police decide to investigate his activities on the night of the murder he could get into trouble. Before the lawyer can construct a defense case, however, he needs to know if John's activities can be accounted for during the critical period and if he might have an alibi. So he asks John, "Think very carefully now, who is likely to remember when you were doing what that night?" John answers, "Well, my wife will remember that I left the house at 9, the cashier at the corner store will remember that I bought a packet of cigarettes at 9.30, and the bartender at Cheers will remember that I came in at 10.30. But that still leaves one hour unexplained." Again, it appears that values for all three wh's are not inappropriate under the circumstances.

Such answers have normally been considered infelicitous and no doubt one needs a lot of context to get other types of pair lists than the one the scope theory proposes. The effect of pragmatic weighting is not incompatible with the distributivity theory but is definitely at odds with the scope theory (see Kuno and Robinson (1972) for some other problems with analyzing pair list answers in terms of scope).As such, there seems little doubt that the distributivity based account of pair list answers in embedded contexts is to be preferred over the scope theory.

9.6. A Remaining Problem

A problem which remains open has to do with the following fact, noted by Hirschbuhler (1978). A multiple wh question like (39) does not allow for multiple pairing but when it is embedded inside a direct question, as in (40), a pair list answer is possible:

(39) How did Mary solve which problem ?
(40) Who knows how Mary solved which problem ?

According to Hirschbuhler, "how" and "which problem" cannot cooccur in the embedded spec. He takes the availability of a pair list answer to (40) as evidence that "which book" must therefore move to the matrix spec.

It is well known that questions like (39) are not like ordinary multiple wh questions and can only be interpreted as echo or referential questions (see Comorovski (1989) for discussion) but it is not clear why this is so. A similar absence of bijectivity with certain combinations was noted in Chapter IV in correlatives.

Let us see why this may be a potential problem for the distributivity-based account. If the propositional set denoted by the indirect question does not contain multiple members, as the absence of a multiple question reading for (39) suggests, it should not be possible to give a pair list answer. The fact that it does could be taken as evidence for the scope theory. It seems to me, however, that the real problem is that we do not quite know why (39) does not have a multiple question reading. Note that the movement account cannot explain why "which problem" cannot move to its own spec. Proper government is obviously not at issue. Note also that it is as easy to answer (40) with an individual answer as with a pair list. This means that for some reason a question like (39) does not allow the two wh's to cooccur but once embedded inside another verb, this possibility opens up. Until an explanation for these facts is found it is not possible to use the data to evaluate the distributivity account. I will therefore leave this aside for now.

In this chapter I have provided a modification of the propositional theory of questions which encodes uniqueness and bijectivity into the semantic representations. The semantics for questions closely mirrors the semantics for correlatives which I had provided in Chápter V. This seems to be a good result given the close connection between questions and relative clauses, particularly quantificational relatives. I have also shown that the established view of pair list answers in the context of embedded questions as involving scope interaction between two wh expressions cannot be correct. The alternative that I suggest treats the distinction between individual and pair list readings as a semantic distinction between pure distributive and cumulative readings. A key idea behind the analysis is that pair list answers are only possible when the two arguments of the matrix verb denote plural objects, a fact that holds for cumulative readings in all contexts. Combined with the independently motivated modification of the propositional theory of questions, the analysis is able to account for a range of data that remained unexplained within the standard account.

CHAPTER X

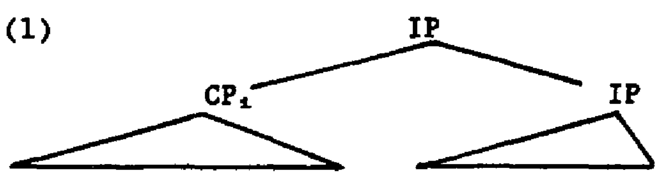
CONCLUSION

10.1. A Summary

In the preceding chapters I have analysed two types of wh constructions in Hindi, namely relative clauses and questions. The analysis of each of these constructions was carried out, to a some extent, independently. In this chapter I would like to briefly list the conclusions reached in each part and make explicit some connections between the two.

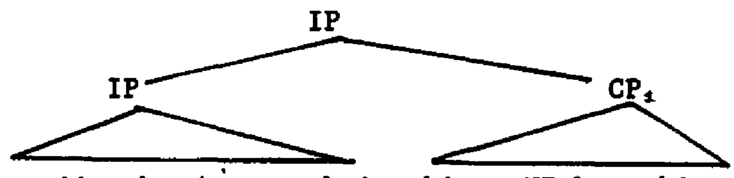
One important aspect of Hindi phrase structure that emerges from the investigation into relative clauses and questions is the impossibility of clauses, i.e. CPs to appear in argument positions. Relative clauses as well as sentential complements, it is argued, are disallowed in cased positions due to the Case Resistance Principle (Stowell 1981). As such, the grammar of Hindi instantiates two types of adjunction structures which have been the focus of this study. In each instance the adjoined clause is coindexed with an argument position inside IP, as shown below:

(1)



<u>jo laRkii khaRii hai</u> vo_1 lambii hai
which girl standing is   she tall is
"Which girl is standing, she is tall."

(2)



(a) ravii $\underline{\text{yeh}}_i$ jaantaa hai ki anuNE $\underline{\text{kyaa}}$ kiyaa
Ravi this knows that Anu what did
"Ravi knows what Anu did."

(b) ravii $\underline{\text{kyaa}}_i$ jaantaa hai ki anuNE $\underline{\text{kyaa}}$ kiyaa
Ravi what knows that Anu what did
"What does Ravi know that Anu did?"

In both these structures the argument position is occupied by a syntactic variable, vo "that" in the first case and **yeh** "this" or **kyaa** "what" in the second. This position is coindexed with a clause in adjoined position, a relative clause to the left of IP in the first case and a sentential complement to the right of IP in the second. At a syntactic level the two structures may be classified together as cases of variable binding. At the semantic level, however, they correspond two distinct types of variable binding.

It was argued, in particular, that in structures like (1) relative clauses are base-generated topics which function like quantifiers. The position at which they are generated is the canonical position at which quantified NPs are assigned scope. The semantic type of an adjoined relative clause is also argued to be that of other quantified NPs, namely a generalized quantifier. This meaning is derived by analyzing the wh element in the relative clause as a two-place operator which combines first with a common noun and then the predicate in the relative clause to yield the properties of the unique individual who is in the extension of the two. The demonstrative vo "that" is analyzed as an entity level variable which can be abstracted over at the main clause level. This, in effect, makes the main clause a property denoting term which can then be combined with the generalized quantifier meaning denoted by the relative clause via standard rules of quantification. The structure in (1) is thus isomorphic to the structures produced at LF by Quantifier Raising of quantified NPs.

This distinguishes relative clauses in adjunction structures from those which are generated inside NPs. In Hindi the latter may appear embedded or at the end of the clause in case they are extraposed. They are restrictive relatives of the kind we find in English. Semantically, they are noun midifiers, i.e. ordinary set denoting terms which may combine with common nouns to form complex predicates which when combined with determiners yield noun phrase meanings. They are distinct from the kind of relative clauses found in Hindi left adjoined structures since they are not quantificational.

It is suggested that quantificational relatives are not limited to languages like Hindi but may in fact be universal. Free relatives in English and internally headed relatives in languages like Quechua and Lakhota are shown to share certain significant properties with Hindi left adjoined relatives. As such, left adjoined relatives belong typologically with them rather than with restrictive relatives.

In the case of questions, the adjoined structure has consequences for determining the scope of wh operators embedded inside the complement. It is shown that the range of readings they allow can be determined by the type of the variable they are coindexed with. **yeh** "this" forces an indirect question interpretation while **kyaa** "what" forces a direct question interpretation.

It is shown that wh elements embedded inside the complement cannot be extracted. This is attributed to the fact that the complement is a syntactic adjunct which is not L-marked by the verb and thus forms an absolute barrier for movement. Following Karttunen (1977), it is assumed that the adjoined complement is interpreted as a set of propositions and that this meaning is associated with the position marked by the syntactic variable **yeh** "this". Taking the semantic type of **yeh** to be compatible with the meaning of the indirect question, we can interpret the complement at the appropriate position in the tree through lambda conversion. In this approach, the complement remains in adjunct position at LF. Only at the level of interpretation is its meaning inserted into the canonical object position marked by the variable. Since wh operators are assigned scope at LF, a level at which the complement is not in an L-marked position, the wh cannot be extracted. And yet the interpretive procedure ensures that the meaning of an adjoined wh complement coindexed with **yeh** corresponds to the meaning of an indirect question in English.

In order to get a wide scope reading for an embedded wh, the adjoined complement has to be linked to the interrogative counterpart of **yeh**, namely **kyaa** "what". This is argued to be a pleonastic wh operator, which is subject to quantifier raising as well as the ban on vacuous quantification, like other quantifiers. When **kyaa** is raised its trace is interpreted like a variable. However, in the interpretation tree, the trace is first identified with the adjoined clause. After lambda conversion, the variable denoted by the trace of

kyaa is replaced by the denotation of the complement. Since **kyaa** is a quantifier it needs to bind a variable. In order for an adjunction structure with **kyaa** to be well formed there therefore needs to be at least one wh in the embedded clause and, in addition, this wh needs to be interpreted as a variable bound by **kyaa**. This is derived by treating the wh in the embedded spec as an analogue of an intermediate trace bound by **kyaa** rather than as an operator. Thus the meaning of this structure corresponds to the meaning of a direct question in English.

In this approach to Hindi questions it is crucial that it be possible to treat the wh in embedded spec as operators or as intermediate traces. Whether an embedded wh will be interpreted as an operator or as an intermediate trace does not have to be stipulated. We can assume that both possibilities exist. When the variable is non interrogative **yeh**, however, the derivation in which the embedded wh is not taken to be an operator is ruled out since otherwise there will be a variable in the complement that remains free. When the variable is interrogative **kyaa** the derivation in which the embedded wh is an operator is ruled out since the pleonastic wh then has no variable to bind and remains vacuous.

The analysis of relative clauses and questions summarized above raises several issues that are significant from a theoretical point of view. In the following sections I will go over some of them.

10.2. The Semantics of Multiple Wh Constructions

A particularly interesting aspect of left adjoined relatives is the fact that they may have more than one wh element, as shown by (3) below:

(3) <u>jis laRkiiNE jis laRkeKO dekhaa</u> usne usko pasand kiyaa
which girl which boy saw she him liked
"Which girl saw which boy, she liked him"

Extending the analysis for single wh relatives to multiple relatives involves treating them as cases of polyadic quantification. In particular, it is argued that the semantic operation involved in interpreting two-place wh operators in spec of CP corresponds to a general schema which can apply to one or more such operator, yielding a quantifier whose polyadicity corresponds to the number of operators in spec. The left adjoined relative in (3) is thus analyzed as a binary quantifier which yields the set of relations obtaining between girls and boys in the "see" relation. The main clause is interpreted, extending the procedure for single demonstratives, as the 2-place relation "like". The sentence is true iff this relation is one of the relations denoted by the relative clause.

There are two aspects of this analysis of multiple relatives that are worth noting. First, empirical motivation for the existence of polyadic quantification in natural language has so far remained controversial. Polyadic quantification has been argued by Higginbotham and May (1981), for example, to be operative in multiple wh questions and Bach-Peters sentences. However, these constructions are also amenable to alternative analyses in terms of strings of unary quantifiers (on multiple wh see Engdahl (1986); on Bach-Peters sentences see Neale (1988)). Hindi relative clauses like (3) provide new and convincing evidence that polyadic quantification is indeed operative in natural language since a viable alternative analysis in terms of unary quantifiers for (3) does not seem possible.

There is a further consequence of the analysis of multiple relatives as polyadic quantifiers developed here. A well-known fact about single wh constructions vs. multiple wh constructions is that the former have a unique reading while the latter have a bijective reading. This distinction is best understood by comparing (3) with (1). In (1) the relative clause is understood to denote the properties of a unique individual who is standing and is a girl. In (3) the relative clause is understood to denote relations that obtain between all pairs of girls and boys, as long as each girl who sees a boy sees a unique boy and each boy who is seen by a girl is seen by a unique girl. The semantic operation for combining operators in spec with the IP in the relative clause yields this distinction between unique and bijective readings in a simple and straightforward way. LIFT_n, given below, provides a general schema which applies to single as well as multiple wh relatives:

(4) $\mathrm{LIFT}_n\ (\mathrm{REL}^*_1 \ldots \mathrm{REL}^*_n,\ C') = \lambda R\ \forall x_1 \ldots \forall x_n\ [[x_1 = \iota x_1(N''(x_1)\ \&\ IP) \ldots\ \&\ \ldots \&\ xn = \iota x_n((N''(x_n)\ \&\ IP)] \dashrightarrow R(x_1 \ldots, x_n)]$

This yields the set of all relations that hold between all individuals $x_1 \ldots x_n$ such that each is identical to the unique entity who satisfies the common noun in the wh phrase and the predicate in the relative clause. In the case of single relatives this enforces uniqueness. In the case of multiple relatives it allows for two readings, one in which there is a single pair of girl and boy in the relevant relation as well as one in which there are more than one such pair but each pair is unique relative to assignment of values to the other variables.

In the case of questions too, a similar procedure is adopted for interpreting single and multiple wh questions. (5), given below, is the question counterpart of (4). It takes wh operators in spec and the open sentence denoted by the IP and yields a set of propositions:

(5) $\text{QUES*}_n\ [[wh_1 \ldots wh_n][C']] = \lambda p\ \exists x_1 \ldots \exists x_n\ [x_1 = \iota x_1(N''(x_1) \ \&\ IP) \ldots \ \&\ \ldots \ \&\ x_n = \iota x_n(N''(x_n) \ \&\ IP) \ \&\ {}^{\vee}p \ \&\ p = {}^{\wedge}IP]$

This too allows for the switch from uniqueness in questions with a single wh NP of the form "which N" to bijection in questions with more than one such NP. This results in a modification of Karttunen's theory in that the set of propositions in the case of questions with single wh NPs can only contain one proposition while those with more than one such NP may contain more than one proposition.

The semantics for relative clauses and questions developed here overlaps with the work of Higginbotham and May (1981) which also addresses the issue of uniqueness vs. bijection. In their system, the semantic value of a single wh NP of the form "which N" encodes uniqueness as part of its meaning. Since the meaning of questions is built up recursively, the semantic representation of a question with more than one such NP requires there to be a unique pair of individuals in the relevant relation. In order to get the bijective reading, therefore, an optional syntactic operation is posited at LF called absorption which combines two or more unary quantifiers. In the process of absorption, the unary quantifiers lose the uniqueness requirement. A semantics for the absorbed polyadic quantifier is then defined which gets the appropriate bijective reading.

The account of polyadic quantifiers developed here is equivalent to the one given by Higginbotham and May in the sense that it captures the same range of readings but the two approaches make rather different theoretical assumptions. The Higginbotham and May semantics must posit a syntactic operation at LF. The semantics given by them is non-compositional in that the bijective reading of multiple wh questions does not use the uniqueness requirement in the meaning of the wh NPs which are an input to absorption. The semantics adopted here, on the other hand, uses a general schema which applies to wh constructions with one or more wh NPs. The bijective reading is compositionally built up out of the uniqueness encoded in each wh NP in the relevant construction. This approach can thus be seen as either doing away with absorption altogether or as claiming that absorption is a purely interpretive phenomenon involving no syntactic transformation. It is a property of strings of operators in spec that they are interpreted as polyadic quantifiers. The semantics proposed here thus presents an alternative to an absorption-based analysis like Higginbotham and May. At the same time, it provides a way of capturing the distinction between unique and bijective readings within propositional theories of questions.

10.3. Subjacency and LF

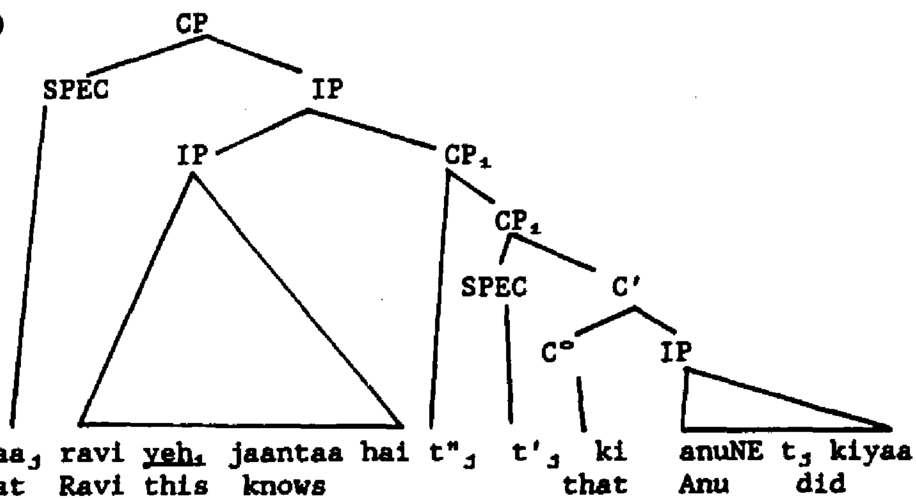
Another area where the facts of Hindi contribute to current theoretical debate is the relevance of subjacency at LF. Chomsky (1986), following Huang's (1982) account of Chinese, assumes that subjacency effects do not obtain at LF. Huang bases his claim on the fact that Chinese wh can take scope outside an island as long as its trace is properly governed. In the case of adjunct phrases, for example, extraction of lexically governed wh phrases like subject and object NPs is free while that of adjuncts is contingent upon antecedent government. In this Chinese differs from English where any kind of extraction out of adjuncts is banned. Since English has overt movement but Chinese wh remains in-situ till LF, this suggests that subjacency is a constraint on movement only at S-structure and that LF movement is subject only to the ECP.

Hindi requires us to modify this view of wh movement since it shows that sentential complements occuring in adjunct position are islands for extraction of all wh in-situ. That is, in a structure like (2a) the wh phrase cannot take scope outside the embedded complement. This is so even if the wh NP originates in argument position so that its trace would be properly governed. Clearly, ECP cannot be at issue and we must accept the relevance of Subjacency at S-structure as well as LF.

In order to account for these facts it is suggested, following Fiengo et al (1988), that Subjacency obtains at LF though its effect is largely invisible. The basic idea behind their claim is that an adjunct which is a potential barrier for movement may be debarrierized by adjunction. Since adjunction is freer at LF than at S-structure adjunct clauses in in-situ languages are not scope islands. In fact, any wh can be extracted out of an adjunct as far as subjacency is concerned. Because adjunction prevents antecedent government, however, LF extraction out of adjuncts is restricted to those expressions whose traces are lexically governed. Under this approach, the observed difference between movement at S-structure and LF derives from the greater freedom of adjunction at LF.

The Hindi construction under discussion differs from the data that has so far been taken into consideration in debates about subjacency effects at LF in that it does not involve extraction out of an ordinary adjunct. The syntactic adjunct is actually a wh complement coindexed with the canonical object position marked by the pleonastic **yeh**. We assumè that the two coindexed elements share a theta role and further that sharing of theta role is possible only if the head of the complement is in an appropriate local relation with the verb. If the locality requirement is defined in terms of proper government of C° by the inflected verb, the impossibility of extraction out of such adjuncts is explained, as shown below:

(6)



In order to void Subjacency, the wh in the lower Spec must first adjoin to CP. The CP is debarrierized and movement of t''_j to matrix comp becomes licit. Though t''_j is not antecedent governed the trace

t_j is lexically governed, hence properly governed. There is thus no ECP violation involved as far as the trace of the wh goes. However, the LF is ruled out because the head of the complement C° is no longer properly governed by the inflected verb, since adjunction prevents antecedent government.

The approach outlined above suggests one way of reconciling the fact that subjacency effects are visible in the case of Hindi wh in-situ while they remain invisible in the case of Chinese wh in-situ. The case of Hindi wh complements, then, provides concrete evidence of the existence of Subjacency at LF.

10.4. Pair-list Answers with Indirect Questions

Finally, the investigation into Hindi questions provides strong arguments against the currently dominant view that pair list answers in contexts like (8a) result from scope interaction between an embedded wh in-situ and the matrix wh. The possibility of a pair list answer like (8b) to this question is usually taken to derive from an LF like (8c):

(8) a. Who knows where Mary bought what?

b. John knows where Mary bought the book and Bill knows where she bought the pen.

c. $[_{CP}[_{spec}$ what who $][_{IP}$ $[_{CP}[_{spec}$ where$][_{IP}$ $]]]]$

Hindi has wh in-situ but we know that when it occurs inside a finite complement it necessarily takes narrow scope. (9a), for example, can only be interpreted as an indirect question. An LF like (9b) with the embedded wh in-situ in matrix spec is clearly ruled out, as discussed earlier.:

(9) a. ravii jaantaa hai merii ne <u>kyaa</u> kiyaa
Ravi knows mary what did
"Ravi know what Mary did"

b.* $[_{CP}\ [_{spec}\ \text{what}\ ]\ [_{IP}\ [_{CP}\ [_{IP}\ ]]]]$

However, the Hindi counterpart of (8a) also allows for a pair list answer:

(10) <u>kaun</u> jaantaa hai ki merii ne kahaa <u>kyaa</u> kharidaa
who knows that Mary where what bought
"Who knows where Mary bought what ?"

The pair list answer obviously cannot be derived from an LF like (8c) in which **kyaa** "what" has moved to matrix spec, given (9). The Hindi facts thus call for an account of pair list answers in these contexts which is not dependent on movement of wh in-situ to matrix spec.

The alternative argued for takes (11) as the only LF of (10):

(11) $[_{CP}\ [_{spec}\ \text{who}\ ]\ [_{IP}\ [_{CP}\ \text{what where}][_{IP}\ ]]]]$

The semantics for questions adopted here takes this LF to denote a set of true propositions: $\underline{\lambda p\ \exists x_1\ (x_1 = \iota x\ (know'(x, P)\ \&\ {}^{\vee}p\ \&\ p}$ $\underline{= {}^{\wedge}know(x_1, \wp)}$, where $\wp$ is the set of true propositions of the form $\underline{\exists y_1}$ $\underline{\exists z_1\ (y_1 = \iota y\ bought'(mary, y\ at\ z_1)\ \&\ z_1 = \iota z\ bought'\ (mary,\ y_1,\ at\ z)}$ $\underline{\&\ {}^{\vee}p\ \&\ p = {}^{\wedge}bought\ (mary,\ y_1,\ at\ z_1))}$. There will be only one proposition in the denotation of the direct question since the matrix spec contains only one wh phrase (see section 10.2). However, in who-questions ιx can denote a plural entity. The set of propositions in the indirect question may, on the other hand, contain more than one proposition since it contains two wh NPs.

Schematically put, the meaning of the question depends on a relation between an individual X and and a set of propositions $\wp$, where X may denote a singular or a plural entity and $\wp$ may contain one or more propositions. For purposes of this discussion we may think of X too as a set rather than a plural entity. Though it is not specified whether every member of X knows every member of $\mathcal{P}$, there is a conventional implicature that $\forall x \in X$ and $\forall p \in \mathcal{P}$, x knows p. Thus, if (13) were answered with "John and Bill" it would be taken to imply that they both know the two propositions linking the pen and the book to the places Mary bought them at.

This leaves open the possibility that when neither X nor $\mathcal{P}$ are singletons the relation between X and $\mathcal{P}$ may not distribute down to the members of the two sets. A pair list answer, we might say, cancels the conventional implicature that every member of X knows every member of $\mathcal{P}$ by making explicit that the members of X _jointly_ know $\mathcal{P}$. The pair list answer thus involves a cumulative reading, rather than the pure distributive reading, in the sense of Scha (1981).

While the primary motivation for moving from an account based on movement to one based on a semantic distinction between distributive and cumulative readings of a single representation comes from Hindi, it is argued that there are advantages in adopting this approach for all languages.

For example, in languages like Bulgarian all wh expressions move into spec position at S-structure. Yet the Bulgarian counterpart of (8a), given in (12) below, allows for a pair list answer:

(12) _koj_ znae _kakvo_ _kade_ e kupila Maria
who knows what where has bought Maria
"Who knows where Maria bought what?"

Accounting for the availability of the pair list answer to this question within the scope theory involves positing spec to spec movement of **kakvo** "what" at LF. Such movement is not considered standard (Lasnik and Saito (1984) and Chomsky (1986b)). Within the analysis of pair list answers presented here the availability of such an answer to a question like (12) is actually predicted with the embedded whs **kakvo** "what" and **kade** "where" having scope over the embedded clause only.

In current syntactic and semantic theories of questions the existence of pair list answers is an accepted heuristic for determining the scope of wh in-situ. The arguments presented here casts serious doubt on this view.

In this dissertation I have analyzed Hindi wh constructions and provided substantive hypotheses about their structure and interpretation. Applying a well articulated theory of syntax as well as semantics made it possible to reduce rather complex data to fairly simple principles and to identify key issues in the understanding of how syntax and semantics interact. In many cases the Hindi facts shed new light on which component of the grammar can explain which range of phenomena. While many problems remain open, I hope the analysis presented in this dissertation will promote further discussion on these issues.

REFERENCES

Abney, S.P.: 1987, "The English Noun Phrase in its Sentential Aspect," Ph.D. dissertation, MIT.

Andrews, A.D.: 1985, *Studies in the Syntax of Relative and Comparative Clauses*, New York, Garland Publishing.

Bach, E. and R. Cooper: 1978, 'The NP-S Analysis of Relative Clauses and Compositional Semantics,' *Linguistics and Philosophy* 2, 145-150.

Bains, G.: 1987, 'Relativization in Hindi,' Paper presented at SALA, Cornell and Syracuse Universities.

----: 1989, 'Complex Structures in Hindi-Urdu: Explorations in Government and Binding Theory,' New York University.

Baker, C.L.: 1970, 'Notes on the Description of English Questions: The Role of an Abstract Question Morpheme,' *Foundations of Language* 6.

Baker, M.: 1985, 'Syntactic Affixation and English Gerunds,' *Proceedings of WCCFL* 4.

Baltin, M.: 1985, *Toward a Theory of Movement Rules*, New York, Garland Publishing.

Barwise, J. and R. Cooper: 1981, 'Generalized Quantifiers and Natural Language,' *Linguistics and Philosophy* 4, 191-219.

Berman, H.: 1972, 'Relative Clauses in Hittite' in P.M. Peranteau, J.N. Levi and G.C. Phares (eds.) *The Chicago Which Hunt, Chicago Linguistic Society*, pp.1-8.

Berman, S.: 1989, 'An Analysis of Quantificational Variability in Indirect Questions', in *MIT Working Papers in Linguistics* 11.

Bresnan, J. and J. Grimshaw: 1978, 'The Syntax of Free Relatives in English,' *Linguistic Inquiry* 9, 331-91.

Carlson, G.: 1981, 'Distribution of Free Choice Any,' CLS 17.

Chierchia, G.: 1988, 'Dynamic Generalized Quantifiers and Donkey Anaphora', in M. Krifka (ed.) *Proceedings of the Tubingen conference on generics, Institut fur Naturlichsprachliche Systeme der Universitat Tubingen*.

Chierchia, G. and S. McConnell-Ginet: 1990, *Meaning and Grammar: An Introduction to Semantics*, MIT Press, Cambridge.

Chomsky, N.: 1965, *Aspects of the Theory of Syntax*, MIT Press, Cambridge.

----: 1981, *Lectures on Government and Binding*, Foris, Dordrecht.

----: 1986a, *Knowledge of Language: Its Nature, Origin, and Use*, Praeger, New York.

----: 1986b, *Barriers, Linguistic Inquiry Monograph*, MIT Press, Cambridge.

Chomsky, N. and H. Lasnik: 1977, 'Filters and Control,' *Linguistic Inquiry* **8**, 425-504.

Cole, P.: 1987, 'The Structure of Internally Headed Relative Clauses,' *Natural Language and Linguistic Theory* 5, 277-302.

Comorovski, I.: 1989, "Discourse and the Syntax of Multiple Constituent Questions," Ph.D. dissertation, Cornell University.

Cooper, R.: 1979, 'The Interpretation of Pronouns,' *Syntax and Semantics* **10**, 61-92.

----: 1983, *Quantification and Syntactic Theory*, Reidel, Dordrecht.

Culy, C.: 1990, "The Syntax and Semantics of Internally Headed Relative Clauses," Ph.D. dissertation, Stanford University.

Dalrymple, M. and S. Joshi: 1986, 'Relative Clauses and Relative Clause Linking in Marathi,' Paper presented at LSA.

Davison, A.: 1984, 'Syntactic Constraints on WH-in situ: WH-questions in Hindi-Urdu,' Paper presented at LSA.

----: 1988, 'Syntactic Structure in Semantic Representation,' Paper presented at LSA.

----: 1990, 'Long Distance Syntactic Anaphors in Hindi-Urdu,' Paper presented at Cornell University.

Dasgupta, P.: 1980, "Questions and Relative and Complement Clauses in a Bangla Grammar," Ph.D dissertation, New York University.

Donaldson, S.K.: 1971, 'Movement in Restrictive Relative Clauses in Hindi,' *Studies in the Linguistic Sciences* 1, 1-74.

Downing, B.: 1973, 'Corelative Clauses in Universal Grammar,' *Minnesota Working Papers in Linguistics and Philosophy of Language* 2, 1-17.

Dowty, D, R. Wall and S. Peters: 1985, *Introduction to Montague Semantics*, *Reidel*, Dordrecht.

Engdahl, E.: 1985, 'Parasitic Gaps, Resumptive Pronouns and Subject Extractions,' *Linguistics* 23, 3-44.

----: 1986, *Constituent Questions*, Reidel, Dordrecht.

Ernst, T.: 1989, 'Base Adjunction in Phrase Structure Theory,' University of Delaware ms.

Fiengo, R., C-T. J. Huang, H. Lasnik and T. Reinhart: 1988, 'The Syntax of Wh-in-Situ', *Proceedings of WCCFL* 7.

Gambhir, V.: 1981, "Syntactic Restrictions and Discourse Functions of Word Order in Standard Hindi," Ph.D. dissertation, University of Pennsylvania.

Groenendijk, J. and M. Stokhof: 1984, *Studies in the Semantics of Questions and the Pragmatics of Answers*.

Groos, A. and H. van Riemsdijk: 1979, 'Matching Effects in Free Relatives' in A. Belletti et al (eds.) *Theory of Markedness in a Generative Grammar*, *Proceedings of the IV GLOW Conference*, Pisa.

Gurtu, M.: 1985, "Anaphoric Relations in Hindi and English, Ph.D. dissertation," CIEFL (India).

Hamblin, : 1976, 'Questions in Montague Grammar,' in B. Partee (ed) *Montague Grammar*, Academic Press, New York.

Harbert, W.: 1982, 'On the Nature of the Matching Parameter,' *Linguisitic Review* 2, 237-84.

Heim, I.: 1982, "The Semantics of Definite and Indefinite Noun Phrases." Ph.D. dissertation, University of Massachussets, Amherst.

Higginbotham, J.: 1980, 'Review of Montague Grammar,' *Journal of Philosophy* 77, 278-312.

Higginbotham, J. and R. May: 1981, 'Questions, Quantifiers and Crossing,' *The Linguistic Review* 1, 41-80.

Hirschbuhler, P.: 1978, "The Semantics and Syntax of Wh Constructions, Ph.D. dissertation," University of Massachusetts, Amherst.

Hock, H.: 1989, 'Conjoined We Stand: Theoretical Implications of Sanskrit Relative Structures,' *Studies in the Linguistic Sciences* 19.

Huang, C.-T. J.: 1982, "Logical Relations in Chinese and the Theory of Grammar," Ph.D. dissertation, MIT.

----: 1989, 'Pro-Drop in Chinese: A Generalized Control Theory', in O. Jaeggli and K. Safir (eds.) *The Null Subject Parameter*, Reidel, Dordrecht.

Jackendoff, R.: 1977, *X' Syntax: A Study of Phrase Structure*, MIT Press, Cambridge.

Jacobson, P.: 1988, 'The Syntax and Semantics of Free Relatives,' Paper presented at LSA.

Junghare, I.: 1973, 'Restrictive Relative Clauses in Marathi,' *Indian Linguistics* 34, 251-62.

Kachru, Y.: 1973, 'Some Aspects of Pronominalization and Relative Clause Construction in Hindi-Urdu,' *Studies in the Linguistic Sciences* 3, 87-103.

----: 1978, 'On Relative Clause Formation in Hindi-Urdu,' *Linguistics* 207, 5-26.

Kadmon, N.: 1987, "On Unique and Non-Unique Reference and Asymmetric Quantification," Ph.D. dissertation, University of Massachusetts, Amherst.

Kadmon, N. and F. Landman: 1990, 'Polarity Sensitive and Free Choice Any,' in *Proceedings of the Seventh Amsterdam Colloquiam, ITLI, Amsterdam.*

Kamp, H.: 1981, 'A Theory of Truth and Semantic Representation,' in Groenendijk, J., T. Janssen and M. Stokhof (eds.) *Formal Methods in the Study of Language*, Mathematisch Centrum, Amsterdam.

Karttunen, L.: 1977, 'Syntax and Semantics of Questions,' *Linguistics and Philosophy* 1, 3-44.

Karttunen, L. and S. Peters: 1976, 'What Indirect Questions Conventionally Implicate,' *Proceedings from the Twelfth Annual Meeting of the Chicago Linguistic Society.*

Kayne, R.: 1983, 'Connectedness,' *Linguistic Inquiry* 14.

Keenan, E.: 1985, 'Relative Clauses' in T. Shopen (ed.) *Language Typology and Syntactic Description II*, Cambridge University Press, New York.

Koopman, H. and Sportiche, D.: 1982, 'Variables and the Bijection Principle,' *The Linguistic Review* 2, 139-160.

Kratzer, A.: 1988, 'Comments on Jacobson (1988),' Presented at LSA.

----: 1989, 'Stage-level and Individual-level Predicates,' *Linguistics and Philosophy* 12.

Kuno, S. and J. Robinson: 1972, 'Multiple Wh Questions,' *Linguistic Inquiry* 3, 463-487.

Landman, F.: 1989, 'Groups I and II,' *Linguistics and Philosophy* 12 and 13.

Lasnik, H. and M. Saito: 1984, 'On the Nature of Proper Government', *Linguistic Inquiry* 15, 235-289.

Lightfoot, D. and A. Weinberg: 1988, 'Review Article: Chomsky: Barriers,' *Language* 64, 366-383.

Link, G.: 1984, 'Hydras: On the Logic of Relative Clause Constructions with Multiple Heads,' in Landman and Veltman (eds.), *Varieties of Formal Semantics*, GRASS 3, Foris, Dordrecht.

----: (to appear), 'Plural' in Wunderlich and von Stechow (eds.) *Handbook of Semantics*.

Longobardi, G.: to appear, 'In Defence of the "Correspondence Hypothesis": Island Effects and Parasitic Constructions in Logical Form', in C.-T. J. Huang and R. May (eds) *Logical Structure and Linguistic Structure*, Reidel, Dordrecht.

Lust, B., T. Bhatia, J. Gair, V. Sharma and J. Khare: 1988, 'A Parameter Setting Paradox: Children's Acquisition of Hindi Anaphora,' *Cornell Working Papers in Linguistics* 8, 107-132.

Mahajan, A.K.: 1987, 'Notes on Wh Questions in Hindi,' Paper presented at Sala, Cornell and Syracuse Universities.

Masica, C.: 1972, 'Relative Clauses in South Asia,' in P. Peranteau, J.N. Levi and G. Phares (eds.) *The Chicago Which Hunt*, pp. 198-204.

May, R.: (1977) "The Grammar of Quantification," Ph.D dissertation, MIT.

----: 1985, *Logical Form: Its Structure and Derivation*, Linguistic Inquiry Monograph, MIT Press, Cambridge MA.

----: 1989, 'Interpreting Logical Form,' *Linguistics and Philosophy* 12, 387-435.

McCawley, J.: 1982, 'Parentheticals and Discontinuous Constituents,' *Linguistic Inquiry* 13, 91-106.

McCloskey, J.: 1979, *Transformational Grammar and Model Theoretical Semantics*, Reidel, Dordrecht.

----: 1989, 'Resumptive Pronouns, A' Binding and Levels of Representation in Irish,' to appear in R. Hendrick (ed) *The*

Syntax of the Modern Celtic Languages, *Syntax and Semantics* 23, Academic Press.

McDaniel, D.: 1989, 'Partial and Multiple WH-Movement,' *Natural Language and Linguistic Theory* 7.

Milsark, G.L.: 1974, "Existential Sentences in English, Ph.D. dissertation," MIT.

----: 1988, 'Singl-ing,' *Linguistic Inquiry* 19.

Neale, S.: 1988, "Descriptions," Ph.D. dissertation, Stanford University.

Partee, B.: 1975, 'Montague Grammar and Transformational Grammar,' *Linguistic Inquiry* 6, 203-300.

----: 1987, 'Noun Phrase Interpretation and Type-Shifting Principles', in Groenendijk, J., D. de Jongh and M. Stokhof (eds.) *Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers*, GRASS 8, Foris, Dodrecht.

Pesetsky, D.: 1982, "Paths and Categories," Ph.D. dissertation, MIT.

Porterfield, L. and V. Srivastav: 1988, '(In)definiteness in the Absence of Articles: Evidence from Hindi and Indonesian,' *Proceedings of WCCFL* 7, 265-76.

Postal, P. and G. Pullum: 1988, 'Expletive Noun Phrases in Subcategorized Positions,' *Linguistic Inquiry* 19.

Rooth, M.: 1985, "Association With Focus," Ph.D. dissertation, University of Massachusetts, Amherst.

Rooth, M. and B. Partee: 1982, 'Conjunction, Type Ambiguity, and Wide Scope Or,' *Proceedings of WCCFL* 1.

Rudin, C.: 1988, 'On Multiple Questions and Multiple Wh-Fronting,' *Natural Language and Linguistic Theory*.

Russell, B.: 1905, 'On Denoting,' *Mind* 14, 479-493.

Safir, K.: 1986, 'Relative Clauses in a Theory of Binding and Levels,' *Linguistic Inquiry* 17, 663-690.

Saito, M.: 1985, "Some Asymmetries in Japanese and Their Theoretical Implications," Ph.D. Doctoral dissertation, MIT.

Sells, P.: 1984, "The Syntax and Semantics of Resumptive Pronouns," Ph.D. dissertation, University of Massachusetts, Amherst.

----: 1987, 'Binding Resumptive Pronouns,' *Linguistics and Philosophy* **10**, 261-298.

Sportiche, D.: 1988, 'A Theory of Floating Quantifiers and Its Corollaries for Constituent Structure,' *Linguistic Inquiry* **19**, 425-449.

Srivastav, V.: 1988, 'Hindi Relative Clauses and Learnability,' *Cornell Working Papers in Linguistics* **8**, 133-60.

----: 1989, 'Hindi Wh and Pleonastic Operators,' *Proceedings of NELS* **20**.

Stowell, T.: 1981, "Origins of Phrase Structure," Ph.D. dissertation, MIT.

Subbarao, K.V.: 1984, *Complementation in Hindi Syntax, Academic Publications*, Delhi.

Suner, M.: 1988, 'Indirect Questions: Implications for the Structure of CP,' Unpublished Cornell University ms.

Tang, C-C. J.: 1988, 'Wh Topicalization in Chinese,' unpublished Cornell University ms.

van Benthem, J.: 1989, 'Polyadic Quantifiers,' *Linguistics and Philosophy* **12**, 437-64.

van Riemsdijk, H.: 1983, 'Correspondence Effects and the Empty Category Principle,' *Tilburg Papers in Language and Literature*.

van Riemsdijk, H. and E. Williams: 1981, 'NP-Structure,' *The Linguistic Review* **1**, 171-217.

Verma, M.K.: 1966, *The Noun Phrase in Hindi and English*, Motilal, New Delhi.

Wali, K.: 1982, 'Marathi Correlatives: A Conspectus' *South Asian Review* **6**.

----: 1988, 'A Note of Wh Questions in Marathi and Kashmiri,' *Cornell Working Papers in Linguistics* **8**.

Williamson, J. 1987, 'An Indefiniteness Restriction for Relative Clauses in Lakhota,' in E.J. Reuland, and A. ter Meulen (eds) *The Representation of Indefiniteness*, MIT Press, Cambridge.

Yoshida, K.: 1990, 'Scope Interpretations and Japanese WH-Q Constructions,' unpublished Cornell University ms.

Zaenen, A., E. Engdahl, and J. Maling: 1981, 'Resumptive Pronouns can be Syntactically Bound,' *Linguistic Inquiry* **12**, 679-682.