Chapter 1
Deriving Logical Representations: A Proposal

1.1 Introduction

The main concern of this monograph is an interdisciplinary one: I investigate the relationship between the syntactic and semantic representations of sentences within the framework of generative grammar. In particular, I address the problem of deriving logical representations from the syntactic representations of sentences, focusing primarily on the issues of quantification (that is, the representation of the relative scope of operators and the determination of quantificational force) and the interpretation of indefinites. In doing this, I concentrate on two central questions, drawing primarily on data from English and German:

(1) What are the possible semantic interpretations of indefinite and quantificational NPs?

(2) What role does the syntactic representation play in the derivation of the semantic representation of NPs?

Although the syntactic representation of scope relations is a familiar concept (see May 1977), determining the quantificational force of an NP may at first blush appear to be purely an interpretive question concerning the semantics of determiners and the like, with the syntactic structure of the sentence playing no role. My aim here is to show that purely syntactic concerns such as word order and hierarchical structure do in fact play an important role in the process of "reading off" semantic representations of NPs from the syntactic forms of sentences. In other words, I am concerned primarily with developing an account of the interface between syntactic theory and semantic theory.

Specifically, I propose a means of relating a primarily syntactic theory, the Government-Binding Theory of Chomsky (1981) and others, with the

semantic theory of NP interpretation developed by Kamp (1981) and Heim (1982). In the analysis I propose, one of the contributions of purely syntactic configurations to the derivation of Kamp-Heim logical representations is stated in terms of a simple mapping algorithm that divides the syntactic tree into two parts, which have correlates in their associated "semantic partition"—the logical representation in which the scope and quantificational force of NPs is represented.

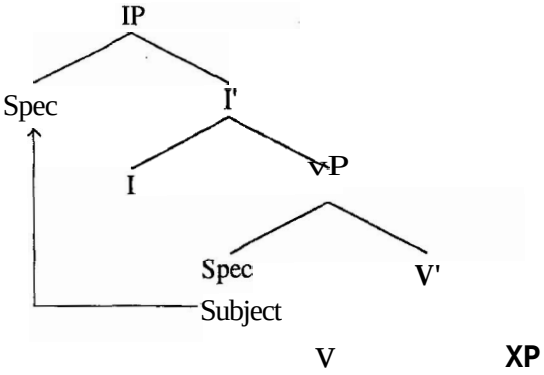
Before I proceed, some introductory background is necessary. In the next two sections I present the basics of the syntactic and semantic frameworks that I take as my starting point in this work.

1.2 The Syntactic Roots of Indefinite Interpretations

The basic syntactic framework I will be assuming is that of Government-Binding Theory, as developed by.Chomsky (1981, 1986a, 1986b) and others. I will not undertake to present a comprehensive overview of the theory here (a more thorough introduction can be found in Haegeman 1991), but will instead focus on two major components that are central to the main thesis of this monograph. The first concerns a recent development in the theory of phrase structure. A number .of works on phrase structure have converged on the hypothesis.that the subjectof a sentence can be base-generated within the verb projection (the VP). This yields a system of X-bar-theoretic phrase structure rules that differs somewhat from the original phrase structure rules as stated in chomsky 1986a.The revised clause structure posits two possible positions for the subject within the X-bar phrase structure. I will refer to this proposal as the ***VP-Internal Subject Hypothesis.***

As illustrated by the tree in (3), one subject position is situated as in the original ***Barriers*** framework (Chomsky 1986a),dominated immediately by IP (the [Spec, IP], or *IP* ***subject).*** The other subject position is located within the VP. I assume that this VP-internal subject position is the [Spec, VP] (referred to alternatively as the VP ***subject).***

(3) The VP-Internal Subject Hypothesis



As indicated by the arrow in (3), the subject in a sentence such as (4) is base-generated within the VP in the [Spec, VP] position and subsequently raises at S-structure to the [Spec, IP] position.

(4) Walter plays the contrabassoon.

An essential consequence of the VP-Internal Subject Hypothesis (and one of the theoretical arguments in its favor) is that subjects are Theta-marked within the VP, allowing an attractive simplification of theta-theory.

This structure has been proposed in a large number of different analyses to account for a correspondingly diverse range of phenomena (see Koopman and Sportiche 1985, Fukui and Speas 1986, Kuroda 1988, Pollock 1989, Diesing-1990a,Chomsky 1991, among many others). Since detailed arguments for the structure in (3) are given in these works and elsewhere, I will simply take the VP-Internal Subject Hypothesis as given.

One of the questions I wish to address in this monograph concerns the properties of the two subject positions. Namely, is there any difference (other than relative position) between a VP-internal subject and a VP-external subject? Does the **VP** have any properties that distinguish it from IP, and vice versa?' In this work I approach these questions by investigating the hypothesis that the VP and the area "outside" of **VP** (at the IP level) are distinct domains for different kinds of quantification, and that therefore IP subjects and VP subjects are distinguished in the derivations of the logical representations of sentences. Put in another' way, the two subject positions are distinguished in the mapping from S-structure to logical representations.

It may not be immediately obvious what role the syntactic structures of IP and VP can play in the semantics of quantified structures. Therefore, at this point it is necessary to introduce another component of the Governrnent-

Binding Theory: the level of logical form. The idea that the syntactic structure of a sentence can play a role in determining logical representations (scope relations in particular) has led Government-Binding theorists to posit an abstract intermediate syntactic level of logical form (LF) that mediates in the mapping from syntax to logical representations (May 1985).2 Just as S-structure is the level to which the phonological interpretations may be assigned, LF is the level from which the semantic interpretations are assigned. In parallel to the derivation of S-structure from D-structure, LF is a phrase structure representation that is derived from S-structure by the application of syntactic rules. Thus, the intermediate LF representations are modeled on their S-structure syntactic representations.

The LF movement rules fall under the general theory of transformational mappings as processes that can be subsumed under the form of the general Move a schema of Chomsky (1981). A central case of LF movement is the rule of ***quantifier raising*** (QR), which raises quantificational NPs to adjoin to IP, producing a structure in which an operator (that is, the quantificational NP) binds a variable (the trace left by the application of QR). The quantifier phrase in its adjoined position thus marks the scope of the quantifier in that its scope is the set of nodes c-commanded by the raised NP at LF. The result is of course not the final semantic representation. Within the Government-Binding framework, the LF level is regarded as intermediary between the syntax and the logical representations. It is from this abstract level of syntactic representation that the actual logical representations are derived. I make here the additional claim that it is at this level that the VP-internal and VP-external subject positions can be distinguished with respect to quantification.

There is a derivational "step" that still remains to be specified. A procedure is needed to indicate how the syntactic LF representation gets mapped into the logical representations (using here those of the type developed by Kamp and Heim). In explicating the derivation of the semantic representations of sentences from syntactic representations, I depend on the notion of a ***semantic partition*** of a sentence, in particular a type of partitioning developed in the theories of NP interpretation proposed by Kamp (1981) and Heim (1982). I initially propose to relate this semantic framework to syntactic structures such as that shown in **(3)** by an algorithm that splits the syntactic tree into two parts, corresponding to the major division (or partition) in the semantic representation.

1.3 Semantic Partition and the Interpretation of Indefinites

The idea of dividing a sentence into two parts on semantic and/or pragmatic grounds is by no means new. The notion of such partition has also taken a number of different forms throughout time, embodying intrasentential distinctions such as topic and comment, theme and rheme (e.g., Danes 1964, Firbas 1970), and subject and predicate. The division I am concerned with arises in analyses of restrictive quantification (particularly the analyses of Lewis (1975) and those following him). Using the terminology of Heim (1982), I refer to this division as the ***restrictive clause/nuclear scope partition.*** *I* focus mainly on the derivation of this partition at the sentence level, and then go on to consider some of its applications in the syntax-semantics interface.

1.3.1 A Brief Introduction to the Kamp-Heim Theory

In order to explain what the nature of the restrictive clause/nuclear scope partition is, I give here a brief introduction to the Kamp-Heim approach to the semantics of NPs. (This introduction is by no means complete; see, for example, Heim 1982 for a detailed exposition of the theory and the motivations that lie behind it.) In this introduction I concentrate on a few simple sentences to show by example how the restrictive clause/nuclear scope division functions at the sentence level.

A primary motivation for the Kamp-Heim theory is based on observations concerning the quantificational variability of indefinites (originally made by Lewis (1975)) that preclude their being analyzed as existential quantifiers (as proposed by Russell (1919)). The following sentences, with their paraphrases (given in the (b) examples), illustrate how indefinites can vary in quantificational force depending on the context in which they appear:

(5) a. A contrabassoonist usually plays too loudly:
b. Most contrabassoonists play too loudly.

(6) a. Cellists seldom play out of tune.
b. Few cellists play out of tune.

(7) a. If a violist plays a solo, the audience often leaves the room.
b. In many of the situations in which a violist plays a solo, the audience leaves the room.

The sentences in (5)–(7) show that rather than being simply existentially

quantified, indefinites can take their quantificational force from other elements in the sentence (such as adverbs like usually, seldom, and often).

To account for these observations, Heim claims that indefinites are not inherently quantified, but merely introduce variables into the logical representation. (I will refer mainly to Heim's work in the examples that follow, but most, if not all, of what I say is applicable to Kamp's theory as well.) To illustrate how this works, I will begin with a simple case:

(8) a. A man owns a llama.
b. $(\exists_{x,y})$ [x is a man ^ y is a llama ^ x owns y]

In (8a) the indefinite NPs a ***man*** and a llama are not represented as existential quantifiers; rather, they introduce variables. Another way of expressing this is to say that indefinites have no quantificational force of their own. They must receive quantificational force by being bound by some other operator. In this case there is no other quantificational element in the sentence that can function as the adverbs do in (5)–(7). Here the variable introduced by the indefinite is bound by an implicit existential quantifier that "existentially" closes off the nuclear scope, preventing the occurrence of unbound variables. In the case of the sentence in (8) the nuclear scope simply contains all instances of the variables introduced by the indefinites in a sentence. This can be seen in the logical representation given in (8b). The implicit existential quantifier is shown within parentheses, and it binds all the variables (in this case ***x*** and y) within the nuclear scope, which for purposes of illustration is enclosed within brackets. (I will dispense with unnecessary parentheses and brackets in the discussions that follow.)

The logical representation in (8b) can also be represented graphically in the "box notation" employed by Kamp (1981), which I present in (9).3The box represents the domain of existential closure, or the nuclear scope.

(9) Nuclear scope

x	*y*
A man owns a llama.	
man ***(x)***	
llama (y)	
x owns ***y***	

The example in **(8)** illustrates the simplest case involving the interpretation of NPs, which involves only simple indefinites. Only a nuclear scope is formed, and the Only quantificational (in the sense of variable binding)

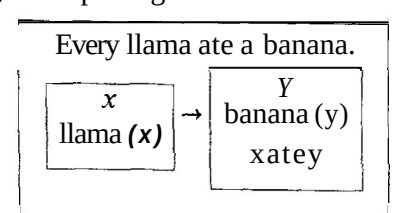
operation involved is existential closure. No restrictive clause is required in the logical representation shown in **(8b).** Thus, although every sentence undergoes the process of being mapped into logical representations, not every sentence ends up being divided into both a restrictive clause and ***a*** nuclear scope. In other words, the mapping to the semantic representation (however it is formulated) can in some cases yield a one-part representation. To see how restrictive clause formation works in Heim's framework, we need to consider a slightly more complicated case involving the interpretation of quantified NPs, such as the one shown in (10).

(10) a. Every llama ate a banana.
b. Every, [x is a llama] **(€y)** y is a banana ^ x ate y
↑ quantifier ↑ restrictive clause ↑ nuclear scope

An important property of quantifiers like every is that they quantify over a restricted set. The sentence in (10a) is true if and only if for all value assignments to the variable **x** that make the restrictive clause true, there is an assignment to the variable **y** that makes the nuclear scope true.4 Thus, in (10a) the quantifier every quantifies not over every thing, but over every thing that is a llama. This restriction on the quantifier is given an explicit representation in the restrictive clause ***([x*** is a llama]), as shown in (10b). The restrictive clause simply specifies the set that the quantifier quantifies over. The variables introduced by the **NPs** in (10a) are bound in the following way: the quantifier every binds all the variables that are established in the restrictive clause (the variable x in this case). Existential closure in turn binds all the remaining variables introduced in the nuclear scope (such as the variable ***y*** introduced by a banana in **(10)).**

In Kamp's box notation, restrictive clause formation can be represented as box splitting, as in (11).

(11) ***Box*** splitting



In this notation, the division of the sentence is represented by the embedded boxes. The left-hand, or antecedent, box corresponds to the restrictive clause, and the right-hand, or consequent, box corresponds to the nuclear scope.

The tripartite form exemplified in (10) also provides a means of representing the interpretations of the indefinites that are apparently bound by quantificational adverbs, such as the ones in (5)–(7). Here the variables introduced by the indefinites are introduced in a restrictive clause, and the quantificational adverb serves as the operator binding the variables, thereby giving them quantificational force:

(12) a. Usually, [x is a contrabassonist] x plays loudly
b. Seldom, [x is a cellist] x plays out of tune

From the representations in (12) it is clear how the quantificational variability of indefinites can arise. The number of true variable assignments to the indefinite required to make the sentence true depends on the choice of adverb.

The Kamp-Heim theory of NP interpretation is thus formulated in terms of restricted quantification, in which the domain of the quantifier is established by the restrictive clause.[5] To summarize this approach, in the Kamp-Heim theory indefinites are represented as variables, which are unselectively bound by abstract operators like existential closure, or overt operators like the quantifier every. Quantifiers like every introduce a restriction (which is represented by restrictive clause formation or box splitting). The resulting logical representations take a tripartite form consisting of an operator, a restrictive clause, and the nuclear scope, as shown in (10b).

Even with only the most elementary introduction, it should be clear that one of the main questions that arise in applying restricted quantification to natural language is how to determine the restrictive clause. In other words, how is the sentence divided into the "semantic partition" consisting of the restrictive clause and the nuclear scope? In the next section I will sketch a proposal for answering this question, and the bulk of this work will be devoted to motivating and supporting this hypothesis.

1.3.2 The Next Step: Deriving the Logical Representations

In this section I begin to consider the question of how sentences are divided into the restrictive clause and the nuclear scope in the mapping from S-structure to the logical representations. This is basically the question of what role the syntactic structure of a sentence (as described by the X-bar phrase structures introduced in section 1.2) can play in determining the interpretation of the NPs contained within it. In other words, how are the variables introduced by NPs to be mapped from the syntactic positions

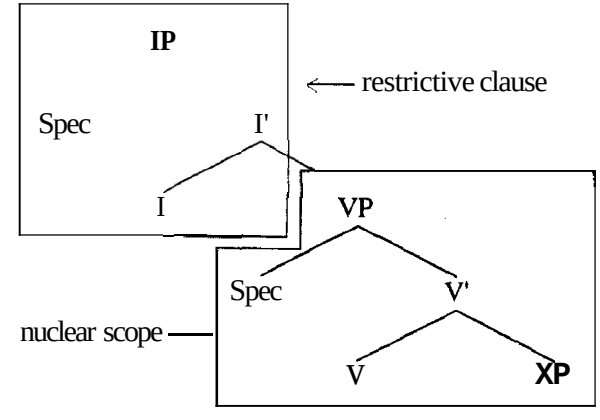
of NPs into nuclear scopes and restrictive clauses? Or stated in terms of box notation, what is the "box-splitting" algorithm?

For the purposes of this introduction, I limit myself to the question of where subjects are mapped, ignoring for the moment the issues involved in the interpretation of objects and adjuncts and such. The interpretation of objects will be dealt with in chapters 3 and 4. I will also limit myself to considering only the syntactic determinants of the partition. Therefore, I will not consider at this point the possible contributions of apparently nonsyntactic factors such as focus and intonation. This is not to deny that these factors are relevant, as the purely syntactic structure of a sentence is not the only determinant of semantic partition. I will discuss the role of focus to some extent in later chapters, but at this point it is instructive to concentrate on one particular phenomenon in order to clearly present the basic outlines of my approach.

In the chapters that follow, I propose and explore a fairly close syntactic link between the two-subject clause structure (the VP-Internal Subject Hypothesis) presented in section 1.2 and the Kamp-Heim-style tripartite logical representations introduced in section 1.3.1. This link, or interface, between the syntactic representation and the semantic representation takes the form of a mapping procedure that splits the syntactic tree into two parts. The two parts of the sentence are then mapped into the two major parts of the logical representation, the restrictive clause and the nuclear scope, producing the desired semantic partition.

The procedure works as follows: Assuming a two-subject model of phrase structure, divide the sentence into a restrictive clause and a nuclear scope as shown in (13) (for the purposes of exposition, assume that this splitting takes place at the level of LF).

(13) Mapping Hypothesis (tree splitting)



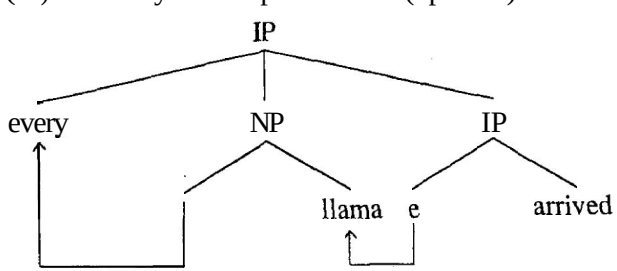
In (13) the two-subject tree is divided into two parts (outlined by boxes for purposes of illustration), one consisting of the VP, and the other consisting of the subtree dominating the **VP** (which I will refer to as the IP-level structure). My claim is that the tree-splitting process illustrated in (13) corresponds to box splitting in the Kamp-style box notation (see (11)). Expressed in words, the derivation of the representations shown in (13) is as follows:

(14) Mapping Hypothesis
Material from VP is mapped into the nuclear scope.
Material from IP is mapped into a restrictive clause.

The diagram in (13) can be intuitively thought of as the two-subject tree from (3) with the split boxes from the diagram in (11) superimposed upon it (where the boxes in (13) correspond to the embedded split boxes in (11)).

At this point some clarification concerning the representations in (8) and (10) is in order. I have claimed that the two parts of the split tree correspond to the two major parts of the logical representation, the restrictive clause and the nuclear scope. Of course, there is a third part in the logical representation, which is the quantifier itself. If the syntactic level of LF involves IP-adjoined quantifier phrases, there must still be a means of excluding the actual quantifier from both the restrictive clause and the nuclear scope. This issue is actually taken up by Heim. In deriving LF representations, Heim (1982, chap. 2) proposes a rule in addition to QR (which she calls "Quantifier Construal"), which adjoins every quantifier to S, or IP (following her QR-like rule of "NP-Prefixing"). This leads to a truly "tripartite tree," as shown in (15) for the sentence Every llama arrived.

(15) Heim-style LF representation (updated)



Thus, in Heim's derivation there are two adjunction operations. The NP-Prefixing rule raises the NP every llama out of IP, and then the Quantifier Construal rule moves every out of the NP to adjoin to IP itself. The Quantifier Construal rule is also used in deriving the logical representations of sentences with quantificational adverbs:

(16) a. Cellists seldom play out of tune.
b. seldom, [*x* is a cellist] *x* plays out of tune

In sentences such as (16a) the quantificational adverb takes sentential scope. This interpretation can be derived by adjoining the adverb to IP through the rule of Quantifier Construal. In the remainder of this monograph I will not concern myself further with the more articulated LF representation shown in (15), but will continue to use the representations in (8) and (10) as a form of shorthand for the representation in (15), with the assumption that some Quantifier Construal rule operates to separate the quantifier from the other two parts of the logical representation.

The Mapping Hypothesis establishes a straightforward relationship between syntactic structure and the form of the logical representations. Thus, the semantic partition of a sentence into a restrictive clause part and a nuclear scope part has its "syntactic roots" in the two-subject structure in (3), through the process in (13).

1.4 Syntactic Factors in the Semantics of NPs: A Preview

The Mapping Hypothesis proposed in (13) has the virtues of being simple and intuitively straightforward. The next step is to show that it is empirically well motivated as well. If the relationship between the syntactic and semantic representations is as straightforward as suggested by (13), this should be reflected in interactions between syntactic phenomena and the semantic interpretation(s) of NPs. In the chapters that follow I examine a range of empirical phenomena in syntax and semantics that demonstrate that there is in fact a connection between the syntax of a sentence and its logical representation of the sort illustrated in (13).

Chapter 2 is devoted to motivating the basic workings of the Mapping Hypothesis. I examine data from English and German that provide empirical support for the tree-splitting procedure. The supporting argument consists of several parts. In the first part I show that the two possible positions for the subject in the semantic representation do in fact correspond to two possible interpretations of the subject. These two interpretations are highlighted by a contrast in interpretation of bare plural subjects (noted originally by Carlson (1977b)) between temporary-state predicates (Carlson's stage-level predicates) and permanent-state (individual-level) predicates. I show that this contrast between the two types of predicates is actually syntactic in nature, but because of the workings of the Mapping

Hypothesis, it is reflected also in the available semantic interpretations of a bare plural subject.

Next, I show that the two syntactic subject positions posited in the VP-Internal Subject Hypothesis can be distinguished at S-structure in German. The German data show that the two subject positions are differentiated syntactically with respect to extraction operations. Finally, I show that the two syntactic subject positions correspond to the two positions in the semantic representations, as predicted by the Mapping Hypothesis. One major consequence of this chapter is that it appears that German and English are rather different in that in German the tree-splitting algorithm seems to reflect the S-structure word order of the sentence, whereas in English abstract **LF** movement operations are clearly involved.

In chapter **3** I extend the idea of deriving the Heim-style representations by the Mapping Hypothesis to the interpretation of quantified NPs. The central question of this chapter is that stated in **(2):** What are the possible interpretations of indefinite and quantified NPs? One major consequence of the data and analysis I present is that indefinites are not all treated uniformly. Specifically, I differentiate two types of indefinites, those that induce box splitting and those that do not (see also Partee 1988 for a discussion of the ambiguity of indefinites with the determiners *few* and many). This is a shift from the Kamp-Heim position in which all indefinites are treated uniformly as variables. I show that this differential treatment of indefinites is based on the contrast between presuppositional and cardinal determiners noted by Milsark (1974).

I also extend this analysis to the problem of quantifier scope determination. By differentiating the two interpretations syntactically with respect to the Mapping Hypothesis, I show that scope order preferences of quantifiers can be represented straightforwardly within a syntactic theory of quantifier scope. In investigating the connection between the two types of interpretations for indefinites and the derivation of the level of LF via the rule of quantifier raising (QR) in the sense of May (1977, 1985), I show that there is a relationship between presuppositionality and the obligatoriness of QR. This association is supported by data from English concerning a special case of VP-deletion, antecedent-contained deletions (ACDs). ACDs turn out to be an indicator for the presuppositional reading of an NP in that ACDs are only grammatical with presuppositional object NPs.

I also examine "specificity" in Dutch and Turkish and conclude that the "specific" indefinites in these languages correspond to the presuppositional, or box-splitting, reading of the indefinite. The Turkish data, which

involve a relationship between morphological case marking and the presuppositional (QR) reading of an NP, raise the possibility of there being S-structure syntactic "triggers" (such as a case marker) for LF raising of an **NP.**

In chapter 4 I look more closely at the consequences of the nonuniform interpretation of indefinites. The focus of this chapter is on extraction from "picture" NPs. The acceptability of extraction from NP is rather controversial, and judgments on the data are notoriously fragile in that they "shift" very easily, depending on the context. I show that the possibility of extraction is closely linked to the availability of a nonpresuppositional reading for the NP. Extraction is prohibited from presuppositional NPs. This close link to presuppositionality explains the "shiftiness" in judgments, since the presuppositional nature of an NP depends in part on context.

The syntactic issue of "locality constraints" on extraction becomes an additional concern in chapter 4. The link between nonextractability and presupposition raises questions about the traditional means of accounting for extraction islands (Ross 1967). I show that the standard derivational approach to extraction from NP as an S-structure constraint against movement across a certain number of "bounding nodes" or barriers (Subjacency; see Chomsky 1977, 1986a), or as a constraint against movement out of an ungoverned domain (such as the Condition on Extraction Domain posited by Huang (1982)), is not adequate to account for the effects of presupposition on extractability6 show that the relevant constraint must be stated in terms that take into account the ***LF*** structure of the sentence.

In contrast to chapter 2, which focuses on the interpretation of subject NPs, the emphasis in this chapter is on the interpretation of object NPs and the syntactic effects that follow from a particular interpretation. Given the workings of the Mapping Hypothesis and the results of chapter **3** concerning the syntactic differences between presuppositional and nonpresuppositional NPs, the presuppositional interpretation of object NPs in English requires that the NP be raised out of the VP by the rule of QR. The varying interpretations of object **NPs** are analyzed, taking into consideration the contexts in which they appear. I examine a number of different verb types and conclude that they differ with regard to which reading of an indefinite object, presuppositional or nonpresuppositional, they prefer.

Alongside the English data, I present German data involving S-structure "scrambling" of indefinite objects. I show that the semantic and

syntactic effects of German scrambling parallel the effects of LF QR in English in that scrambling of an indefinite object results in the restrictive clause interpretation of the indefinite. Thus, scrambling appears to act as "S-structure QR in these cases. This again raises the possibility that there may be S-structure triggers for QR, just as in the case of Turkish morphological case marking examined in chapter 3.

Finally, a few remarks are in order on the place of the Mapping Hypothesis within the overall picture of "semantic partition." Although I do not devote any attention to the more traditional forms of partitioning the sentence on semantic and/or pragmatic grounds, it is not my intention to suggest that the syntactic approach I take here should supplant notions such as topic/comment, theme/rheme, and subject/predicate. These sentential divisions encode various-semantic and pragmatic distinctions that fall outside the range of phenomena to be discussed here. Thus, the Mapping Hypothesis is simply an additional source of partitioning, which will be shown to be amply justified in its own domain.

Chapter 2
Initial Evidence in Favor of the Mapping Hypothesis

2.1 Introduction

The basic aim of this chapter is to provide specific empirical motivation for the relationship between syntactic and logical representations proposed in the previous chapter in the form of a "tree-splitting algorithm," or Mapping Hypothesis:

(1) Mapping Hypothesis
Material from VP is mapped into the nuclear scope.
Material from IP is mapped into a restrictive clause.

The procedure in (1) not only outlines the derivation of logical representations, but also makes a number of predictions concerning interactions between syntactic phenomena and the semantics of NPs. I present here a variety of data that support the notion that there is such a correspondence between the syntactic and logical representations.

Since the subject/nonsubject contrast is pivotal in the **VP/IP** distinction emphasized in (1), I first concentrate on the interpretation of indefinite subjects. My initial claim is that different predicate types show different properties with respect to the possible interpretations of subjects and their distribution, and these contrasts can be easily accounted for by the procedure in (1). As a starting point I introduce a particular distinction of predicate types that highlights the "splitting" of the sentence effected by the Mapping Hypothesis in a number of different ways. This classification is the stage/individual distinction of Carlson (1977b). Various syntactic and semantic properties of the subjects of these two predicate types provide support for the hypothesis in (1). In the final sections of this chapter I extend my approach to a number of other predicate types.

2.2 The Readings of Bare Plurals

In and of itself, the form of the logical representations introduced in the previous chapter makes certain predictions concerning the interpretation of subjects. The tree-splitting diagram (along with the representations derived by the procedure) implies that there are two possible positions for the subject in the logical representation. A subject in [Spec, IP] will map into a restrictive clause, and a subject in [Spec, VP] will map into the nuclear scope. The first thing to consider in investigating the empirical validity of the Mapping Hypothesis is whether or not these two possibilities are actually both attested in the interpretations of subjects. In this section I focus on a particular class of NP, the English bare plural, and consider the two possibilities for representing the interpretations of these subjects in the logical representations. I conclude that we do in fact need both positions for the subject in the semantic representation.

Bare plurals are a particular kind of indefinite NP that do not have an overt determiner of any kind. As observed by Carlson (1977b), English bare plural subjects can receive either a generic or an existential reading:

(2) a. Brussels sprouts are unsuitable for eating. GENERIC
b. Carpenter ants destroyed my viola da gamba. EXISTENTIAL

The example in (2a) illustrates the generic reading. (2a) is not a statement about any particular Brussels sprouts. Instead, it states that in general Brussels sprouts have the property of not being edible. The bare plural subject in (2b), on the other hand, exemplifies the existential reading. This is not a statement about a property of carpenter ants in general; it merely asserts the existence of some carpenter ants that ate my viola da gamba.

In deriving the logical representations of these two readings, I will assume (following Wilkinson (1986) and Gerstner and Krifka (1987)) that there is an abstract generic operator Gen that binds variables to produce a generic reading. I will also assume that bare plurals, like certain singular indefinites such as a llama, introduce variables into the logical representation. Thus, the two readings of the bare plural subject in **(2)** result from different representations in Heim's framework:l

(3) a. Gen_x [x is a Brussels sprout] x is unsuitable for eating
b. €x *x* is a carpenter ant ^ *x* destroyed my viola da gamba

In (3a) the bare plural NP ***Brussels sprouts*** is introduced in the restrictive clause and is bound by the operator Gen, which gives the generic reading- in general, those things that are Brussels sprouts are unsuitable for eating.

In (3b) the NP carpenter ***ants*** appears in the nuclear scope and is bound by existential closure, resulting in the existential reading—there were some carpenter ants that destroyed my viola da gamba.

Carlson notes, however, that not all predicates allow both the generic and existential readings for a bare plural subject. Carlson distinguishes two types of predicates, stage-level predicates and individual-level predicates. Stage-level predicates typically correspond to temporary states such as "available" and "lying on the floor" and transitory activities such as "destroying my viola da gamba" and "falling down the stairs." Individual-level predicates roughly correspond to more or less pennanent states such as "unsuitable for eating," "intelligent," and "having six legs."2 In the following sections I examine more closely the behavior of these two types of predicates. After considering the distribution of readings for bare plural subjects, I show that the two kinds of predicates differ in where they allow a bare plural subject to appear in the logical representation, providing the first step in justifying the Mapping Hypothesis.

In particular, I discuss the different possible readings of bare plural subjects with stage-level and individual-level adjectival predicates. The distribution of the readings possible with the two types of predicates leads to a formulation of the stage/individual contrast in terms of where the subject NPs of each type of predicate can be represented in the logical representations.

2.2.1 Stage-Level Predicates

Close examination of sentences with stage-level predicates reveals that not only are both existential and generic quantification allowed, but there are also apparent interactions between existential quantification and generic quantification. In other words, a stage-level predicate can induce both existential properties and generic properties at the same time. Thus, a stage-level predicate like available allows the following readings:

(4) a. Firemen are available.
b. 3, *x* is a fireman A *x* is a available
c. $\text{Gen}_{x,t}$ [*x* is a fireman A *t* is a time] *x* is available at *t*
d. Gen, [*t* is a time] 3, x is a fireman A x is a available at *t*

The first reading given in (4) is the existential reading of the bare plural subject. On this reading there are firemen available at some point in time. This reading involves an "episodic" reading of the predicate, along with an existential reading of the subject.

The second reading is a generic reading expressing a dispositional attribute of firemen; it is a necessary property of firemen that they be generally available for fighting fires. It follows from this reading that a person who is likely to give other commitments a higher priority than firefighting shouldn't be a fireman. Unlike (4b), this reading is not episodic, but involves some sort of generic tense (see Carlson **1977b)** as a result of the generic operator binding times as well as firemen (as shown in the restrictive clause in (4c)).

Finally, in the third reading the existential quantification is under the scope of a generic operator, producing an "existential generic" interpretation. This reading can be paraphrased as 'Generally, there are firemen available'. In this case the generic operator may perhaps bind times, as shown in **(4d).** One context in which this reading may arise is the situation where firemen work short shifts, but there are always some firemen on call. Thus, not only can the stage-level adjectival predicates induce both generic and existential readings for bare plural subjects, but they are also ambiguous between episodic and generic tense so that multiple generic readings are in fact possible as a result of the interaction of the generic operator with existential closure.[3] In what follows in this chapter I will concentrate mainly on the occurrence or nonoccurrence of the existential and generic readings, without discussing the interactions between the various readings any further.

2.2.2 Individual-Level Predicates

Whereas bare plural subjects of stage-level predicates receive either the existential or the generic interpretation, bare plural subjects of individual-level predicates appear to be more restricted. There is a striking asymmetry between the two types of predicates with respect to subject interpretation. Individual-level adjectival predicates seem to allow only the generic reading of their bare plural subjects, and do not seem to allow existential readings at all. This is illustrated in (5).

(5) a. Violists are intelligent.
b. Opera singers know Italian.

Consideration of the examples in (5) reveals that the absence of the existential reading cannot be attributed to pragmatic factors (unlike the case of the sometimes implausible generic readings with stage-level predicates; see note 3). The lack of an existential reading in (5a) has nothing to do with whether or not the subject NP violists can be appropriately applied to intelligent. It is difficult, if not impossible, to think of any contextual

situations in which (5a) could be taken to mean 'There are intelligent violists'. The same observation applies to the predicate know Italian in (5b) with respect to the subject opera ***singers.*** Thus, stage- and individual-level predicates differ in the interpretive possibilities they allow for bare plural subjects. Whereas bare plural subjects of stage-level predicates can be bound by either the generic operator Gen or existential closure (or of course an overt adverb of quantification such as always), subjects of individual-level predicates can only be bound by the generic operator (or an adverb of quantification). Since the Gen operator only binds variables that are introduced in the restrictive clause of the logical representation, this difference between the two types of predicates can be expressed in terms of a difference in where the subject NPs can appear in the logical representation:

(6) Stage-Individual-level distinction
In a logical representation, bare plural subjects of stage-level predicates can appear in either the nuclear scope (to be bound by existential closure) or the restrictive clause (to be bound by either the abstract quantifier Gen or an overt operator). Bare plural subjects of individual-level predicates can only appear in the restrictive clause.[4]

Thus, a bare plural subject can be mapped into either of the two possible positions in the logical representation, either the nuclear scope or the restrictive clause. The data concerning the multiple interpretations of the English bare plural show that we do indeed need both positions for the subject in the logical representation. At this point, the generalization stated in (6) is merely descriptive. There still remain the questions of how the mapping from the syntax to the logical representations is accomplished, and of why the two types of predicates should be distinguished in this way. In the next section I propose how the two types of subjects may be distinguished in the syntax to make the mapping to logical representations possible. This in turn leads to proposing a syntactic distinction between stage- and individual-level predicates that derives the distinction in (6).

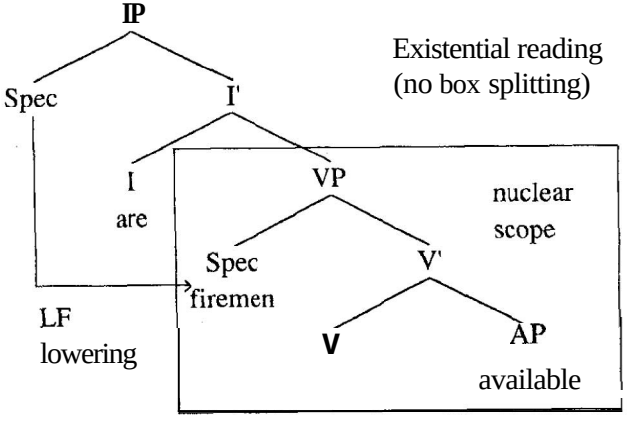
2.3 The Syntactic Connection: Deriving the Two Readings

The Mapping Hypothesis under consideration here maintains that there is a correspondence between the two subject positions in the syntactic tree and the two possible positions for the subject in the logical representations illustrated in (3). In this section I examine the relationship between the

tree-splitting process and restrictive clause formation, or box splitting, by taking a closer look at the syntactic derivations of the two readings of the bare plural subject.

I will concentrate on the basic existential and generic readings of the sentence ***Firemen are available*** shown in ***(4b)*** and (4c), beginning with the existential reading.

(7) ***Deriving the existential reading***

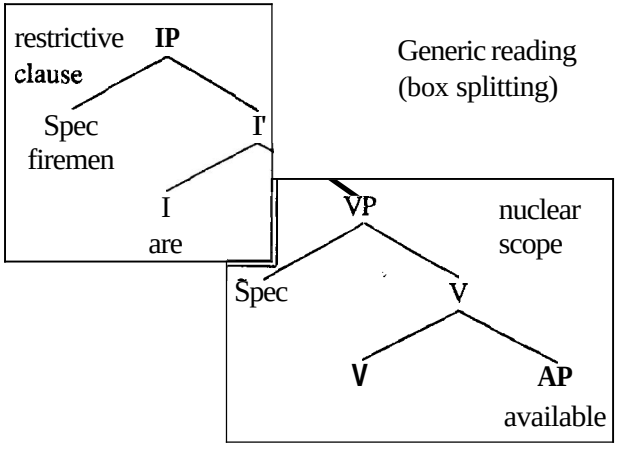


The tree in (7) shows the derivation of the existential reading of (4). The subject lowers from its S-structure position in [Spec, IP] to the VP-internal subject position [Spec, VP] (I will discuss the question of where the subject is base-generated later on).5 This is similar to the quantifier lowering operation proposed by May (1977,1985) to account for scope ambiguities in raising constructions. This entails that there is some abstract syntactic level of "logical form" (which I will call LF, following May (1977) and others) intervening between S-structure and the level of semantic representation. I will assume, just as in the quantifier-lowering case discussed by May, that the trace left by the lowered NP is interpreted as an empty expletive at LF and thus need not be bound at LF (see May 1985:102).6 Tree splitting then applies (at the abstract level of LF), mapping the VP into the nuclear scope. The IP-level subtree is left empty, and therefore no restrictive clause is formed (or, following the parallel to Kamp's (1981) box-splitting operation, tree splitting produces only one box). This leads to the representation in **(4b).7**

In deriving the generic reading, on the other hand, no LF lowering of the bare plural subject takes place. The subject stays in [Spec, IP], where it is mapped into a restrictive clause by the mapping algorithm. From this LF configuration, tree splitting produces two boxes: a restrictive clause

and a nuclear scope. The variable introduced in the restrictive clause is bound by the generic operator. Since no new variables are introduced in the VP in this case, existential closure does not apply. This is shown in (8), which corresponds to the logical representation in (4c).

(8) ***Deriving the generic reading***



The syntactic derivation of the generic and existential readings of (4) raises a question about the levels of representation involved: namely, When in the derivation of a sentence does the mapping to logical representations (tree splitting) occur? In English, it is clear that it cannot be at S-structure, since all subjects must appear in [Spec, IP] at S-structure. There is no way to distinguish IP subjects (in [Spec, IP]) and VP subjects (in [Spec, VP]) at S-structure in English. The mapping to logical representations must therefore occur at the intermediate syntactic level of LF (see May 1977, 1985). The generic and existential readings are distinguished by the fact that LF lowering of the subject to the VP-internal subject position occurs in the existential reading but not in the generic reading. To return to the question of the relation between the syntactic representations and the semantic representations, given these assumptions about the derivation of logical representations, there is in fact a correspondence (albeit an indirect one mediated by the level of LF) between the two subject positions in the logical representations and the two subject positions in the phrase structure tree.

Only stage-level predicates permit both the derivations in (7) and (8). With individual-level predicates only the generic reading (illustrated by the derivation in (8)) is possible. Thus, at the point of mapping to logical representations **(e.g.,** the level of LF) the bare plural subject of an

individual-level predicate must be in [Spec, IP], in order to be mapped into a restrictive clause, where it will be bound by the generic operator. The distinction between stage- and individual-level predicates stated in (6) can be restated in terms of the possible syntactic position of the bare plural subject at the level of LF:

(9) LF representation of bare plural subjects

Subjects of stage-level predicates can appear either in [Spec, IP] or in [Spec, VP]. Subjects of individual-level predicates can appear only in [Spec, IP].

Although this translation into syntactic terms addresses the question of how the two readings are derived, it still leaves open the question of why the two predicate types should differ in just this way. From the derivations in (7) and (8) it might be expected that subjects of individual-level predicates such as ***intelligent*** should have the option of lowering the subject to [Spec, VP] at LF, just as in the case of the stage-level predicate ***available.*** Nothing in the analysis as presented so far precludes this possibility.

Kratzer (1989) proposes to derive the difference from a difference in argument structure. She proposes that stage-level predicates have an abstract "Davidsonian" spatiotemporal external argument, whereas individual-level predicates lack this argument.[8] She gives various kinds of evidence for the existence of the abstract spatiotemporal argument in stage-level predicates, including availability of the spatiotemporal argument for binding as a variable by an operator. This difference in argument structure is used to derive the syntactic difference between the two types of predicates stated in (9) through argument-linking conventions. Taking the argument-linking analysis of Williams (1981) as a starting point, Kratzer assumes that all arguments except the external argument are realized at D-structure within the maximal projection of their predicate (the VP in this case). The external argument (if not implicit, as in the case of the abstract Davidsonian argument) then appears external to the predicate (in [Spec, IP]).

Thus, in Kratzer's account the difference between stage- and individual-level predicates is due to a difference in argument structure. In particular, the two predicate types differ in their external arguments: stage-level predicates have the abstract Davidsonian argument, whereas individual-level predicates (or, more accurately, individual-level predicates that have an external argument) map the subject NP to the external position at D-structure. In the case of the individual-level predicates the subjects are

base-generated in [Spec, IP], and subjects of stage-level predicates are base-generated in [Spec, VP].

2.3.1 Control, Raising, and the Stage/Individaal Contrast

The argument-linking approach taken by Kratzer unifies the explanation of the variable-binding properties of the two types of predicates with the explanation of the other semantic properties of the predicates (e.g., the possible interpretations of bare plural subjects). This unification is accomplished at the cost of making some unorthodox assumptions about argument linking. In any case, it is no longer clear that the external argument must be base-generated external to VP (as proposed by Williams), since the VP-Internal Subject Hypothesis permits &marking of the external argument within VP (see Kitagawa 1986 and also Larson 1988 for some proposals in which all arguments are projected from base positions within VP).

Kratzer's proposal also rules out the possibility of there being ***any*** connection between the external subject and the internal subject position ([Spec, VP]) in individual-level predicates. There is some preliminary evidence that this restriction may not be correct. Bonet (1989), citing data from Catalan, suggests that floated quantifier constructions might require that all subjects be base-generated in [Spec, **VP**]. Her claim is based on the fact that floated-quantifier constructions are acceptable with individual-level predicates (incidentally, this is true of English as well). The logic of Bonet's argument follows the NP-movement analysis of floated quantifiers proposed by Sportiche (1988) in which the floated quantifier originates from the internal (or lower) subject position. Thus, on Sportiche's analysis the subject in the following sentence has raised from a position adjacent to the floated quantifier ***all*** (the subject NP is base-generated as ***all*** the ***violists):***

(10) a. $[_{IP}$ The violists, are $[_{VP}$ all t, tone-deaf]].

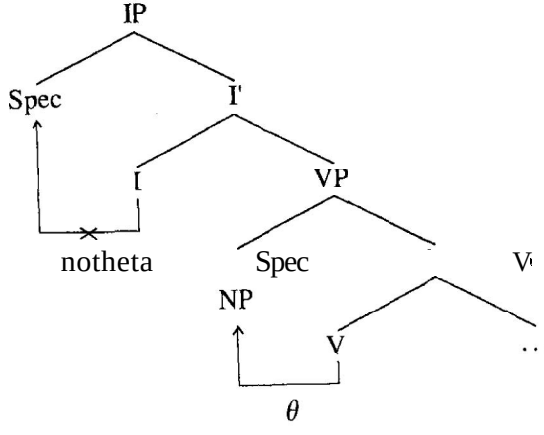
If the subject were base-generated in [Spec, IP] with no connection to [Spec,VP], this relation between the S-structure subject and the floated quantifier could not hold.

The sentence in (10) makes it clear that it must be possible for the subject of an individual-level predicate to be related to the lower position in some way, regardless of whether or not floated-quantifier constructions involve an actual ***movement*** relation, rather than some other sort of relation between the two subject positions. I would like to propose a variation

on Kratzer's approach that is consistent with the results of Bonet and Sportiche in that it permits an "anaphoric" relationship of some kind to exist between the two subject positions with both types of predicates, although the nature of the relation differs in each case.

My claim is that the difference between the two types of predicates arises from differences in the properties of the Infl associated with them. As shown in (11), stage-level predicates have an "unaccusative" (in the sense of having an internal subject) Infl the subject is base-generated internal to the VP in [Spec, VP], and Infl does not assign a 0-role to [Spec, IP]. This gives rise to a "raising" relation between the two subject positions.

(11) ***Stage-level predicate***



The pattern of theta-assignment illustrated in (11) permits S-structure raising of the subject of a stage-level predicate to [Spec, IP] to receive case, leaving a trace in [Spec, VP], analogous to raising predicates. The raising analogy also applies to the "LF lowering" operation used to derive the existential reading of the subject. As mentioned earlier, May (1977, 1985) shows that subjects of raising predicates can be interpreted as though they have been lowered at LF, in an "undoing" of NP-movement. In parallel to raising predicates, stage-level predicates also allow lowering of the subject from [Spec, IP] into the lower subject position, [Spec, VP], in the mapping to LF.

Thus, subjects of stage-level predicates at LF may stay in [Spec, **IP],** or they may be lowered to their base position in [Spec, VP]. Stage-level predicates can thus receive either a generic interpretation (subject remains in [Spec, IP] at LF) or an existential interpretation (subject is lowered into [Spec, VP] at LF). Subjects of raising predicates like seem also can be interpreted as if lowered at LF. Thus, in the sentence in (12) the indefinite

NP a unicorn may be interpreted as having either wide or narrow scope with respect to the matrix predicate.

(12) A unicorn is likely to damage the walls.

Empirical support for this "lowering" analysis of the bare plural subject of stage-level predicates comes from binding facts in multiple raising structures, or sentences in which a stage-level predicate is embedded as the complement of a raising verb.9

(13) a. Firemen, seem to their, employers to be available.
b. Gila monsters, seem to their, predators to be visible.

In the sentences in (13) the bare plural subjects firemen and ***Gila*** monsters show a dependency between the generic reading and the pronominal binding shown in the indexing given. The bound variable relation between the bare plural and the pronoun forces the generic reading. The sentence in (13a) cannot mean 'There are firemen that seem to their employers to be available'. If the existential reading is derived by lowering of the subject as proposed above, the absence of this reading in the sentences in (13) is actually expected. Lowering of the subject into the lower VP would rule out the bound variable reading for the pronoun their since the subject would no longer c-command the pronoun (assuming that these binding relationships must hold at LF):

(14) e_i seem to their, employers [to be [firemen, available]]

This contrasts with parallel sentences without a bound pronoun, in which both the "lowered" (existential) and "raised" (generic) readings of the bare plural are possible (although the sentences are somewhat awkward):

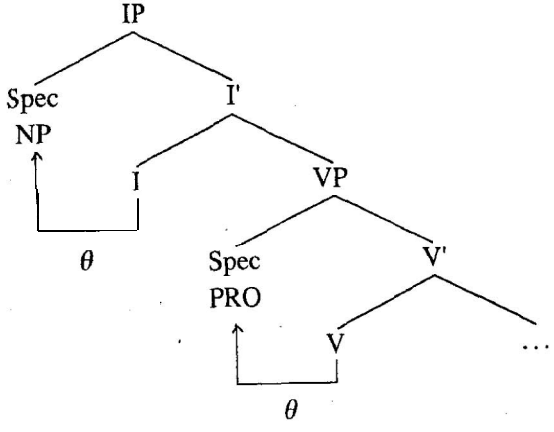
(15) a. Firemen seem to the mayor to be available.
b. Gila monsters seem to the coyotes to be visible.

Thus, the absence of the existential reading on the bound variable interpretation of the pronoun in (13) supports the lowering analysis of the derivation of the existential reading.

The raising analysis of stage-level predicates accounts for the fact that they permit both the generic and existential readings of bare plural subjects. This leaves us with the matter of accounting for why individual-level subjects are restricted to the generic reading. My proposal here is that individual-level predicates should be analyzed as analogues to control predicates. On this account, as illustrated in **(16),** individual-level predicates differ from stage-level predicates in that they have an Infl that

assigns a theta-role to [Spec, IP]. This role has roughly the meaning 'has the property **x'**, where x is the property expressed by the predicate. The lexical NP in [Spec, IP] controls a PRO subject in [Spec, VP], which is assigned a &-role by the verb.

(16) Individual-level ***predicate***



The "control Infl" is thus a two-place predicate, with the subject NP and the VP as arguments.

The presence of PRO in [Spec, **VP]** raises the question of the government status of the [Spec, VP] position. As required by the PRO Theorem (see Chomsky 1981 and related works), PRO must be ungoverned. In the configuration in (16), the **PRO** in [Spec, VP] is theta-marked by V, and presumably also governed by it (we will see empirical evidence for the assumption that [Spec, VP] is a governed position later on in this chapter).10 If **PRO** were to remain in this position, the proposal would be inconsistent with the assumptions that led to the formulation of the PRO Theorem.

There are a couple of ways of dealing with this problem. One could simply propose that contrary to Chomsky (1981), **PRO** may be governed in English. There are in fact a number of analyses of various phenomena that independently support the notion of a governed PRO; see, for example, Haider 1983, É. Kiss 1987, Koster 1987, and Sigurdsson 1990.

Alternatively, one could choose to maintain the PRO Theorem and assume that the PRO in [Spec, **VP]** in (16) is simply forced to move to an ungoverned position external to VP, a position that might not otherwise be generated. Here again there is evidence that a mechanism of this kind is independently necessary. In order to maintain the idea that PRO must be ungoverned, forced movement of PRO out of a governed position is

necessary in contexts involving control into passives:

(17) Hector tried to be killed.

One possible candidate for the landing site for the moved **PRO** would be the specifier of Pesetsky's (1989) mu-phrase (the mu-phrase is used by Pesetsky as a sort of all-purpose escape hatch). Thus, on this approach PRO may be generated in a governed position, but it must not remain there throughout the derivation. I will not choose between these two options for dealing with the problem of a governed PRO, but will simply leave the matter for further research.

The parallel to control predicates also shows up in the available semantic interpretations of the bare plural subjects of individual-level predicates. As noted by May (1985), the subjects of control predicates such as ***be anxious to*** do not lower in the mapping to LF, since the [Spec, IP] is assigned a 8-role. Thus, the subject of a control predicate can only have wide scope with respect to the matrix predicate:

(18) **A** unicorn is anxious to damage the walls.

Likewise, subjects of individual-level predicates are not able to lower and therefore ***must*** be mapped into the restrictive clause at LF, receiving only the generic reading:

(19) a. $[_{IP}$ Opera singers $[_{VP}$ PRO know Italian]].
b. $\mathbf{Gen}_x$ [x is an opera singer] **x** knows Italian

Thus, the fact that only the generic reading is possible with individual-level predicates can be accounted for by the fact that subjects of individual-level predicates are base-generated in [Spec, IP]. They have not undergone NP-movement, raising them from [Spec, VP], and thus cannot be lowered. Thus, the only possible position for the subject of an individual-level predicate at LF is the outer subject position, or the position corresponding to the restrictive clause.

If the distinctions in behavior between the two types of predicates are due to a difference in Infl, the question arises how this difference is to be represented in the case of adjectival predicates. Following Stump (1985), I will assume that there are (at least) two verbs ***be.*** The first is a predicative ***be*** that selects an individual-level adjective and forms an individual-level predicate (Stump's ***be,,*** p. 75). The second ***be*** selects a stage-level adjective to form a stage-level predicate (Stump's be,, p. 79).11 The individual-level ***be*** takes the individual-level Infl, and the stage-level ***be*** takes the stage-level Infl.12 I will return to the question of classifying adjectives according to the stage/individual distinction in a later section. This alter-

nation between two types of be is perhaps comparable to the alternation between the be-forms ser and estar in Spanish.13

Summarizing this section, I have proposed to analyze the stage/individual contrast as being analogous to the contrast between raising and control predicates. This sort of analysis parallels descriptions of epistemic modals as raising verbs (see Jackendoff 1972, McCawley 1988:211-213), as opposed to root modals, which may involve a control-like structure (Zubizarreta 1982).14 The contrast centers on a difference in Infl: individual-level predicates take the "control" Infl that assigns a theta-role to [Spec, IP], which has roughly the meaning 'has the property **x'.** The subject is thus base-generated in [Spec, IP], but controls a PRO subject in the VP-internal subject position. Stage-level predicates, on the other hand, take an Infl that does hot assign this theta-role to [Spec, IP].15 In this case the subject is base-generated in [Spec, VP] and raises to [Spec, IP] at S-structure. Stage- and individual-level predicates are further distinguished with respect to the presence or absence of an event argument. These two properties are shown in (20):

(20) Properties of stage- and individual-level predicates

	Stage	Individual the
theta-role to [Spec, IP]?	No	Yes
Event argument?	Yes	no

My account differs from Kratzer's (1989) analysis in that the subject of an individual-level predicate in [Spec, IP] still bears a control relationship to the internal [Spec, VP] position. This is desirable, because it is consistent with the fact that floated quantifiers do not show a stage- and individual-level contrast, as pointed out by Bonet (1989). The control analysis of individual-level predicates allows the needed connection between the subject NP and the VP in the floated-quantifier construction, since (as noted by Sportiche (1988)) floated quantifiers can to some extent "originate" from PRO in the "usual" control structures:

(21) The violists promised to all leave.

Thus, the lexical NP associated with the floated quantifier need not be base-generated in the internal position to allow floated quantifiers with individual-level predicates.

The classification given in (20) leads one to wonder about other possible settings of the two parameters shown there: theta-role assignment to the external subject position and the presence of the event argument. One possibility relates to a particular class of predicates discussed by Kratzer

(1989) (although the discussion does not occur in this connection). This case is what Kratzer refers to as "individual-level unaccusatives." These amount to predicates that lack an event argument and allow the surface subject to be generated VP-internally as an underlying object. No theta-role is assigned to [Spec, IP]. Thus, on Kratzer's analysis these predicates are those that do not assign a theta-role to an external subject, and also do not have an event argument. Examples are verbs like belong to and is known *to:*

(22) a. Snow leopards belong to the emperor.
b. Counterexamples are known to most linguists.

Though the sentences in (22) do have a "universal flavor" of sorts, they do not seem to express generic qualities of their subjects (snow leopards and counterexamples). If anything, they express properties of their objects (the emperor and linguists).

I would like to suggest that the universal nature of these sentences derives from binding by the generic operator ***Gen,*** whereas the absence of the 'has property **x'** reading results from the fact that no theta-role is assigned to [Spec, IP]. However, it is important to note that as Kratzer has argued, these predicates differ from stage-level predicates in that they give no evidence of having an event argument. I will discuss the properties of the individual-level unaccusatives in more detail in a later section.

2.3.2 Existential Closure and Bare Plural Objects

One final point to note is that this account predicts that there should be no generic readings for bare plural objects. This is because existential closure applies to **VPs,** binding all variables within VP. VP-internal bare plurals should therefore receive only the existential interpretation. In most cases, genericity does indeed appear to be subject-oriented. This fact is discussed by Carlson (1977b).

The observation that generic interpretations are limited to subjects does not hold generally for all types of predicates, however. Carlson (1977: 186ff.) notes that there are some transitive verbs that do result in generic readings for bare plural objects. These are verbs such as ***like,*** hate, ***fear,*** and loathe—the so-called experiencer predicates:

(23) a. Cellists hate boring bass lines.
b. Contrabassoonists love chocolate chip cookies.

In the sentences in **(23)** both the subject and object seem to be interpreted generically.16 Thus, it appears that objects of experiencer predicates can

somehow "escape" the nuclear scope and be mapped into the restrictive clause, to be bound by ***Gen*** along with the subject. Some light can be shed on this situation by considering free word order, or "scrambling," in German. Kratzer (1989) notes that there is a parallel between these cases and S-structure scrambling of indefinites in German in that whereas indefinites are normally barred from scrambling out of VP in German (Lenerz 1977), indefinite objects of experiencer verbs generally do scramble. Kratzer therefore proposes that objects of experiencer predicates in English are scrambled out of the VP at LF (presumably adjoining to IP) and can thus be mapped into the restrictive clause.

The generic reading for an object bare plural is not strictly limited to the objects of experiencer verbs (although experiencer verbs are special in that they require generic readings for bare plural objects). In certain "habitual" contexts other verb types permit generic readings for bare plural objects as well. In (24) the bare plural NP ***novels*** can receive a generic interpretation in a context where whenever Esther comes upon a novel, she reads it.

(24) Esther reads novels.

Interestingly, contexts such as that given for (24) also permit scrambling of indefinites in the parallel sentences in German (see also Kratzer 1989 and Kathol 1989). I will therefore assume that these cases in English also involve LF scrambling of the object NP, which subsequently results in the object NP being mapped into a restrictive clause. (I will discuss constructions of this type in both English and German in detail in chapter 4.)

2.3.3 Overview of Stage- and Individual-Level Predicates

The interpretations of bare plural subjects reflect a correspondence between the X-bar syntactic representation at LF and the Heim-style logical representationsin which the VP maps into the nuclear scope and material outside of the VP maps into the restrictive clause.17 The interpretive differences between subjects of stage- and individual-level predicates are thus due to a syntactic contrast. Whereas all subjects appear in [Spec, IP] at S-structure in English, at LF the subjects of stage- and individual-level predicates differ in position: individual-level subjects can only appear in the outer position and are mapped into the restrictive clause, whereas stage-level subjects can appear in the inner position and be mapped into the nuclear scope. This difference derives from differing properties of Infl in the two types of predicates, which results in the stage-level predicates being given an analysis parallel to raising verbs, and individual-levelpredicates being analyzed as parallel to control structures.

In this section I have confirmed the first prediction made by the Mapping Hypothesis: the existence of two possible positions for the subject in the logical representation is motivated by the English bare plural facts. In demonstrating this, I noted that the relationship between S-structure and the logical representations in English is necessarily somewhat abstract, since in English all subjects must appear in [Spec, IP] at S-structure. In the next section I consider the possibility of a more direct relationship between the restrictive clause/nuclear scope positions and the syntactic [Spec, IP]/[Spec, VP] positions, in order to confirm the close relation between the syntactic tree and the logical representations that is imposed by the tree-splitting algorithm. This requires focusing on a language in which subjects need not appear in [Spec, IP] at S-structure. One,language where this seems to be the case is German.

2.4 Two Subject Positions in German: An IP/VP Contrast

German provides data that permit the possibility of a more direct relationship between the tree-splitting procedure and the S-structure representations than that described for English in the previous section. In German it appears that it is not necessary for the subject to appear in [Spec, IP] at S-structure. Thus, in the sentences in *(25)* the subject NP Ameisen 'ants' can appear either to the left or to the right of the sentential particles ja and doch.18 As we will see, this freedom of word order provides a basis for testing the relationship between the syntactic structure and the semantic interpretation of a sentence.

(25) a. ... [$_{CP}$ weil [$_{IP}$ Ameisen ja doch [$_{VP}$ einen Postbeamten gebissen
since ants 'indeed' a postman bitten
haben]]].
have

b. ... [$_{CP}$ weil [$_{IP}$ ja doch [$_{VP}$ Ameisen einen Postbeamten gebissen
since 'indeed' ants a postman bitten
haben]]].
have

I have bracketed the sentences in (25) in such a way as to indicate that the subject to the left of the particles (as in (25a)) is immediately dominated. by the IP node and the subject to the right of the particles (as in (25b)) is immediately dominated by the VP node. It has in fact been argued by Jackendoff (1972) for English, by Holmberg (1986) for Scandinavian, and by Webelhuth (1989) for German that sentence adverbials

mark the VP boundary. Arguments involving relative positioning of elements have also been used by Pollock (1989) to argue for phrase structure positions (inflectional heads in particular) in an articulated inflectional structure. This is not the strongest sort of evidence to use in investigating clause structure, however. It may be possible that the "reference points" (in this instance the adverbials) themselves may move by some process (such as scrambling). Therefore, before considering the semantic implications of the two possible word orders in (25), it is worthwhile to seek additional evidence going beyond arguments based on relative position to support the claim that the two apparent subject positions shown are in fact the [Spec, IP] or [Spec, VP] positions. To this end, I consider two cases of extraction in German that show a contrast in acceptability depending on the apparent S-structure position of the subject.

2.4.1 Extraction and the Two Subject Positions

The first case of extraction I will consider is the *was-für* split. The *was-für* split is a case of extraction out of NPs (subextraction) discussed by Den Besten (1985) (the Dutch counterpart of this construction, the wat-voor split, is also discussed by Bennis (1986)). The NP specifier *was-für* (meaning 'what kind of') can occur as a lexical unit, or the 'was' portion can break off and be fronted to [Spec, CP] by wh-movement, leaving the rest of the NP behind:

(26) a. Was fiir Ameisen haben denn einen Postbeamten gebissen?
what for ants have 'indeed' a postman bitten
'What kind of ants have bitten a postman?

b. [$_{CP}$ Was haben [$_{IP}$ denn [$_{VP}$ fiir Ameisen einen Postbeamten gebissen]]]?

c. *[$_{CP}$ Was haben [$_{IP}$ fiir Ameisen denn [$_{VP}$ einen Postbeamten gebissen]]]?

In (26a) the entire subject NP was *für Ameisen* has been fronted to [Spec, CP] by wh-movement. No splitting of the specifier *was-für* has taken place. In (26b) only the was portion of the specifier has been fronted, leaving the remainder of the NP behind to the right of the particle *denn* (the arrow indicates the movement that has taken place). (26c) illustrates the case in which was is extracted out of a subject that is to the left of the sentential particle, as indicated by the "stranded" portion of the NP. In this case the extraction is not acceptable. Den Besten (1985) has argued that the *was-für* split is indeed a case of movement, on the basis that it is possible only from "governed positions."

A second case of movement in German that shows a contrast between the two subject positions is the split-topic construction. This construction has been the subject of much recent work (see, for example, Van Riemsdijk 1989, Fanselow 1988a, Tappe 1989, and Bhatt 1990). I will simply assume here that just as in the *was-für* split, extraction (e.g., topicalization) from an NP has taken place, with the result that a portion of the NP has been fronted to the "topic" position preceding the finite verb and a determiner is left stranded in the base position (for specific arguments that this construction does indeed show properties characteristic of movement, see Van Riemsdijk 1989).[19] This construction raises a number of interesting problems, many of which are discussed in the references mentioned. I will be focusing in particular on extraction from subjects, as in (27).

(27) a. Ameisen, haben ja einen Postbeamten [$_{NP}$ viele t_i] gebissen.
ants have PRT a postman many bitten
'As for ants, many have bitten a postman.'

b. *Ameisen haben viele ja einen Postbeamten gebissen.
ants have many PRT a postman bitten

As illustrated here, the split-topic construction shows the same contrast with respect to extractability from a subject as the *was-für* split. Subjects in an internal position (to the right of the sentential particle ja) permit subextraction (27a), whereas subjects in the external position (to the left of the particle) do not allow extraction (27b).

Thus, the relative position of the subject determines extractability in both the *was-für* split and split-topic constructions. The original observations of Den Besten (1985) and Van Riemsdijk (1989) concerned the contrast between extraction from subjects of unaccusatives and extraction from unergatives. They did not note the distinction between internal and external subjects in unergatives shown above (this distinction was originally noted by Angelika Kratzer in class lectures in the spring of 1988).

These contrasts in extraction provide evidence concerning the relative structural position of the two subject positions. If the two subject positions (to the left and the right of the sentential particles) are structurally distinguished as [Spec, IP] and [Spec, VP], Kratzer's observations concerning extraction can be assimilated to Huang's (1982) discussion of the restriction against extraction from subjects (a subcase of his Condition on Extraction Domain, or CED). In this case the position to which the

CED-like constraint applies is the [Spec, IP], as opposed to [Spec, VP], which carries no restriction on extraction.

Huang's results have been reanalyzed in terms of Subjacency violations in the Barriers framework of Chomsky (1986a). I will adopt Chomsky's analysis to show that the extraction contrast between (26b)/(26c) and (27a)/(27b) can be explained as a Subjacency contrast *if* the leftmost subject position is assumed to be [Spec, IP] and the right-hand subject position is assumed to be [Spec, VP].

In the Barriers framework a Subjacency violation is defined as resulting from crossing two categories that are barriers to movement. The definition of a barrier is relational and involves the interplay of several different concepts. In (28)–(31) I give the relevant definitions from Chomsky 1986a.

(28) Barrier
γ is a barrier for β iff (a) or (b):
a. γ immediately dominates δ, δ a blocking category (BC) for β;
b. γ is a BC for β, $\gamma \neq$ IP.

(29) Blocking category
γ is a BC for β iff γ is not L-marked and γ dominates β.

(30) L-marking
α L-marks β iff α is a lexical category that 0-governs β. (α 8-marks β and is a sister to β)

(31) Spec-head agreement
If a head L-marks a maximal projection, it L-marks the specifier of the projection. (Koopman and Sportiche 1988)

This system can be applied to explain the contrasts in extraction noted above, but some minor revisions have to be made. The first modification arises in considering the cases of [Spec, **VP**] extraction in (26b) and (27a). Here the lexicalized Infl (V + Infl) L-marks VP (as Chomsky (1986a) assumes in discussing raising). I make an additional assumption, which is that aspectual verbs like have (or the German haben, in this case) L-mark their complements, just as other verbs do (this assumption is also made by Tappe (1989) with regard to the split-topic construction; see also Bhatt 1990 for further discussion).

Since the VP is L-marked, the [Spec, VP] is also L-marked, by means of Spec-head agreement, as defined in (31). In this case the L-marking head is the lexicalized Infl (or V + Infl), the maximal projection is the VP, and the specifier of VP ([Spec, VP]) is thereby L-marked. This is an extension of the original notion of Spec-head agreement as put forth by Chomsky

(1986a). Originally Spec-head agreement was proposed for cases where IP was L-marked (such as an embedded clause in exceptional case marking (ECM) contexts). The agreement mechanism was motivated by the case-assigning relationship between [Spec, IP] and Agr (Chomsky 1986a:24). Chomsky then extended this agreement relation to the head and specifier of CP (p. 27), characterizing the specifier-head relation in terms of the sharing of some abstract "phi-features." I simply extend this idea to heads and specifiers generally, as expressed in definition (31).[20]

The result is that in (26b) neither the VP nor [Spec, **VP**] is a blocking category, since by definition (29) a blocking category is necessarily ***not*** L-marked. ***A*** further consequence is that neither the VP nor [Spec, VP] is a barrier, since a barrier must either itself be a blocking category or immediately dominate a blocking category (see definition (28)). Thus, extraction out of a subject in [Spec, VP] does not cross any barriers and should therefore be good. This is what we see in (26b) and (27a).

In the case of (26c) and (27b), or the [Spec, IP] extractions, IP is ***not*** L-marked. There is subsequently no Spec-head agreement, and [Spec, IP] is therefore also not L-marked. Since it is not L-marked, [Spec, IP] is a blocking category (by definition (29)). [Spec, IP] is thereby also a barrier, by clause (b) of the definition of barrier in (28), since it is a blocking category and not equal to IP. The IP in turn then "inherits" barrierhood by clause (a) of the definition of barrier: it dominates [Spec, IP], which is a blocking category. Thus, extraction from the [Spec, IP] crosses ***two*** barriers, [Spec, IP] and IP, and the result is ungrammatical.

In summary, the position of the subject relative to sentential particles (either to the left or to the right) led to the observation that there are at least two positions for the subject in German. The contrasts in extractability between the two subject positions in the *was-für* split and the split-topic construction provide evidence that the two positions are distinguished in the Barriers framework with respect to Subjacency. In obtaining this result, I have made two revisions to the original Subjacency analysis given by Chomsky (1986a). First, I assume that aspectual auxiliaries such as have theta-mark (and therefore L-mark) VP. Second, I assume that a Spec-head agreement relation holds between the head and specifier of VP, which leads to the specifier of VP being L-marked by virtue of the L-marking of VP (this in contrast to the specifier of IP, which is in no way L-marked). This contrast supports the hypothesis that the two positions for the subject are in fact [Spec, IP] and [Spec, VP]. Thus, German subjects can appear in either the VP-external subject position ([Spec, IP]) or the VP-internal subject position ([Spec, **VP**]) at S-structure.21

In the next section I will return to these two sets of syntactic phenomena concerning the subject in German in considering once again the problem of deriving the logical representations from the S-structure representations. I will show that the German facts fill in a final piece of the argument justifying the Mapping Hypothesis.

2.4.2 Word Order and Subject Interpretations

So far, in justifying the tree-splitting algorithm for mapping S-structure representations into logical representations, I have shown that the two possible positions for the subject within the Kamp-Heim-style representations (in the nuclear scope and in a restrictive clause) do in fact correspond to two possible interpretations for subjects (the existential and generic readings of English bare plural subjects). I have also shown that the two syntactic positions for the subject ([Spec, IP] and [Spec, VP]) are clearly distinguished at S-structure in German, with sentential particles serving as a diagnostic for the position of the subject, Defining the position of the subject relative to the particles is further supported by extraction data (the was-fur split and the split-topic construction). The task that remains is to show that the two syntactic positions illustrated by the German data directly correspond to the two positions in the logical representations illustrated by the English bare plural facts. To show this, I will now turn to the German bare plural.

German bare plural subjects, like the other German subjects we saw in the previous section, have the option of appearing in [Spec, VP] at S-structure rather than appearing in' [Spec, IP], the two options being reflected in the relative word order. In the following examples (with stage-level predicates) the position of the subject is indicated relative to the position of the sentential particles.

(32) a. ... weil ja doch Linguisten Kammermusik spielen.
since PRT PRT linguists chamber music play
'... since there are linguists playing chamber music.'
b. ... weil Linguisten ja doch Kammermusik spielen.
since linguists PRT PRT chamber music play
'... since (in general) linguists play chamber music.'

(33) a. ... weil ja doch Haifische sichtbar sind.
since PRT PRT sharks visible are
'... since there are sharks visible.'

b. ... weil Haifische ja doch sichtbar sind.
since sharks PRT PRT visible are
'... since (in general) sharks are visible.'

(34) a. ... weil ja doch Kinder auf der Straße spielen.
since PRT PRT children on the street play
'... since there are children playing in the street.'
b. ... weil Kinder ja doch auf der Straße spielen.
since children PRT PRT on the street play
'... since (in general) children playing in the street.'

In the (a) examples the subject is in [Spec, VP], as shown by the fact that it is to the right of the particles ja and doch. In the (b) examples the subject is to the left of the particles, indicating that it is in [Spec, IP].

As the translations in the above examples show, the position of the bare plural subject makes a difference with respect to the relative availability of the generic and existential readings for the bare plural in German. The contrasting pairs of sentences in (32)–(34) show that the two possible positions for the bare plural subject (as indicated relative to the sentential particles) correspond to two different interpretations for the subject. The (a) examples have an existential reading (paraphrasable as a there-sentence), and the (b) sentences have a generic reading (paraphrasable with the sentential adverbial in general). Thus, in German the S-structure position of the subject correlates with the most readily available reading for a bare plural subject. A subject in [Spec, VP] yields the existential reading, and a subject in [Spec, IP] has the generic reading.

2.4.3 Word Order and the Stage/Individual Contrast

The correspondence between the S-structure position of the subject in German and its interpretation leads to a clear prediction concerning the subjects of stage- and individual-level predicates. Since stage-level predicates permit both the existential and generic readings, it is expected that the subject of a stage-level predicate should be able to appear in both [Spec, IP] and [Spec, VP] at S-structure in German. This is in fact what is seen in (32)–(34). (35)–(36) provide additional examples illustrating the contrast in interpretation that arises with stage-level predicates:

(35) a. ... weil Professoren ja doch verfügbar sind.
since professors 'indeed' available are
'... since (in general) professors are available.'

b. ... weil ja doch Professoren **verfügbar** sind.
since 'indeed' professors available are
'... since there are professors available.'

(36) a. ... weil Meerschweinchen ja doch mit der Bahn fahren
since guinea pigs 'indeed' by train travel
'... since (in general) guinea pigs travel by train.'
b. ... weil ja doch Meerschweinchen mit der Bahn fahren
since 'indeed' guinea pigs by train travel
'... since there are guinea pigs traveling by train.'

With individual-level predicates, on the other hand, the bare plural subject can appear in the "outer" subject position to give a generic reading, but a bare plural subject to the right of the particles is somewhat awkward. (A more marked intonation pattern deaccenting the subject and stressing the predicate makes the awkward order more acceptable.) In any case, the existential reading is not possible, regardless of the intonation pattern:

(37) a. ... weil Wildschweine ja doch intelligent sind.
since wild boars 'indeed' intelligent are
'... since (in general) wild boars are intelligent.'
b. *?... weil ja doch Wildschweine intelligent sind.
since 'indeed' wild boars intelligent are

(38) a. ... weil Skorpione ja doch giftig sind.
since scorpions 'indeed' poisonous are
'... since (in general) scorpions are poisonous.'
b. *?... weil ja doch Skorpione giftig sind.
since 'indeed' scorpions poisonous are

(39) a. ... weil Wolfshunde ja doch Deutsch konnen.
since German shepherds 'indeed' German know
'... since (in general) German shepherds know German.'
b. *?... weil ja doch Wolfshunde Deutsch konnen.
since 'indeed' German shepherds German know

If, as I have claimed, the distinction between stage- and individual-level predicates is a syntactic distinction that restricts the position of the subject in individual-level predicates but not in stage-level predicates, then the facts in **(37)–(39)** are not unexpected. The (b) sentences are expected to be less good, since the subject of an individual-level predicate is base-generated in [Spec, IP], the outer position, and has no option of lowering into

the VP. The impossibility of the generic reading follows from the Mapping Hypothesis. In order to receive an existential interpretation, a bare plural subject must be able to lower into the VP, where it will be mapped into the nuclear scope and bound by existential closure.

This then gives the final piece in the argument supporting the Mapping Hypothesis, or tree-splitting algorithm. The syntactic positions [Spec, IP] and [Spec, VP] correspond to the positions in the restrictive clause and the nuclear scope, respectively. This correspondence results in the contrast in interpretation observed in German sentences such as **(32)** and (33). Subjects in [Spec, VP] are mapped into the nuclear scope by tree splitting and are bound by existential closure to give the existential reading. The [Spec, IP] subjects, on the other hand, map into the restrictive clause and thereby receive the generic reading by virtue of being bound by the generic operator. The second result of this section is that unlike what happens in English, in German tree splitting **can** occur at S-structure. In other words, in deriving the logical representations for the sentences in (32) and **(33),** abstract movement operations such as LF lowering need not occur. This difference between German and English **will** be considered in more detail in chapter **3.**

2.4.4 Extraction and the Stage/Individual Contrast

The two extraction constructions I introduced earlier give us another way of testing whether or not the syntactic formulation of the stage/individual contrast is correct. As I noted above, the ***was-für*** split and the split-topic construction are both sensitive to the position of a subject from which extraction occurs. If the subject is VP-internal, extraction is possible. If the subject is VP-external, extraction is not allowed.

Thus, it is predicted that extraction should be possible from the subjects of stage-level predicates, since these subjects have the option of appearing in the VP-internal subject position. Individual-level predicates, on the other hand, should disallow extraction from the subject, since they do not permit the option of having the subject in [Spec, VP].

This is in fact true for the ***was-für*** split. With individual-level predicates such as ***intelligent*** 'intelligent', ***taub*** 'deaf', ***wasserdicht*** 'waterproof', and ***Franzosisch konnen*** 'know French', the extraction is bad. With stage-level predicates such as ***verfügbar*** 'available' and ***sichtbar*** 'visible', and locative **PPs** such as ***im Kühlschrank*** 'in the refrigerator' and ***auf*** der ***Straße*** 'in the street', the extraction is permitted. This contrast is shown in (40)–(43).

(40) a. *Was sind fiir Leguane intelligent? I-Level
what are for iguanas intelligent
'What kind of iguanas are intelligent?
b. Was sind fiir Leguane verfiigbar? S-Level
what are for iguanas available
'What kind of iguanas are available?'

(41) a. *Was sind fiir Abgottschlangen taub? I-Level
what are for boa constrictors deaf
'What kind of boa constrictors are deaf?'
b. Was sind fiir Abgottschlangen sichtbar? S-Level
what are for boa constrictors visible
'What kind of boa constrictors are visible?

(42) a. *Was sind fur Schuhe wasserdicht? I-Level
what are for shoes waterproof
'What kind of shoes are waterproof?'
b. Was sind fiir Karotten im Kiihlschrank? S-Level
what are for carrots in-the refrigerator
'What kind of carrots are in the refrigerator?'

(43) a. *Was konnen fiir Studenten Franzosisch? I-Level
what know for students French
'What kind of students know French?
b. Was sind fiir Tiere auf der Strasse? S-Level
what are for animals on the street
'What kind of animals are in the street?

This type of extraction contrast between stage- and individual-level predicates also holds in the case of the split-topic construction. The stage-level predicates permit the fronting of the head noun of a subject NP, whereas the individual-level predicates do not:

(44) a. *Wildschweine sind viele intelligent. I-Level
wild boars are many intelligent
'As for wild boars, many are intelligent.'
b. Wildschweine sind viele verfiigbar. S-Level
wild boars are many available
'As for wild boars, many are available.'

(45) a. *Haifische sind viele taub. I-Level
sharks are many deaf
'As for sharks, many are deaf.'

b. Haifische sind viele sichtbar. S-Level
sharks are many visible
'As for sharks, many are visible.'

(46) a. *Schuhe sind viele wasserdicht. I-Level
shoes are many waterproof
'As for shoes, many are waterproof.'
b. Karotten sind viele im Kiihlschrank. S-Level
carrots are many in-the refrigerator
'As for carrots, many are in the refrigerator.'

(47) a. *Linguisten wissen das viele. I-Level
linguists know this many
'As for linguists, many know this.'
b. Miicken haben ihn viele gebissen. S-Level
mosquitos have him many bitten
'As for mosquitos, many have bitten him.'

Thus, the extraction facts provide further support for the syntactic characterization of the stage/individual contrast.

In discussing the properties of stage- and individual-level predicates so far, I have purposely limited myself to the clearest cases of each type. Since the permanence of a property can vary with the particular context involved, the classification of a particular predicate may also vary. For instance, being red can be an individual-level property of strawberries, but when applied to a person it can be a stage-level property referring to a transitory state of blushing (this sort of variability in classification is similar to that seen in classifying a noun such as *wine* as a mass or count noun). In addition, there are many predicates that do not fall neatly into one category or the other. In the next section I will discuss a broader range of predicates and show that with a closer look, even in the more difficult cases the stage/individual classification is still useful in that it makes the important distinctions.

2.5 Delineating the Limits of the Predicate Classification

Although the most typical cases of stage- and individual-level predicates are fairly easy to classify by simply using the permanent-versus temporary-state distinction as a rule of thumb, there are numerous cases that cannot be classified as stage- or individual-level once and for all. The classification of predicates can vary, and not all predicates can be easily categorized in

terms of permanent versus temporary states. Therefore, it is useful to consider some of the other properties that distinguish stage- and individual-level predicates in order to have a wider range of tests for distinguishing predicate types. Throughout the preceding discussion I have focused on two different properties of stage- and individual-level predicates. The first of these was semantic, concerning the interpretation of bare plural subjects. The second was syntactic, involving an extraction contrast. There are a number of other properties that distinguish the two predicate types. Another syntactic property is that there-insertion sentences are limited to stage-level predicates (Milsark 1974):

(48) a. There are carrots in the refrigerator.
b. There are chili peppers available.
c. There are pumpkins visible on the vine.

(49) a. *There are carrots nutritious.
b. *There are chili peppers spicy.
c. *There are pumpkins heavy.

In the following sections I will use these tests as well as others to examine some other predicate types that might be regarded as problematic for the approach I have taken. The problematic cases fall into a number of different semantic categories, which I will consider in turn.

2.5.1 Psychological States

Terms denoting psychological states of emotion such as angry, cheerful, obnoxious, nervous, and nasty might intuitively seem to be stage-level predicates in that they describe transitory states. However, applying the semantic and syntactic tests described above places them in the category of individual-level predicates. Consider the interpretation of the bare plural subjects in the following examples:

(50) a. Contrabassoonists are cheerful.
b. Basenjis are nervous.
c. Peasants are angry.
d. Brussels sprouts are nasty.

In these sentences the bare plural subjects all have only the generic reading. This is typical of individual-level predicates.

The psychological state predicates also behave somewhat like individual-level predicates with respect to the German extraction constructions:22

(51) a. *?Was sind fiir Trombonisten heiter?
what are for trombonists cheerful
b. *?Was sind fiir Hunde nervos?
what are for dogs nervous
c. *?Was sind fiir Kinder ungezogen?
what are for children naughty

(52) a. *?Trombonisten sind viele heiter.
trombonists are many cheerful
b. *?Hunde sind viele nervos.
dogs are many nervous
c. *?Kinder sind viele ungezogen.
children are many naughty

The extractions in the sentences in (51) and (52) are all rather awkward (if not downright ungrammatical), as would be expected if the subjects could only appear in the outer subject position from which extraction is prohibited.

Finally, these predicates are also generally unacceptable in ***there***-insertion contexts:

(53) a. *There are contrabassoonists cheerful.
b. *There are Basenjis nervous.
c. *There are Brussels sprouts nasty.

It looks, then, as if the intuitive rule of thumb regarding temporary states fails in these cases. There is a reason to take a closer look, however. I do not find the extractions in (51) and (52) as bad as the corresponding sentences with "canonical" individual-level predicates such as intelligent. There are contexts in which the extractions are quite acceptable. These are contexts where a temporal or spatial adverbial modifies the .predicate. These interpretations are not possible for the more typical individual-level predicates:

(54) a. Kinder waren am Freitag viele nervos. I-Level to S-Level
children were on Friday many nervous
'As for children, many were nervous on Friday.'
b. Trombonisten waren heute viele heiter. I-Level to S-Level
trombonists were today many cheerful
'As for trombonists, many were cheerful today.'

(55) a. *Kinder waren am Freitag viele intelligent. Typical I-Level
children were on Friday many intelligent
b. *Trombonisten waren heute viele blond. Typical I-Level
trombonists were today many blond

Another fact about these predicates (noted by Stump (1985)) is that in English they become clearly stage-level (as indicated by the possibility of an existential interpretation for a bare plural subject) with a progressive form of be. This shifting of the predicate is less felicitous with the more typical individual-level predicates. The examples in (56) show the existential reading for the bare plural subjects.

(56) a. Contrabassoonists are being cheerful.
b. Basenjis are being nervous.
c. Peasants are being angry.

The observation that the stage-level interpretation is brought out in this context is supported by the fact that with the progressive be the states of emotion are also acceptable in there-insertion sentences:

(57) a. There are contrabassoonists being cheerful.
b. There are Basenjis being nervous.
c. There are peasants being angry.

What appears to be happening is that the psychological state predicates are in fact ambiguous in that certain contexts select an individual-level interpretation and others (in particular the progressive be) select a stage-level interpretation. This raises the question of just what the nature of this progressive be is. Carlson (1977b) notes that the progressive form of verbs usually goes hand in hand with the existential reading of a bare plural subject, whereas other verb forms are ambiguous between a habitual, or generic, interpretation and an existential interpretation:

(58) a. Basenjis yodel. (ambiguous)
b. Basenjis are yodeling. (existential)

One possibility is that the progressive aspect is an indicator of the stage level Infl, perhaps similar to the Spanish be-form estar, which selects stage-level predicates (as opposed to ser, which selects individual-level predicates).

A closer look shows that things are not as simple as that, however. The progressive be in the sentences in (56) is not permitted in all contexts. The most prominent restriction is that it requires an agentive subject:

(59) a. *Brussels sprouts are being nasty.
b. *There are Brussels sprouts being nasty.

Thus, this form of the verb be is clearly Partee's (1977) "active" be. In other words, in the sentences in (56) the verb be takes a meaning roughly corresponding to 'act', and the adjectives have a more adverbial rather

than predicative function. This is true also when the progressive be combines with more typical individual-level predicates such as intelligent:

(60) a. Hector is being intelligent:
b. Horace is being stupid.
c. *?Hilda is being overweight.
d. *?Hepzibah is being tall.

Individual-level predicates that can modify act (such as intelligent and stupid) are quite acceptable with the progressive be, as shown by (60a) and (60b). Individual-level predicates that cannot readily modify act (such as overweight and tall) are much less acceptable in this context.

In addition, the acceptable sentences in (60) allow ***only*** the adverbial interpretation for the adjective. This adverbial interpretation is distinct from the "transient property" interpretation found in stage-level predicates like available. In fact, truly stage-level predicates cannot readily occur with the progressive be:

(61) a. *Plumbers are being available.
b. *Saber-toothed tigers are being in the zoo.

This distinction between an adverbial interpretation and a truly stage-level interpretation can be brought out by a "science fiction" example.23 One could devise imaginary contexts in which a predicate like intelligent could have an interpretation that corresponds to a transient property. One such context would be a planet where all beings are quite stupid, but they have "intelligence pills" that enable them to be intelligent for a few hours at a time, allowing them to complete their daily business. In this context one could in fact say things like Galrpthk is intelligent from 9 to ***11,*** much as one can say ***Bert*** is available ***from*** 9 to ***11*** here on Earth. The there-insertion construction is also permitted in these cases: There is a ***doctor*** intelligent in this office ***at*** all times.

This interpretation of intelligent is clearly distinct from the interpretation in (60a). Not only that, the science fiction context stage-level interpretations need not distinguish between predicates like intelligent and overweight as the progressive be does.

These examples show not only that the behavior of these psychological state predicates does in fact depend in part on tense and context, but also that there is a distinction to be made between transitory properties that are adverbial modifiers and the transient quality found in the most typical stage-level predicates. Thus, in some contexts the states-of-emotion predicates are strongly individual-level and in others they function as adverbial

modifiers to the progressive *be,* taking on certain stage-level properties. This variability is what results in the somewhat counterintuitive judgments in (50)–(53). The states of emotion are capable of being both permanent characteristics (as in (50)–(53)) and transitory modifiers (as when applied to the English progressive form, or when appearing with an overt adverbial in German).

2.5.2 Individual-Level Unaccusatives

As I noted earlier, Kratzer (1989) observes that there is a class of individual-level predicates whose subjects are generated in an internal (object) position. Unlike stage-level predicates, which can also have internal subjects, these predicates do not give evidence of having the abstract spatiotemporal event argument. Expressed in terms of the analysis I have given, these predicates are those that do not have the event argument and also do not assign a theta-role to [Spec, IP] (see the chart in (20)). Examples of predicates of this type are be known to, belongs to, be similar to, and *be* familiar to. This classification corresponds roughly to the "possessional locative" predicates of Gruber (1965) and Jackendoff (1972).

In order to see more clearly how these predicates are distinguished from the canonical stage- and individual-level predicates, it is useful to consider Kratzer's diagnostics for the presence of an event argument. One of her arguments involves locative modifiers. She observes that these modifiers can only modify stage-level predicates. With regard to this test the individual-level unaccusatives pattern with individual-level predicates in that they do not permit a locative to modify the predicate. It can only modify the noun, as shown by the translations in (62). The translation corresponding to predicate modification is not possible.

(62) a. . . . weil alle Skorpione in dieser Wiiste giftig sind.
since all scorpions in this desert poisonous are
'. . . since all scorpions in this desert are poisonous.'
*'. . . since all scorpions are poisonous in this desert.'

b. . . . weil mir alle Skorpione in dieser Wiiste gehoren.
since to-me all scorpions in this desert belong
'. . . since all scorpions in this desert belong to me.'
*'. . . since all scorpions belong to me in this desert.'

This contrasts with the clearly stage-level predicates that permit the locative to modify either the noun or the predicate itself:

(63) . . . weil ihn alle Skorpione in dieser Wiiste gebissen haben.
since him all scorpions in this desert bitten have
'. . . since all the scorpions in this desert have bitten him.'
'. . . since all the scorpions have bitten him in this desert.'

Kratzer claims that the predicate modification in **(63)** results from the locative expression relating to the verb via the event argument. In the absence of this argument, as in the sentences in (62), this modification is not possible. Thus, example (62b) shows that predicates like belong to do not have the event argument, and that they pattern with individual-level predicates like is poisonous.

The claim that these predicates are "unaccusative" in the sense that their subjects are generated VP-internally is supported by the extraction facts. Unlike typical individual-level predicates, the individual-level unaccusatives permit extraction from their subjects:

(64) a. Skorpione gehoren ihm viele.
scorpions belong to-him many
'As for scorpions, many belong to him.'

b. Giftige Skorpione sind mir viele bekannt.
poisonous scorpions are to-me many known
'As for poisonous scorpions, many are known to me.'

The individual-level unaccusatives also are permitted in there-insertion constructions:

(65) a. There are counterexamples known to me.
b. There are some scorpions belonging to Simon.
c. There are presidents similar to Millard Fillmore.
d. There are many marsupials familiar to Marvin.

Thus, although predicates such as be known to and belong to denote permanent or individual-level properties, they also show some of the syntactic and semantic properties of stage-level predicates. This apparent mismatch is resolved if the properties that distinguish stage- and individual-level predicates (the event argument and &role assignment to [Spec, IP] in my account) are allowed to vary independently.

2.5.3 Experiencers

Another class of verbs that requires special mention is the experiencer type. These are individual-level predicates (describing more or less permanent properties) that also induce generic readings of bare plural objects. Examples of verbs of this type are appreciate, loathe, love, and like:

(66) a. Professors appreciate neatly written papers.
b. Children loathe Brussels sprouts.
c. Scottish Highland cattle love windy days.
d. Chinchillas like dried currants.

Taking the Mapping Hypothesis quite literally, the generic readings of the objects in (66) are unexpected, since the VP (and the bare plural contained within it) should be mapped into the nuclear scope, and the bare plural should be bound by existential closure to give an existential reading for the object. Instead, both the subject and the object seem to be mapped into a restrictive clause where both are bound by the generic operator:

(67) a. $\mathbf{Gen}_{x,y}$ [**x** is a professor A y is a neat paper] **x** appreciates y
b. $\mathbf{Gen}_{x,y}$ [**x** is a child A y is a Brussels sprout] **x** hates ***y***
c. $\mathbf{Gen}_{x,y}$ [***x*** is a Scottish Highland cow A ***y*** is a windy day] x loves y

As I mentioned earlier, what seems to be happening is that the bare plural objects scramble at LF to adjoin to IP, and then are mapped into a restrictive clause by the tree-splitting algorithm. I will not discuss this phenomenon any further here, since I deal with both LF scrambling of objects and the semantic properties of experiencer verbs in chapters 3 and 4.

2.5.4 Contextual Effects

Finally, the stage/individual distinction is obviously subject to contextual influences, even in cases other than the psychological states discussed above. Predicates that are of one category in a somewhat neutral context can be pushed into the other category in various ways. A group of problematic cases of this type includes predicates like ***sick*** and drunk. These are generally thought of as stage-level predicates (see Milsark 1974 and Carlson 1977b):

(68) a. There are children sick.
b. There are people drunk.

(69) a. Children are sick.
b. People are drunk.

In (68) and (69) the predicates ***sick*** and drunk behave like stage-level predicates—they are permitted in the there-insertion sentences, and they allow both existential and generic readings for bare plural subjects.

Adding descriptive material to the subject NPs changes the behavior of these predicates, however. In this case the predicates can behave like individual-level predicates in that they are prohibited in there-insertion

contexts and strongly favor the generic reading of the subject, in contrast to a "canonical" stage-level predicate such as available:

(70) a. *There are children with red rashes sick.
b. *There are people in bars drunk.
c. There are children with **red** rashes available.
d. There are people in bars available.

(71) a. Children with red rashes are sick.
b. People in bars are drunk.
c. Children with red rashes are available.
d. People in bars are available.

Thus, with certain stage-level predicates like ***sick*** and ***drunk*** additional descriptive content in the subject NP can force restrictive clause formation and subsequent binding by the generic operator. In chapter 3 I will discuss this property of more "specific" NPs and show that restrictive clause formation of this type is a quite general process, extending to all indefinites.

2.6 Focus and the Bare Plural Readings

At various points in this chapter I have mentioned that intonational factors can play a role in the matter of the interpretation of bare plurals, and in the case of German, intonation can also be regarded as a factor influencing word order. In this section I will give speculative consideration to the role that focus and intonation play in "semantic partition," and to how certain focus phenomena can be accounted for within the framework developed here. I make no attempt to develop a comprehensive theory of focus phenomena, since that would take me beyond the scope of this monograph, but I present some remarks that might suggest a direction in which future research could proceed.

Setting aside the question of German word order for the time being, I consider first the role of focus in the interpretation of bare plural subjects. Recall that stage-level predicates allow three readings for a bare plural subject:

(72) a. Firemen are available.
b. 3, **x** is a fireman A **x** is available
c. $\mathbf{Gen}_{x,t}$ [**x** is a fireman A t is a time] **x** is available at ***t***
d. Gen, [*t* is a time] 3, x is a fireman A **x** is available at *t*

Although all three of these readings are generally possible, focusing various constituents can cause certain readings to be favored over the others.

The judgments in many cases are subtle, but I find for example that focusing the subject leads to favoring the existential reading represented in (72b), and that focusing the adjective leads to favoring the generic reading represented in (72c):

(73) a. FIREMEN are available.
b. Firemen are AVAILABLE.

At first blush, this phenomenon may appear to present a counter-example to the central claim that I am arguing for in this work—namely, that syntactic structure is a major determinant of the semantic partition of a sentence—in that the focus structure appears to be delineating the two parts of the logical representation. For example, on a focus-oriented account the sentences in (73) could perhaps be (roughly) mapped into their logical representations by mapping the focus material into the nuclear scope, and extrafocal material into the restrictive clause, rather than making a syntactic division of the sentence.

But simply noting the correspondence between focus structure and the structure of the logical representation in the sentences in (73) is not sufficient to dismiss the Mapping Hypothesis. What is most important to bear in mind at this point is that focus is not the ***only*** determinant of the readings. The patterns of focus shown in (73) are not in fact necessary to induce the readings they favor. In appropriate contexts, any one of the possible readings can also arise with neutral focus. Thus, although focus certainly can have an effect on the interpretation of a particular utterance, it is not an essential component of any particular interpretation. Consequently, focusing contrasts such as that illustrated by the examples (73a) and (73b) do not in and of themselves constitute counterexamples to the proposal that the syntactic structure of the sentence plays an important role in determining its semantic partition.

A second reason not to dismiss the Mapping Hypothesis in favor of a focus-based account is that it is not clear that focus phenomena cannot also be accounted for within the syntactic account. In fact, certain focus phenomena concerning stage- and individual-level predicates appear to provide additional support for the syntax-oriented approach I have taken here.

The observation brought out by the interpretive preferences in (73) is roughly that the "focus part" of the sentence corresponds to the nuclear scope of the logical representation, and the extrafocal portion corresponds to the restrictive clause. This observation can be recast in terms of the tree-splitting approach by saying that in sentences like (73a) focus on the

subject causes the subject to lower into the [Spec, VP] position at LF; consequently, when tree splitting applies, the subject is mapped into the nuclear scope, yielding the existential reading. Thus, the effect of focus in this case is that it causes the subject to move into the VP domain at LF. Support for this characterization of the effect of focus comes from certain data concerning the operation of "focus projection."

Focus projection is the process by which focus (which is assumed to be some kind of feature that appears on a word or phrase; see, for example, Chomsky 1971, Jackendoff 1972, and Selkirk 1984) is projected (or percolated) upward from the word that receives the pitch accent. The fact that focus can project upward to produce "focus domains" of varying size is most clearly brought out in association with operators like ***only*** and ***even*** (Jackendoff 1972, Rooth 1985):

(74) a. I only ate [CABBAGE].
b. I only [ate CABBAGE].

In the sentence in (74) I have indicated the domain of the projected focus by square brackets. Thus, focus can project either to the NP (74a) or up to the VP (74b). Projecting focus to the NP gives a "contrastive" reading that can be paraphrased as 'The only thing I ate was cabbage'. The reading in (74b) can be paraphrased as 'The only thing I did today was eat cabbage'.

Focus projection is subject to a number of constraints, the one most relevant here being that in most cases focus projection beyond a subject NP is not possible:

(75) a. I only said that [BERT] likes Brussels sprouts.
b. *I only said that [BERT likes Brussels sprouts].

With focus on ***Bert*** in the sentence in (75), only the contrastive reading in (75a), paraphrased as 'I only said that Bert likes Brussels sprouts, not that Betty (or anyone else) does', is possible. The reading with focus projected over the entire embedded sentence, as in (75b), is not possible. The sentence cannot mean 'The only thing I said was that Bert likes Brussels sprouts, I didn't say anything else'.

Selkirk (1984) notes that there are exceptions to the prohibition on projecting focus beyond subjects. Most notably, subjects of unaccusatives allow focus projection beyond the subject NP:

(76) a. The chicken only said that [the **SKY]** is falling.
b. The chicken only said that [the SKY is falling].

Thus, it appears that when the subject is base-generated from a VP-internal position, then focus projection from a subject NP over an entire clause is allowed. Therefore, it is not surprising that stage- and individual-level predicates contrast with respect to focus projection (see also Gussenhoven 1984):

(77) a. Betty only said that [EGGPLANTS are available]. (stage)
b. *Betty only said that [EGGPLANTS are poisonous]. (individual)

Stage-level predicates allow focus projection from a subject NP, whereas individual-level predicates do not.

The generalization concerning focus projection seems to be that focus can project from a phrase that has been base-generated within VP, but not from a phrase generated outside of VP. If there is a correspondence between the nuclear scope and the projected focus domain, as I suggested above, it is not surprising that only subjects that can lower into [Spec, VP] permit projection of focus over the whole sentence. Put in another way, the effect of focus on the subjects in (76a) and (77a) (as well as (73a)) is that it forces the subjects to "lower" into the **VP** (presumably at LF). Thus, the correspondence between the VP and the nuclear scope can still be maintained, a result that is given additional support by the focus projection data.

This hypothesis concerning the effects of focusing may also account for the observations I made above concerning focus and word order in German. Recall that there is a contrast between stage- and individual-level predicates with respect to possible word orders:

(78) **a.** ... weil Professoren ja doch verfugbar sind.
since professors 'indeed' available are
'... since (in general) professors are available.'
b. ... weil ja doch Professoren verfügbar sind.
since 'indeed' professors available are
'... since there are professors available.'

(79) a. ... weil Skorpione ja doch giftig sind.
since scorpions 'indeed' poisonous are
'... since (in general) scorpions are poisonous.'
b. *?... weil ja doch Skorpione giftig sind.
since 'indeed' scorpions poisonous are

I also remarked above that deaccenting the subject and stressing the predicate makes the word order in (79b) more acceptable, although the subject can only receive a generic interpretation (see also Lenerz 1977, Lotscher 1983, and Jacobs 1984 for further discussion of focus and word order in German):

(80) ... weil ja doch Skorpione GIFTIG sind.
since 'indeed' scorpions poisonous are
'... since (in general) scorpions are poisonous.'

Since the subject of poisonous is base-generated in [Spec, IP], it is not surprising that it cannot be focused, since then it would be forced to lower into [Spec, VP]. The puzzling fact is that the subject appears to be VP-internal in (80), based on its position relative to the particles. This might perhaps be explained by the fact that German allows scrambling, which reorders constituents (including adverbials) by adjoining them to IP (Webelhuth 1989; see also the discussion and references cited in chapters 3 and 4). Thus, the order in (80) may arise not from the subject being VP-internal, but from scrambling of the particles ja and doch, a conjecture that would be consistent with both the intonation pattern required and the generic interpretation that results.

These remarks are not conclusive by any means, and of course certain questions still remain. An obvious question concerns the correspondence between the nuclear scope and the focus: why should this correspondence exist? Another is how to handle sentences in which the focused part does not include the whole VP.[24] Both of these questions relate to the issue of the role the restrictive clause plays in representing presupposed (in this context, nonfocal) material within the sentence. In chapter 3 I explore the significance of presuppositionality with regard to restrictive clause formation. In particular, I introduce a syntactic mechanism of presupposition accommodation (following work by Berman (1991); and see also Partee, to appear, for an application to focus phenomena). This mechanism (which basically incorporates presupposed, or nonfocused, material into a restrictive clause via a syntactic rule of quantifier raising) may provide a basis by which the relationship of focus to the interpretation of indefinite NPs can be accounted for by the (syntactic) Mapping Hypothesis.

2.7 Conclusion

In this chapter I demonstrated that there is support in both English and German for the Mapping Hypothesis. The interpretations of the English bare plural provide evidence for the two positions for the subject in the logical representation, and the German data provide evidence for the

correspondence between the two positions in the logical representation and the two readings of the bare plural subject. The existence of two S-structure subject positions in German is supported by the was-fir and split-topic extraction facts.

The contrasts between stage- and individual-level predicates in both languages also support the correspondence between the two syntactic subject positions and the two positions in the logical representations. Here the possibility of the existential, or "internal." reading correlates with the possibility of extraction. I have suggested that the two predicate types are distinguished by two parameters, 8-role assignment to [Spec, IP] and the presence/absence of a "Davidsonian" event argument (following Kratzer (1989)).

Finally, I discussed a number of cases that seem to present problems for a simple two-way division of predicate types. I showed that these difficulties can be accommodated by a number of different means. Although some predicate types require additional variation in the two parameters differentiating predicate types (e.g., the individual-level unaccusatives), other predicates (those involving states of emotion) seem to have two distinct stage-level and individual-level forms. Finally, for a number of stage-level predicates context plays an important role in determining which interpretation of a bare plural subject (the generic or the existential) is preferred.

In this chapter I have limited myself to discussing the interpretation of bare plural subjects. In chapter 3 I extend the Mapping Hypothesis to NPs of other types. I show that many of these also admit of two interpretations, one corresponding to a tripartite quantificational structure and the other corresponding to binding by existential closure. I also discuss the interpretation of object NPs and consider the relationship between restrictive clause structures and the operation of the rule of QR proposed by May (1977, 1985).

Chapter 3
Tree Splitting and the Interpretation of Indefinites

3.1 Introduction

In the previous chapter I introduced the Mapping Hypothesis and showed how it explained a number of facts concerning the interpretation of a particular type of NP—the bare plural—in English and German. In this chapter I extend my analysis to indefinite and quantificational NPs in general. Taking Kamp's (1981) and Heim's (1982) analyses of the interpretation of indefinites as my starting point, I propose that there are actually two types of indefinites (rather than treating them uniformly, as Kamp and Heim do): those that form restrictive clause structures, and those that are bound by existential closure. The syntactic nature of the derivation of the tripartite logical representations (as represented by the tree-splitting algorithm) leads to the consequence that these two types of indefinites are themselves distinguished syntactically by the operation of the rule of QR (May 1977, 1985).

3.2 Tree Splitting and Quantification

The tree-splitting algorithm has a number of syntactic and semantic consequences for a theory of quantification. As a result of the formation of the restrictive clause and nuclear scope by dividing the tree into two parts, the categories IP and VP are distinguished in the derivation of logical representations as domains for different kinds of quantification, and thus IP subjects and VP subjects are also semantically differentiated. In the rest of this chapter I take a closer look at quantification and the Kamp-Heim theory of indefinites in light of the Mapping Hypothesis that I have proposed. I show that indefinites are actually ambiguous between presuppositional and nonpresuppositional readings (as originally observed by