1 An Introduction

1 The Grammatical Locus of Semantic Interpretation

Few points in the study of language are uncontested. One truism is that sentences are pairings of sounds with meanings. They are phonetically characterizable objects that carry a specific interpretation. Since the earliest days of generative grammar, a central concern of linguistic theory has been to elucidate how it is that a natural language sentence expresses its meaning. In earlier theories of grammar, the locus of interpretation is taken to be Deep Structure, as in (1) (see Chomsky 1965, and Katz and Postal 1964) and the transformational operations that produced Surface Structures were assumed to be meaning preserving in the sense that these operations did not contribute to the grammatical licensing of the interpretive information encoded in the Deep Structure phrase marker.

(1) Deep structure $\rightarrow$ Semantic interpretation
   $\downarrow$ Transformations
   Surface structure $\rightarrow$ Phonetic interpretation

In the 1970s, the Extended Standard Theory (EST) proposed that grammatical levels other than Deep Structure syntactically determine sentence meaning. Jackendoff (1972), for example, argued that (2) specifies how the grammar contributes to meaning. On this conception, different grammatical levels determine different features of sentential interpretation. For example, a sentence's thematic properties are a function of its Deep Structure configuration while relative quantifier scope is related to the structural properties of the Surface Structure phrase marker.

(2) Deep structure $\rightarrow$ Thematic interpretation
   $\downarrow$ Transformations $\rightarrow$ Coreference, scope
   Surface structure $\rightarrow$ Focus and presupposition
The development of trace theory in the mid 1970s made it possible to treat S-structure (SS) as the sole locus of semantic interpretation. The Revised Extended Standard Theory (REST) postulates that grammatical operations do not reduce the basic grammatical information encoded in a phrase marker. For example, if a verb has an object at D-structure (DS) then it must have one throughout the course of the derivation. REST enforces this requirement by having a moved element leave behind a trace which preserves within the derived phrase marker the structural relations that obtained prior to movement. For example, whereas in EST WH-questions as (3a) are formed from structures like (3b) yielding phrase markers like (3c), in REST the phrase marker resulting from WH-movement is the one provided in (3d) where \( t \) marks the position of the moved \( \textit{what} \) while the indexing allows the content of this position to be recovered from the coindexed antecedent, i.e. the element that moved.

(3a) What did Bill buy

(3b) [Bill [buy what]]

(3c) [What [Bill buy]]

(3d) [What, [Bill [buy \( t \)]]]

Given the information-preserving quality of trace theory, semantic interpretation in REST can largely be driven by properties of the SS phrase marker. In effect, given traces, it seems possible to consolidate all the grammatical information relevant to semantic interpretation at SS. REST pictures the interaction of grammar and meaning as in (4).

\[
\text{(4) D-structure} \rightarrow \text{Transformations} \rightarrow \text{Phonetics} \leftarrow \text{S-structure} \rightarrow \text{Semantic interpretation}
\]

Research in the late 1970s has tended to the conclusion that REST must itself be revised. In particular, it has been argued (and we review these arguments in chapters 2 and 3) that SS cannot adequately bear the interpretive load expected of it. The locus of the grammatical conditions within contemporary Government-Binding (GB) theory is the linguistic level called "LF" (meant to suggest "Logical Form"). (5) depicts how GB conceives the grammar's contribution to semantic interpretation.

\[
\text{(5) DS} \rightarrow \text{Move } \alpha \rightarrow \text{SS} \rightarrow \text{PF} \rightarrow \text{LF} \rightarrow \text{Semantic interpretation}
\]

GB organizes the grammar in a "T-model." D-structure phrase markers are related to SS phrase markers by applications of transformations (Move \( \alpha \)). As in REST, movement transformations leave behind traces coindexed with their antecedents. The derivation from DS to SS is "overt syntax." It is "overt" in the sense that movement operations result in phonetic gaps at the movement sites.

At SS, the derivation splits into a track leading to PF (meant to suggest "Phonetic Form") where phonological and phonetic information is ultimately encoded and a path leading to LF where interpretive-semantic information is represented. The path from SS to LF is the domain of "covert" syntax. The derivation is syntactic because LF is derived from SS via repeated applications of Move \( \alpha \). However, the syntax is covert because these transformations do not have phonological consequences given the branching organization of the grammar in (5). In a sense, therefore, LF is more abstract than SS as the post SS applications of Move \( \alpha \) that are instrumental in deriving LF do not leave phonological tracks.

This book focuses on two different views of LF. The early chapters review the properties of LF within GB theories. The later chapters consider the structure of LF within the Minimalist program. Minimalism, though distinct in many ways from its GB precursor, shares one major commitment with its predecessor. Minimalism adopts a version of the T-model and so endorses the distinction between overt syntactic operations which have phonological effects and covert syntax which does not alter the phonological form of a sentence. Broadly speaking, Minimalism differs from GB theories in not accounting for DS and SS any grammatical significance. In effect, Minimalism postulates only two levels, PF and LF. These two levels alone are legitimate loci of grammatical well-formedness conditions on representations. The effect of this restriction is quite dramatic. It effectively requires that all output conditions (e.g. the theta criterion, subcategorization, the case filter, the Binding Theory (BT)) be stated at LF as opposed to being parsed across various levels as is standardly done in GB theories (e.g. subcategorization at SS, the theta criterion at DS, the binding theory at SS and LF and case theory at SS). For present purposes, however, it is enough to appreciate that Minimalist theories, like GB predecessors, assume that LF and PF do not directly "converse" and that LF derives from earlier phrase markers via repeated applications of transformations similar to those operative in overt syntax. Chapter 4 details the theoretical commitments and technological devices that drive the Minimalist LF analyses in chapters 5–9.

2 Two Ways of Identifying LF

LF can be characterized in various ways. (6) gives a "content" designation of LF. It provides a specification of LF in terms of the kind of information that the level encodes.

(6) LF is the level of linguistic representation at which all grammatical structure relevant to semantic interpretation is provided
In terms of (6), an Aspects style theory identifies LF with Deep Structure, REST equates LF with SS while EST denies that LF exists, viz. that there is a single level meeting the specification in (6).

Something like (6) is standardly assumed in GB (and Minimalist) characterizations of the LF phrase marker. Thus, both approaches assume that there is a level which encodes all the information grammatically relevant to semantic interpretation. However, this does not yet say very much. To have bite, it is necessary to specify how “semantic interpretation” should be understood. If semantic interpretation is rendered via a truth definition then what LF provides is the syntactic structure appropriate for the recursive application of the clauses of the truth definition. Other views of what semantic interpretation comes to may place different structural requirements on LF. However, in practice, what this content designation amounts to is clear enough. (6) comes down to the claim that various facts that we take to be characteristic of meaning such as relative quantifier scope, scope of negation, modality, opacity, pronoun binding, variable binding, focus and presupposition structure, adverbal modification, and so forth are all “done off” the LF phrase marker. In short, LF provides the requisite compositional structure for the execution of these interpretative procedures. Thus, whatever we naively mean by “meaning” meets its grammatical or structural requirements at LF and thereby has the specific interpretive properties it enjoys.

It is possible to identify LF in various other “contentful” ways. For example, in a GB-style account, LF is the level at which the Empty Category Principle (ECP) is checked. In particular, in a theory of the Barriers variety, LF is the unique level at which gamma marking is checked. In many GB accounts, LF is also a level to which the BT applies.

A Minimalist theory will strongly differ from standard GB accounts when these sorts of designations are considered. The reason is that LF is the unique level with phrase marker properties. Thus, it is the only level at which any structural condition can be checked. Thus, in a Minimalist theory, the Binding theory, case theory, and every other module of the grammar that is stated in terms of structural output conditions must all apply to the LF phrase marker. Minimalist theory can pick out LF quite trivially: it is the unique grammatical level with phrase structure properties. This clearly contrasts with a GB specification of LF given that SS and DS are significant levels in this sort of theory, in addition to LF.

In sum, if one thinks about what LF does, in both GB and Minimalist theories, it inputs to semantic interpretation procedures. In Minimalist theories it is also the locus of all output conditions while in a GB theory LF is one of three levels to which conditions have been assumed to apply. As should be obvious, this second “content” designation of LF is very theory dependent.

Another way to identify LF is “formally,” as in (7).

(7) LF is the phrase marker derived from S-structure by applications of “Move α,” branches with respect to PF and is input to rules of interpretation.

The specification in (7) locates LF within a GB-style grammar. It is more “formal” than (6) in that it identifies LF by specifying how the LF phrase marker is derivationally related to other significant levels of linguistic representation. It goes beyond this by suggesting that the same rule that is involved in generating overt syntactic structures, Move α, is responsible for generating LF phrase markers from S-structures.

As is evident, the formal determination of LF is sensitive to grammatical detail. The formulation in (7) is tied to the specific details of the T-model (Chomsky and Lasnik 1977). The characterization of LF in (7) specifically advert to the grammatical levels PF and SS and to the fact that LF and PF branch. Consequently, detailed changes in the rest of grammatical theory could significantly affect the formal characterization offered in (7). An illustration of the potency of background grammatical assumptions on the overall form and detail of particular analyses is provided in the contrasting approaches to interpretive phenomena within GB and Minimalist theories outlined in detail in the chapters that follow. However, even brief consideration of the leading ideas behind the Minimalist program indicates that (7) could not be used to identify the LF level in this sort of theory. The reason is that there is no SS level nor does DS exist, though there is a PF level. Nonetheless, an analogue of (7) is available within the Minimalist scheme which functionally identifies LF; it is one of two grammatical levels. It branches with respect to PF, interfaces with the conceptual-intentional system and is derived from the phrase marker that obtains at SPELL OUT (the point at which the derivation splits) via repeated applications of the available singulary transformations.

3 Studying LF

What does research on LF consist in? One active empirical project has been to show that the two ways of identifying LF in (6) and (7) coincide. Research in the GB framework has been directed to show that they do, i.e. that those phenomena that we take to be characteristic of meaning are explicitly represented in a phrase marker whose structure is obtained from an SS phrase marker by the successive application of Move α.

A further research aim arises when coupled with the view that meaning is exhausted by the specification of a sentence’s truth conditions. This further assumption requires that LF yields a logical syntax appropriate for recursively stating the truth conditions of a sentence. With this assumed, one can work backwards from the truth conditions of a given sentence first, to the syntax that a standard truth definition requires to yield these truth conditions, and then to operations on the SS phrase marker required to transform it into an LF phrase marker with the requisite logical syntax.

An example might help give the flavor of the enterprise. Consider the pair of sentences in (8):

(8a) Everybody left
(8b) John left
(8a) and (8b) are standardly treated as having distinct logical forms. John in (8b) is a name, a referring expression, in contrast with everyone in (8a) which is a quantifier. In the Frege/Russell tradition, this sentence expresses a singular proposition with a logical structure like that in (9).

9. Left (John) [L(j)]

This representation is meant to display the fact that John is a logical simple and that left is a one place predicate with a single argument position, filled in this instance by John.
In contrast, (8a) is logically more complex. Everyone is not a referring expression and the sentence is not of simple subject/predicate form. A variable fills the argument position of the predicate and a quantifier is appended to the whole open sentence.

10. (Every x: x a man) [left (x)]

The difference in logical syntax displayed in (9) and (10) reflects the purported semantic difference between names and quantified expressions. If LF is driven by the requirement of getting the truth conditions right, and we adopt the Frege/Russell distinction between names and quantified NPs, then the LF phrase markers of this pair of sentences should have structures analogous to these two logical forms. In other words, the LF phrase markers will reflect the fact that (8a) is semantically complex while (8b) is semantically simpler.

Given this, the question is how to get from the SS representation of these sentences to their respective LFs. In the case of (8b), there is hardly any problem as the SS and LF phrase markers are virtually identical, at least if we ignore orthographic conventions. (11) is an adequate LF representation of the logical form of (8b):

11. [John [left]]

To obtain a semantically adequate LF for (8a) we apply the rule of Move α, in the guise of quantifier raising (QR), and adjourn everybody to the front of the clause. QR, like other instances of Move α, leaves behind a coindexed trace that is interpreted as a variable bound by the adjoined (restrictive) quantifier. (12) is the phrase marker that results from these operations and it is a plausible representation of the logical form of (8):

12. [Everybody, [t, left]]

This case illustrates how grammatical rules like Move α can be exploited to yield structures that deliver up the right form for the recursive specification of truth conditions. The question is not whether this can be done but if it should be. In other words, what reason is there for thinking that we should avail ourselves of these sorts of abstract rules to yield these sorts of LF phrase markers? There is nothing incoherent in denying that LF exists in the sense of a level of linguistic representation dedicated to representing the logical form of a sentence (vide Cooper 1983 for example). It is logically possible that there are not "any aspects of meaning that emerge in the course of normal matura-
tion of the faculty for language" (Higginbotham 1985). This does not mean to say that sentences might not have the properties logicians claim for them. Rather these properties need not be linguistic properties, need not be represented in grammatical objects such as phrase markers nor derived via grammatical rules such as Move α. A property can be significant, interesting, and cognitive without being linguistic. 4

To this point, we have identified several generally assumed characteristics of LF. First, it is derived via Move α from S-structure (in a GB theory). Second, it is "where all grammatically determined information that is relevant to interpretation" is consolidated (Higginbotham 1985: 549) and where certain output conditions apply. Third, it is the grammatical level that provides the correct logical syntax for the interpretive apparatus.

A fourth commonly held view is that LFs disambiguate sentences. In other words, if a sentence is n-ways ambiguous then it has n different LF phrase markers. 5

There is a fifth additional assumption of note that is commonly held. At the level of LF, all grammars are alike. Thus, whatever surface differences disparate grammars may manifest, at the LF level, grammars are identical. This is a very powerful assumption and I would like to briefly consider the reasons adduced in its favor. The ones generally provided are of the standard poverty of stimulus variety. One version of this argument is concisely advanced in Higginbotham (1985: 550):

the most fundamental principles of semantics are so remote from the data available to the child (situations of utterance, the behavior of other speakers etc) that it is quite plausible to suppose that these principles vary minimally or not at all from language to language, the differences that show up being attributable to local syntactic conditions.

If one understands the first phrase -- "the most fundamental principles of semantics" -- as including the principles that determine LF structure then we have a poverty of stimulus argument as applied to LF. The claim above is that LF is too remote from experience to allow parametric variation across grammars. In other words, there are no data accessible to the child in terms of which s/he could directly fix different LF parameter values. Consequently, LF phrase markers must be essentially identical across speakers and languages or can only differ in ways that are dependent on differences in overt syntactic structure that the child can use in the course of specifying its grammar.

This constitutes the argument for LFs being identical across grammars. As a form of argumentation, the poverty of stimulus argument cannot be faulted. However, it is not clear how powerful this particular application of the argument is. There is a good sense in which SS (in a GB-style theory), the locus of "local syntactic conditions," is more remote from "experience" than LF is, at least if by experience one intends non-linguistic information. The reason is
that LF is thought of as the grammatical level that interfaces with the other cognitive modules, just like PF and in contrast to SS.

To help us get a feel for the strength of the application of the poverty of stimulus argument when applied to LF, let us consider an analogy between LF and PF. PF ultimately interfaces with the modules involved with phonetic perception and muscle control systems that govern articulation. Grammarians believe that phonologies can differ across languages. If so, the reason must be that the child can fix phonological parameters by inspecting the incoming phonetic data. In other words, the relationship of PF to phonetic/motor events is transparent enough to allow a child to deduce the structure of phonological parameters from the patterns of perceptual/motor data that the child has access to.

Given the parallel between LF and PF the argument outlined by Higgins-botham must amount to the claim that the relationship between the structure of LF and the information in its interface modules, say, for concreteness, a sentence’s truth conditions, is more opaque than the relationship that obtains on the PF side of the grammar between phonetic data and phonological parameters. Consequently, inspecting truth conditions made manifest in a particular situation fails to be a good indicator of LF structure and so cannot be used to fix possible LF parameters. This kind of disanalogy between PF and LF is the assumption that drives the above argument. The question is why should we accept it.

Chomsky (personal communication) argues as follows:

The basic point seems to be simple. If a child hears English, they [sic] pick up the phonetics pretty quickly (in fact, it now turns out that many subtle distinctions are being made in language-specific ways, as early as six months). The perceptual apparatus just tunes in. But if you observe what people are doing with language, it is subject to so many interpretations that you get only vague cues about LF.

In simpler terms, we are perceptually built for sound but not perceptually built for meaning. I do not know whether this speculation is correct. Consider recent work by Fisher et al. (1994) for example. They observe that very young children upon hearing sentences of varying adjectives will reliably tune to a screen projecting the situation described by these sentences. Thus, for example, given two screens, one portraying an event described by a transitive verb and the other depicting an event expressed by a ditransitive verb, the child will reliably gaze on the one that matches the sentence broadcast to him/her. If this is correct, it appears that argument structure (the adicity of the predicates) is perceptually available in the data the child exploits in fixing his/her grammar.

For the sake of argument, consider a further possibility. Say children are able to perceptually discern quite generally which truth conditions characterize a given situation. For example, say the possible relative quantifier scopes in “a shark attacked every diver” are discernable by children in the two different sets of circumstances corresponding to the alternate truth conditions that the sentence may have: in one situation a lone shark munched on every frogman while in the other each frogman is served up to a different shark. If this occurs, then whether a given language licenses certain kinds of relative quantifier scope ambiguities can be culled directly from the linguistic context. If alternate quantifier scopes are reflected in different LF phrase markers, then LF parameters can be directly set by the primary data if this scenario obtains. I am not urging that this is indeed so, but it does not strike my pre-theoretical hunches as terribly far-fetched. What is clear is that this is an empirical judgement about an area that we know very little about. As such, it remains unclear just how powerful the poverty of stimulus argument outlined above really is. Suffice it to say that the discussions in the following chapters adhere to a principle of LF invariance in large part.

The rest of this book is divided as follows. The early chapters (2 and 3) review the canonical arguments for the existence of LF and its properties. LF in its standard version has the properties noted above. It is derived from SS via successive applications of the rule Move α. Of particular importance in these derivations is the rule of QR and WH-raising. The former Chomsky-adopts quantified NPs to IPs and the latter moves WH-elements to complementizer positions. The various boundary conditions noted above are taken to characterize LF so that all relevant grammatical information that determines sentence interpretation is represented at LF. The kinds of arguments surveyed below include analyses of quantifier scope interactions, pronoun-binding phenomena, antecedent-contained deletion structures, and superiority effects among others. These arguments for LF are set in a GB framework of assumptions. Later chapters (4 through 9) set these GB assumptions aside to investigate the properties of LF against the background of a Minimalist theory. Minimalism places different desiderata on grammars and one aim is to see just what these imply for the structure of LF. In addition, Minimalist grammatical technology is somewhat different from that standardly assumed for LF within GB theory. In particular, it is unclear whether WH-raising or QR obtains at LF in a Minimalist theory, at least as these operations are standardly understood. There is also far more A-movement at LF in this revised model than there is in the standard GB system. What this empirically implies for LF structures and operations in general (and for the analyses surveyed in chapters 2 and 3 in particular) is the central concern of these chapters.
Motivating LF

There is a series of direct syntactic arguments that bear on the form and existence of LF in a GB-style theory. They are "syntactic" in that they exploit generalizations exemplified in SS phrase markers. Interestingly, these SS conditions can be generalized and given wider empirical reach by supposing that they apply to a phrase marker similar to (but more articulated than) SS rather than to SS itself. Furthermore, this grammatical object is formally very similar to the logicians' logical form; a syntactic object sufficient for specifying the recursive interpretive structure of a sentence. This confluence of properties lurks behind the "LF" designation for this phrase marker.

In this chapter, I review some standard GB arguments supporting the conclusion that a grammatical level like LF exists. The form of these arguments is as follows. As noted in chapter 1, there is a semantic distinction between names and quantifiers, the latter being scopal elements. Suppose that scopal elements represent their scopes grammatically within LF phrase markers. Suppose as well that quantifiers assume their scope via the rule of Move α at LF, i.e. QR adjoins quantified NPs to the clauses over which they have semantic scope. If this is correct, then we expect this movement to obey the assorted grammatical restrictions that typically characterize overt movement operations. For example, we expect the movement to be constrained by principles like subjacency and the traces left by movement to be subject to the ECP (see below for the relevant definitions). Furthermore, the licit movements should result in phrase markers that reveal the semantic compositional structure of the sentence. This is what we expect if semantic information is grammatically encoded in phrase markers derived by standard grammatical processes. The data provided below support these expectations and thereby constitute evidence for the assumption that LF exists.

Before illustrating instances of this type of argument, it is worth observing that, if it can be provided, it is very powerful. What better reason can there be for postulating a new level of grammatical representation, a new kind of phrase marker (or for that matter any other kind of theoretical construct), than that it extends the domain of empirical coverage while exploiting independently motivated generalizations!

1 Interpreting LF

A range of arguments for the existence of LF arise from considering the properties of WH-elements. WH-elements are semantically akin to operators. They take scope over the propositions relevant to the interpretation of the sentence. Consider a simple case.

(1a) What did Bill buy
(1b) What does Bill know that Frank bought
(1c) John knows what Bill bought

We can think of the interpretation of a question as a function of the appropriate answers to it. In (1a), for example, the answer consists of a sentence like (2) with appropriate purchases plugged into the X-position, e.g. shoes, a car, a telephone.

(2) John bought X

(1b) has a different set of appropriate responses determined by the frame (3).

The set of potential answers includes statements like "Bill knows that Frank bought a hot dog," "Bill knows that Frank bought a lemon" etc. In contrast, the statement "Harry knows that Bill bought a hot dog" is not a potential answer as it exploits the wrong propositional frame.

(3) Bill knows that Frank bought X

(1c) is not a question at all though it has a question as a subpart: the embedded clause. This embedded clause determines a set of "answers" arrived at by filling in the frame (4):

(4) John knows: Frank bought X

Roughly speaking, (1c) is true just in case Bill knows if Frank bought a car, or a boat, or a stove or . . .

This very brief set of observations highlights the semantic function of the WH-operator. The moved WH has scope over the clause that it heads and this clause forms the propositional frame which helps determine the set of appropriate answers for a given question. The position from which the WH has moved further delimits the relevant propositional frame. The standard syntactic treatment of WH-questions moves the WH to sentence initial Complementizer position and leaves a trace behind. This trace functions as the variable X above, the slot that is filled to complete the set of answers. The boundary of the relevant propositional frame is determined by the position that the WH occupies; the trace functions to determine the position of the variable. The syntax of overt WH-movement in English, in effect, provides the kind of information needed to interpret a question.
Not all languages function like English. In various languages, including French and Chinese among others, WH-elements can remain in situ at SS. Thus, at SS, these languages do not seem to render the propositional frame explicit. It is reasonable to suppose, however, that this information is somewhere provided, if not at SS then at some other level of representation. There is, in fact, considerable evidence that theseWHs, despite their overt surface positions outside of the Comp slot, nonetheless act as if they were situated within it.

Consider the following type of data. (5) receives an interpretation as a simple (non-echo) question. The Chinese sentence (6a) manifests the ambiguity made explicit in the English translations (6b) and (6c).

(5) Jean a vu qui J. has seen who
Who did Jean see?

(6a) Zhangsan zhidao [p [Lisi mai-le sheme]]
know Lisi bought-ASP what
(6b) What did Zhangsan know that Lisi bought
(6c) Zhangsan knows what Lisi bought

One way of accounting for the semantic parallelism between English questions, in which WH-expressions overtly move to the Comp at SS, and the French and Chinese cases, where there is no comparable SS movement, is to propose that at LF, the WH-elements in situ at SS in French and Chinese, move to the Comp position. Observe that if we adhere to the assumption that the interpretive (semantic) properties of grammars are uniformly represented cross-linguistically, then it is natural to assume that WH-in-situ elements abstractly move to Comp positions rendering languages structurally identical with regards to semantic interpretation. Note that French and Chinese thereby determine the relevant propositional frames at LF rather than SS. Assuming this, (5) has the LF phrase marker in (7) and (6a) has the ones in (8). Thus, at LF, the various French, Chinese and English sentences are formally identical and at this level, provide the relevant information for interpretation.

(7) [Qui [Jean a vu t]]
(8a) [sheme, [p Zhangsan zhidao [p t, [p Lisi mai-le t]]]
(8b) Zhangsan zhidao [p sheme, [p Lisi mai-le t]]

WH-in-situ constructions are not limited to French and Chinese. English multiple interrogatives involve them as well.

(9) Who bought what

In this case, it is supposed that the WH-in-situ moves at LF to the Comp containing the overtly moved WH-element (Chomsky 1973). The WH-in-situ, then, joins the WH in Comp at LF. This permits an absorbed interpretation for the pair of WH-operators. Thus, the appropriate interpretation for questions like (9) involves responses of buyer–buyee pairs; John a car, Bill a boat and Cathie a motorcycle. The appropriate propositional frame is something like (10) in which the pair of variables X, Y must be filled in to yield an appropriate answer.

(10) Which X, Y [X bought Y]

An LF phrase marker like (11) makes the relevant propositional frame explicit. The traces of movement once again function like variables and the complex WH-amalgam in Comp demarcates the appropriate proposition.

(11) [[what, [who] t bought t]]

The examples above favor movement of WH-in-situ elements to pre-sentential positions on the assumption that the interpretive properties of operators have a syntactic reflex. In other words, the derivation of LF phrase markers to encode interpretive information is motivated on the assumption that in cases such as these, syntactic form follows interpretation. A pressing question then is whether there exist non-interpretive reasons for thinking that phrase markers such as these exist. What kind of evidence can be adduced aside from the interpretive concerns mooted above?

2 The Empty Category Principle at LF

The ECP is a condition that requires that traces be licensed to be licit. Thus, a trace in a given structure is acceptable if and only if it is properly governed (see definitions below). Thought of this way, the ECP is essentially a trace detector, a condition that makes noise when a trace fails to satisfy it. The aim of this section is to deploy this detector to hunt for possible covert traces, i.e. traces without phonological residues. The existence of such non-phonologically marked traces is implied by the existence of LF and so finding such would support the position that such a phrase marker exists. This section reviews evidence that such traces exist and trigger the ECP.

The ECP is a condition that distinguishes the movement behavior of (i) adjuncts and arguments and (ii) subjects and objects. (12) illustrates the first contrast, (13) the second.

(12a) (?) Which car did John wonder how to fix
(12b) *How did John wonder which car to fix
(13a) Which car did John say that Bill fixed
(13b) *Which mechanic did John say that fixed the car

The ECP effects this contrast by requiring that traces formed by movement meet the locality conditions stated in (14) and (15).
(14) ECP: All traces must be properly governed
(15) A trace is properly governed iff it is governed by a head X or locally
bound by its antecedent.

Assume for the present that local binding is effected within the same clause.
(14) and (15) encode the familiar head government and antecedent government
options for proper government. The details do not matter for the present.

The ECP distinguishes the sentences in (12) and (13) as follows. They have
the structures in (16) and (17).

(16a) [Which car, [John wonder [how, [PRO to [fix t] t]]]]
(16b) [How, [John wonder [which car, [PRO to [fix t] t]]]]
(17a) [Which car, [John say [that, [Bill fixed t]]]]
(17b) [Which mechanic, [John say [t, that [t, fixed the car]]]]

Consider the traces in (16a, b). The trace t is an argument of the verb fix. As
such, it is sister to the verb and hence governed by it. The trace t is an adjunct
outside the governing domain of the verb or any other lexical head. The former
trace meets the ECP by being head governed by the verb. The trace of how can
only conform to the ECP by being locally bound. In (16a), t is so bound by how
from the local Comp position. However, in (16b), this fails to occur and t is
neither head governed nor antecedent governed. An ECP violation results and
the relative unacceptability of (16b) is accounted for.7

A similar account extends to (17a) and (17b) though the technical details
differ. In the former, t is head-governed by fix. In contrast, the subject trace in
(17b) has no head governor. The question whether it is locally bound (i.e.,
antecedent governed) by the intermediate t. Assume that the Comp that blocks
this.8 The unacceptability of (13b) then follows from the ECP.

Consider now how the ECP interacts with non-syntactically overt WH-
movement. Recall that in French it is possible to form a question without
overly moving the WH. Consider in this light the pair of sentences in (18).9

(18a) Pierre a dit que Jean a vu qui
    P. has said that J. has seen who
    "Who did Pierre say that Jean saw"
(18b) *Pierre a dit que qui a vu Jean10
    P. has said that who has seen J.
    "Who did Pierre say that saw Jean"

The pair display a subject/object asymmetry characteristic of the ECP. Indeed,
we can extend the account above to these French cases on the assumption that
the qui in situ moves to the matrix Comp at LF and that the result of this
movement is subject to the ECP. The structure of (18b) at LF is (19). The trace
in subject position fails to be properly governed.11

(19) [Qui, [Pierre a dit [que t, a vu Jean]]]

Similar subject/object asymmetry effects are observable in English multiple
interrogation constructions.12

(20a) Who believes that Bill bought what
(20b) *Who believes that what happened

If English multiple interrogatives involve moving the WH-in-situ to a Comp
containing a WH, then the LF structure of (20b) is identical to (18b) above and
results in an ECP violation (but see n. 7).

(21) [[What, [who]] t said that t happened]]


(22a) Ni xiang-zhidao Lisi zeme mai-le sheme
You wonder Lisi how buy-ASP what
(22b) How do you wonder what Lisi bought
(22c) What is x that do you wonder how Lisi bought x

(22a) is unambiguous in Chinese. It can be interpreted as (22c) but cannot
carry the interpretation (22b). Furthermore, the prohibition against (22b) is not
due to the inability of extracting zeme long distance. (23) is well formed.

(23) Ni renwei ta yinggai zeme lai
You think he should how come
"How do you think that he should come"

A direct way to account for the unacceptability of (22a) with the interpretation
(22b) is via the ECP. The structure of the unacceptable sentence is (24). The
adjunct trace is neither head nor antecedent governed and hence the indicated
structure is ill-formed, in violation of the ECP.

(24) Zeme, [ni xiang-zhidao [sheme, [Lisi t, mai-le t]]]
    How you wonder what Lisi bought

Though we have used Chinese examples to make the case, the glosses indicate
that parallel facts hold for English. In effect the pair of examples in (12)
above follow the logic illustrated here. The key difference between the English
and Chinese cases is that in the former the movement is overt while in the latter
the WH-elements all move at LF. The fact that the interpretive properties of
the English sentences (which involve overt syntactic movement) and the Chi-
inese sentences (which appear not to) are identical follows from the assump-
tion that the ECP applies to LF phrase markers of the kind postulated.

The ECP can also be brought to bear on another interesting set of data
involving WH-movement, superiority effects.

(25a) I wonder who bought what
(25b) *I wonder what who bought

Assume once again that to receive an interpretation the WH-in-situ moves to
the Comp containing a WH-operator and adjoins to it thereby permitting an
absorbed interpretation of the complex WH-operator. This yields (26) as the correct structure of (25).

(26a) I wonder [[what, [who]] \_\_t_{1} bought t_{1}]
(26b) I wonder [[who, [what]] \_\_t_{1} bought t_{1}]

Consider the traces. In (26a, b) the object trace \_\_t_{1} is properly governed by the verb bought. In (26a) the subject trace \_\_t_{1} is antecedent governed by who, or more precisely, by the complex WH of which who is the head. This complex WH is in the same structural proximity to the trace in subject position as a simple WH would be, e.g. as in (27).

(27) [What, [\_\_t_{1} happened]]

This contrasts with (26b) where who plausibly fails to locally bind the subject trace. The intervening head of the complex WH what, intervenes to upset the local binding relation much as that does in cases such as (13b) above. If we assume that this, or something like this, is correct, then superiority effects can be brought within the purview of the ECP.13

It is interesting to observe that we find similar superiority effects in languages in which WHs all move overtly to Comp in the syntax. Rudin (1988) observes that in Bulgarian and Romanian all WHs move to Comp by SS. These multiple questions exhibit superiority effects. (28) illustrates this using Romanian data.14

(28a) Cine ce cumpara
   Who what buys
   "Who buys what"
(28b) *Cine cine cumpara
   What who buys
   "What did who buy"

Once again, it is significant that we find overt analogues of the LF phrase markers proposed. If LF is a grammatical level, then its phrase marker properties should parallel those we find in other phrase markers. The fact that both overt movement of WHs in Romanian and covert movement of WH in English are amenable to a common analysis on the assumption that WHs-in-situ move at LF to Comp adds grammatical support to the hypothesis that LF exists.

Before reviewing further evidence, let us pause to consider the fine structure of the argument presented to this point. Semantically, a distinction exists between quantifiers and names.15 The former have distinctive scopal properties which are reasonably represented grammatically by moving these expressions to positions that c-command their scopal domains. WH-operators are quantificational entities and so have scopal properties. In many languages, English being one, these scopal properties are manifested overtly in the position that WH-elements occupy. It is reasonable to suppose that this movement manifests the logical structure of questions with the pre-sentential WH occupying its scope position. What we have rehearsed evidence for is a more striking proposition; that the satisfaction of semantic ends (such as assuming one's proper scope position) is accomplished by syntactic means. The line of argument above indicates that quantifiers like WH-expressions are subject to the rule of Move α and it is through a process of (grammatical) movement that WHs attain their scope positions. This movement, like overt forms of syntactic movement, leaves behind traces which are subject to conditions on trace licensing such as the ECP. This means that scope of WH is a property of phrase markers and hence that semantic content has syntactic consequences, in at least this one case. Importantly for our purposes, the phrase marker relevant to stating this confluence of semantic and syntactic fact is a phrase marker derived from SS by further application of syntactic operations. In short, LF.

Other quantified expressions conform to the ECP as well. Kayne (1981) considers some evidence from French that indicates that negative quantifiers display subject/object asymmetries with respect to abstract movement. Quantified NPs like personne take scope over the clause within which the negative marker ne appears. Typically, this is the same clause. (29a) has the LF (29b).

(29a) Jean n'aime personne
   J. neg likes no one
   "Jean doesn't like anyone"
(29b) Personne, [Jean n'aime t_{1}]

Interestingly, there are cases in which it is possible in some dialects to get the neg marker and the quantifier whose scope it indicates in different clauses.

(30a) Jean n'exige que Marie a vu personne
   J. neg insist that M. has seen no one
   "Jean didn't insist that Marie saw anyone"
(30b) *Jean n'exige que personne est venue
   J. neg insist that no one is come
   "Jean didn't insist that anyone came"

If personne moves to the clause that contains the neg marker ne, the LF representations of the two sentences is (31).16

(31a) Personne, [Jean Neg exige [que [Marie a vu t_{1}]]]
(31b) Personne, [Jean Neg exige [que [t_{1} est venue]]]

It is reasonable to account for the relative unacceptability of (30b) by treating (31b) as an ECP violation, on a par with (18b) above. In this instance, however, the trace is a result of a rule of quantifier raising (QR) rather than WH-raising. However, the logic is similar to the WH-case. Quantifiers are also scopal elements. On the familiar assumption that this scope is displayed at LF and effected via movement, then we expect QR to conform to the ECP and display the asymmetry noted above.17
The ECP plausibly accounts for a further set of quantificational relative scope facts as well.\(^{18}\)

\[(32a)\] At least one person expects every candidate to win
\[(32b)\] At least one person expects (that) every candidate will win

\[(32a)\] has a reading in which the universally quantified NP every candidate takes scope over the existential NP at least one person. Thus, it is compatible with the truth of \[(32a)\] that there be a different person expecting every candidate to get elected. This reading is unavailable for \[(32b)\]. The relevant difference between this pair is that the embedded clause in \[(32b)\] is finite while the embedded clause in \[(32a)\] is infinitival. This difference is crucial. Given standard assumptions, subjects of non-finite clauses under verbs like expect are case marked by the higher predicate. As case marking is under government, this implies that expects governs the subject position of the embedded clause in \[(32a)\]. This, in turn, implies that this position is head-governed by expects. Extraction from this position should then be perfectly acceptable. This contrasts with the subject of the embedded clause in \[(32b)\]. Here case marking is via the finite inflection, which is not a proper governor. As such, extraction here should be prohibited. In effect, long QR from the embedded subject in \[(32a)\] meets the ECP while long QR in \[(32b)\] does not. The LF representations with wide scope for the universal NP are those in \[(33)\].

\[(33a)\] [Every candidate, [at least one person, [t, expects [t, to win]]]]
\[(33b)\] [Every candidate, [at least one person, [t, expects [t, will win]]]]

\[(33b)\] has a non-properly governed trace t. This accounts for the inability to give every candidate a wide scope reading in \[(32b)\]. Another important phenomenon displays an identical ECP effect. Consider sentences such as \[(34)\].

\[(34)\] John likes everyone that I do

This is an example of antecedent-contained deletion (ACD).\(^{19}\) The interpretation of \[(34)\] is provided in \[(35)\].

\[(35)\] Everyone that I like John likes

An appropriate LF for this interpretation is provided in \[(36)\].

\[(36)\] [Everyone, [that [I like t]] [John likes t]]

ACDs have the following difficulty. Assume, for concreteness, that the way we interpret a null VP is by copying the VP it is dependent on (its antecedent) into the null position. Two observations are pertinent. First, to give \[(34)\] the interpretation \[(35)\] requires interpreting the deleted VP within the relative clause. Second, copying the antecedent of the null VP cannot be effected if the quantified phrase remains in situ. The problem is that the null VP within the relative clause is interpretively dependent on the VP that contains it. With ACDs, this copying cannot eliminate the VP gap as copying the larger VP will result in copying the VP gap it contains. In short, copying cannot be executed without regress unless we move the whole quantified phrase out from under the VP that contains the null VP. The problem is graphically illustrated by considering the SS phrase marker of \[(35)\].

\[(37)\] John \[[v_{p1}] \text{likes } [everyone \text{ that I do } [v_{p2} \text{ e}]]\]

\[(37)\] It is not possible to copy VP1 into VP2 without copying the VP gap as well. But if we end up with a VP gap again then we still do not have a fully specified content for the clause. On the assumption that gaps must be discharged for interpretation to be well formed, the procedure outlined above is problematic, at least if stated at S-structure.\(^{20}\)

I importantly, this simple procedure can proceed without a hitch if we assume that ACDs are interpreted at LF, the relevant structure being \[(38)\].

\[(38)\] [Everyone, [that I do [v_{p2} e] [John [v_{p1} \text{ likes t}]]]]

Here VP1 can be copied into VP2 without regress as VP1 no longer contains VP2. The effect of moving the relative clause to its scope position (note that the head everyone is a quantificational NP) is to remove it from under VP1 and this movement circumvents the regress problem that besets SS interpretation. In effect, ACDs provide another kind of interpretive evidence for the utility of LF. We gain syntactic corroboration for the view that ACD interpretation involves LF phrase markers by considering the following contrast.

\[(39a)\] John expected everyone that I did to win
\[(39b)\] *John expected everyone that I did would win

The relevant interpretation of interest is the one paraphrased as “John expected everyone that I expected to win.” It is much more difficult to give \[(39b)\] this ACD reading than \[(39a)\].\(^{21}\) This follows if movement is involved and this movement is subject to the ECP. The LFs required to feed the ACD interpretation are the ones in which the relative clause moves to a position above the matrix VP. The requisite LFs for the pair of sentences in \[(39)\] are provided in \[(40)\]. In both phrase markers VP2 has been moved out from under VP1.

\[(40a)\] [Everyone, [that I did [v_{p2} e] [John [v_{p1} \text{ expected } [t \text{ to win}]]]]
\[(40b)\] [Everyone, [that I did [v_{p2} e] [John [v_{p1} \text{ expected } [t \text{ would win}]]]]

The reason that \[(39b)\] cannot have the ACD interpretation is that \[(40b)\] violates the ECP, in contrast to \[(40a)\]. In fact, \[(40b)\] has the same problem as \[(33b)\] above. The embedded trace in subject position fails to be properly governed. In both cases, the ECP prevents QR from moving the embedded subject to the
next higher clause. As this is required to get the indicated interpretations, these are not available for these sentences. In the case of (39b) this prevents VP2 from moving out from under VP1 and hence we face the regress problem when interpreting the VP2 gap in (39b). In sum, ACD constructions seem subject to ECP considerations; just as expected if LF movement is involved.

Consider one more interpretive phenomenon with apparent ECP effects.22 Sentences like (41) are ambiguous, with either what or everyone taking wide scope. The two interpretations are highlighted by the answers in (42).

(41) What did everyone bring
(42a) Everyone brought a bottle of wine
(42b) John brought a bottle of wine, Fred brought beer, Cheryl, chips and Sue guacamole

(42a) corresponds to a wide scope reading for what while (42b) gives the universal quantifier widest scope. Call the reading in (42b) the pair-list reading.

Various ways have been proposed for representing this pair of interpretations at LF. Chapter 3 considers various analyses of these constructions. For now, let us adopt the analysis in May (1985). May (1985) assumes that the rule of QR adjoins quantified NPs to any XP. Assume here that everyone adjoins to IP. The LF of (41) is then (43).

(43) [CP What, [IP everyone, [vP t, bring t]]]

Whence the ambiguity given a solitair LF? May (1985) suggests the following definition of c-command in terms of strong domination and the following scope rule.23

(44) A c-commands B iff every node that strongly dominates A strongly dominates B
(45) A node N strongly dominates B iff every segment of N dominates B
(46) Scope rule: If A asymmetrically c-commands B then A has scope over B

The effect of the definitions (44) and (45) as regards (43) is that in this structure what and everyone mutually c-command each other. IP does not strongly dominate everyone as one of the segments of IP does not dominate the adjoined universal quantifier. The only node that strongly dominates everyone is CP and this strongly dominates what as well. Given the scope rule, the effect of mutual c-command between what and everyone is to permit either to take scope over the other. In effect, May (1985) drops the requirement that sentences be disambiguated by LF. The LF phrase marker is interpretively ambiguous with either quantifier capable of bearing wide scope.

In light of this consider a sentence like (47).

(47) Who brought everything

This sentence is unambiguous. It does not support a pair-list reading. (42b) is an inappropriate answer to (47). The ECP explains why. Consider what

LF structure would be required for the pair-list reading. Everything must c-command who, which sits in Comp. The LF structure is (48).

(48) [CP Who, [IP everything, [vP t, brought t]]]

However, there is a problem with this configuration. In particular, it is plausible to suppose that t is not properly governed given the intervening adjoined universal quantifier. If this is so, the unavailability of the pair-list reading in (47) follows. (48), the LF phrase marker required for the pair-list reading, violates the ECP.

One last issue remains. The LF of the acceptable interpretation of (47) is (49). Everyone is adjoined to VP. Within this configuration, who asymmetrically c-commands everyone (IP and CP strongly dominate everyone while only CP strongly dominates who) and thus is interpreted by (46) as necessarily taking scope over it.

(49) [CP Who, [IP t, [vP everything, [vP brought t]]]]

The above canvassed material supports the conclusion that some semantic properties of sentences are mediated by LF phrase markers. WH-scope, quantifier scope, scope of negation, and VP ellipsis in ACD contexts all appear sensitive to whether the traces left by non-overt movement are properly governed. In short, the ECP appears to limit the effects of abstract LF operations in ways similar to the restrictions it imposes on overt SS movement. This follows if there is indeed a level of representation that mediates interpretation that is derived from SS via Move α.

3. Cross Over Effects at LF

We have been thinking of the ECP as a trace detector. There is another: cross over effects. Consider the following sentences.

(50a) *Who, did he, give a book to t
(50b) *Who, did his, mother give a book to t

There sentences in (50) exemplify strong and weak cross over. In (50a) the trace/variable t is bound by the pronoun he within the domain of its operator/quantifier. This is a violation of principle C (as in (51)) and yields an illicit structure.

(51) A variable must be free in the domain of its operator24

The variable t in (50b) is coindexed with a pronoun on its left. This is illicit. A variety of principles have been proposed to rule such structures out. For
current purposes it is not crucial which is adopted so I rest with a traditional favorite, the Leftness Condition.  

(52) A variable cannot serve as the antecedent of a pronoun on its left

(52) bans structures with the indicated indexing in (50b) with indexation interpreted in terms of antecedence. In simple cases, if X (A-)binds Y then X is the antecedent of Y.

(50a, b) involve SS movement. They manifest strong cross over (SCO) and weak cross over (WCO) effects respectively. (53) indicates that similar effects can be detected in sentences without any form of overt syntactic movement.

(53a) *Who said that he, gave a book to who
(53b) *Who said that his mother gave a book to who

The LF structures of these sentences are provided in (54), the WH-in-situ having moved to the matrix Comp position.

(54a) [[Who, [who]] [t, said [that [he, gave a book to t]]]]
(54b) [[Who, [who]] [t, said [that [his mother gave a book to t]]]]

The relevant interpretations here have he in (54a) and his in (54b) interpreted as bound variables. What is crucial is that they cannot have the interpretations in (55).

(55a) For which pair of people x, y did x say that y gave a book to y (i.e. himself)
(55b) For which pair of people x, y did x say that y’s mother gave y a book

These are perfectly coherent propositions but the sentences in (53) cannot express them. More importantly, as the structures in (54) clearly demonstrate, the same principles that rule out (50) above will filter out these structures as well. Thus, once again, assuming that multiple interrogative constructions involving move the WH-in-situ to the WH in Comp allows us to generalize grammatical conditions attested at SS.

The argument carries over to non-interrogative quantifiers. (56a) cannot be interpreted as meaning “everyone gave himself a book” nor can (56b) mean “everyone’s mother gave him a book.”

(56a) *He, gave everyone, a book
(56b) *His, mother gave everyone, a book

At LF, after QR has applied, these have the structures in (57), the former induces an SCO violation and the latter displays a WCO configuration. Hence both phrase markers are ill-formed and the attendant interpretations are unavailable. Much as in the ECP cases discussed above, it appears that (51) and (52) do not discriminate between overt traces/variables or covert ones.

Neither variety may be bound or serve as an antecedent to pronouns on their left.

(57a) [Everyone, [he, gave t, a book]]
(57b) [Everyone, [his, mother gave t, a book]]

4 Bound Pronouns

Movement has another significant effect. It alters the c-command domain of the moved expression. Prior to movement, the WH in object position only c-commands elements within the VP in (58a). After movement, it has the entire clause as its c-command domain.

(58a) John [v, bought what]
(58b) What [v, John bought t]

This can be significant given principles such as (59).

(59) If a pronoun P is c-commanded by an NP O then P can be interpreted as a variable bound by O

The movement of operators alters their c-command domains and thereby alters the pronouns that can be treated as bound variables. Consider an example.

(60) *The man [who disliked every boy], hit him,

Here every boy does not c-command the pronoun at SS as it is embedded within the relative clause. If (59) applies at SS then every boy’s failure to c-command him accounts for the lack of a bound pronoun reading in (60). For this example, the result is the same if (59) holds at LF. QR is typically clause bound (Chomsky 1977) and at LF, (60) has a structure something like (61).27

(61) The man who, [every boy, [t, disliked t],] hit him,

In (61), every boy fails to c-command the pronoun and so the pronoun cannot be interpreted as bound. Though this instance of LF movement does not affect the pronoun-binding powers of the quantified NP, there are other cases in which it might. Consider some simple examples.

Parasitic gap constructions require that the real gap not c-command the parasitic gap. This is what differentiates the relatively acceptable (62a) from the unacceptable (62b).

(62a) Which book did Bill read t, after Frank reviewed t,
(62b) *Which book t, was read by Bill after Frank reviewed t,
In the former, the real gap is in object position. If the _after_ clause is adjoined to VP, then the real gap in object position fails to c-command the trace inside the adjunct. The contrast with (62b) is attributable to the fact that subjects c-command the whole clause thereby c-commanding the adjunct and the parasitic gap within it. This c-command configuration leads to a violation of principle C and the structure is ungrammatical. 29

Assume that this is correct. We then are confronted with a puzzle in cases such as (63).

(63a) John kissed every child, after Bill introduced him,
(63b) Orson will drink no wine, before its, time

The pronouns here can be interpreted as bound variables, which should be impossible if (59) holds at SS. As we have just observed, the object NP does not c-command the adjunct at this level. This problem can be finessed, however, if we permit (59) to apply after QR. The relevant LF structures are (64) with the quantified object NP adjoined to IP via QR. 29 This LF movement suffices to place the pronoun within the c-command domain of the raised quantified NP. In short, for this case, LF movement serves to save the generalization proposed in (59).

(64a) [Every child, [John [vp, kissed t1] after Bill introduced him]]
(64b) [No wine, [Orson will [vp, drink t1] before its, time]]

There is some independent evidence that the trace/variable does not c-command the adjunct. Consider the distribution of epithets. It is impossible to anaphorically anchor an epithet to an NP so long as this NP c-commands the epithet. 30 (65) illustrates this.

(65) *No boy, thinks that the boy, is smart

Now consider (66).

(66) Orson will drink no wine, before the wine, is ready

It is perfectly acceptable. This follows on the assumption that the object position does not c-command the adjunct that contains the epithet, the same assumption as above. Thus, there are two kinds of data to point to the conclusion that an NP in object position at SS does not c-command a VP adjunct. The fact that pronominal binding is nonetheless possible from here supports the position that LF is the correct level for stating (59).

There are two other kinds of bound pronoun structures that support the conclusion that pronominal binding is licensed at a grammatical level different from SS. May (1977, 1985) observes that binding is possible in “inverse linking” configurations such as (67).

(67) [No one [vp, from every city],] loves it,

At SS, _every city_ does not c-command the pronoun, as (67) indicates. By (59) the bound pronoun interpretation should be unavailable, contrary to fact. This c-command problem is solved once we assume LF movement of quantified NPs. The interpretation of (67) assigns the universally quantified NP wide scope. The LF structure is (68).

(68) [vp, Every city, [vp, [someone from t1], t1 loves it]]

Once again, there is independent evidence that _every city_ does not c-command the pronoun at SS. Reinhart (1983) observes that sloppy identity constructions are subject to (59) as well. A sentence has a sloppy reading when the semantic value of the pronoun varies with that of the antecedent. The sloppy reading of (69a) is the one paraphrasable as (69b). (69c) is the strict reading.

(69a) John loves his mother and Bill does too
(69b) John loves John’s mother and Bill loves Bill’s mother
(69c) John loves John’s mother and Bill loves John’s mother

That (59) applies can be seen from cases such as (70a) which only have strict readings, i.e. the readings in (70c). This is what we expect on the assumption that non-quantified NPs do not move at LF to their scope positions. Names, being scopeless, remain in situ even at LF and so a sloppy reading of the pronoun is not licensed. 31

(70a) People from Los Angeles love its beaches and someone from NYC does too
(70b) People from LA love LA’s beaches and people from NYC love NYC’s beaches
(70c) People from LA love LA’s beaches and people from NYC love LA’s beaches

Interestingly, the sloppy reading once again becomes available in cases like (71).

(71) Someone from every western city loves its beaches and someone from every eastern city does too

At LF, Move α derives an inverse-linked phrase marker with the pronoun c-commanded by the quantified NP. This licenses the sloppy reading.

One last point: if we replace the bound pronouns with bound epithets (or definite descriptions) the sentences remain acceptable with the same interpretations. That these anaphors are available corroborates that the SS expression does not c-command the epithet.
(72a) People from LA love that city’s beaches and people from NYC do too. (strict reading only)

(72b) People from every western city love that city’s beaches and people from every eastern city do too ( sloppy reading possible)

A last instance of the same effect can be found in cases like (73).

(73a) Everyone’s mother thinks he’s handsome

(73b) No one’s mother thinks he’s ugly

The genitive specifier is contained within the subject NP (or DP). Therefore, at SS, it fails to c-command the pronoun and hence by (59) should not be able to bind it. Nonetheless, the bound reading is available. This problem is once again solved if we assume that at LF quantifiers move and adjoin to IP. The relevant structure after movement is (74). At LF, the pronoun is c-commanded by the adjoined quantified NP and so (59) is respected.

(74a) [IP Everyone’s, [IP [NP t, mother] thinks he’s, handsome]]

(74b) [IP No one’s, [IP [NP t, mother] thinks he’s, ugly]]

Corroboration for the claim that at S-structure the specifier fails to c-command the pronoun comes from further consideration of principle C effects. It is possible to get a bound epithet in these configurations – (75a) – and it is possible to get backwards pronominalization – (75b). This should not be possible if the SS specifier had the IP as its c-command domain as in both cases we would have a principle C effect.32 Contrast (75) with (76).

(75a) No kid’s mother thinks that kid, is ugly

(75b) His, mother gave the kid, a nickel

(76a) *No kid, thinks that kid, is ugly

(76b) *He, gave the kid, a nickel

Sloppy identity data add further confirmation to the claim that the SS specifier does not c-command the pronoun. In (77), the sloppy identity reading (77b) is unavailable, as expected. (77a) can be interpreted as (77c) but not (77b). The specifiers, not being quantificational, do not move to higher positions at LF. Hence John and Frank never c-command the pronouns and a bound variable interpretation remains unlicensed even at LF.

(77a) John’s mother loves him and Frank’s father does too

(77b) John’s mother loves John and Frank’s father loves Frank

(77c) John’s mother loves John and Frank’s father loves John

Interestingly, we find sloppy readings in these configurations in cases where the specifier moves. There are two relevant cases. Reinhart (1991) has argued that bare argument ellipsis is fed by LF movement. In effect, what is elided is an LF constituent. A sentence like (78a) has the LF structure (78b) and IP1, a constituent present only at LF, is copied into the elision site IP2.

(78a) John liked your poem yesterday and your book

(78b) [IP1 Your poem, [IP2 John liked t yesterday] and [IP your book, [IP e]]

Elision, in short, involves movement of even non-quantified NPs. With this in mind consider (79).

(79) John’s mother kissed him and Bill’s too

In cases such as these the sloppy interpretation of the pronoun is available. (79) can carry the interpretation: “Bill’s mother kissed Bill.” This contrasts with the unavailability of this sloppy reading in (77a). The difference stems from the presence of elision in the latter case. Observe that the head noun has been elided, in addition to the rest of the IP. The LF structure is something like (80).

(80) [IP1 John’s, [IP2 [NP t, mother] kissed him] and [IP Bill’s [IP e]]

The availability of the sloppy identity reading is expected in this sort of case if elision involves adunction of the remnant to IP. With this LF movement, the pronoun is c-commanded and is licensed as a bound pronoun. Consequently, the sloppy reading is expected to arise.

Confirmation of this comes from the reemergence of sloppy readings in cases without elision but with quantified determiners.

(81a) Everyone’s mother kissed him but no one’s father did

(81b) Every congressman’s aide will support him and every senator’s secretary will too

These sentences permit sloppy readings. For example, (81a) has the paraphrase: For every x, x’s mother kissed x and for no y, did y’s father kiss y. This is once again expected given that QR raises the quantified determiner at LF to a position from which it can c-command the pronoun. This allows it to get a bound variable interpretation in conformity with (59).

Movement alters the c-command domain of an expression. In this section, I have surveyed arguments supporting the conclusion that the c-command domain of some NPs is larger than their SS position indicates that it should be. More interesting still, the NPs with these larger scope domains are quantificational. In this respect, they contrast with names, the scope of which are accurately reflected in their SS positions. This contrast is precisely what we expect if LF structurally reflects the semantic properties of different nominal expressions. Scopal NPs should move at LF and alter their c-command domains. Scopeless elements should not. The evidence suggests that the way things are is the way they should be.
5 Conclusion

This chapter has reviewed the standard arguments for LF. We have seen that there is considerable evidence that covert movement can alter SS c-command relations, can affect pronoun-binding conditions, can extend the reach of the WCO effect and the ECP. At the same time, we have surveyed evidence that suggests that LF phrase markers respect natural semantic distinctions such as that between names and quantifiers and also provide a grammatical basis for certain aspects of semantic interpretation, e.g. relative quantifier scope, VP anaphora in ACD structures. In sum, we have seen that there is considerable evidence that there is a grammatical level that is responsive to semantic distinctions. What is crucial is that there is a confluence of semantic and grammatical properties. The latter features implicate the presence of a phrase marker. The former makes it reasonable to call it "logical form."

Appendix Subjacency

Some have argued for subjacency restrictions on LF movement. I review some of the arguments for this here. I take the evidence to be inconclusive. However, chapters 8 and 9 provide additional arguments to the effect that subjacency is a restriction that applies to LF phrase markers within a Minimalist theory. Overt instances of Move α are subject to subjacency.44

(82) Movement cannot cross more than one bounding node, where IP and NP are bounding nodes

This condition restricts movement out of complex NPs and embedded WH-questions, among other islands. There are two ways of thinking of subjacency, as a condition on representations or derivations. The first view treats subjacency as a well-formedness condition on phrase markers that requires that links in a movement chain be locally relatable; e.g., that no two successive links be separated by more than a single bounding node. The second way of thinking of subjacency is as a condition on rule application. Here, the operative idea is that a movement operation cannot apply so as to move an expression across more than a single bounding node. In contrast with the representational view, this treats subjacency as a constraint on the operation of the rule itself rather than its output. In effect, subjacency is simply part of the definition of what it is to be a movement rule. Research since the early 1980s has oscillated back and forth, some results supporting the representational approach, others the derivational interpretation. For present purposes, it is the second version of subjacency that is of interest for it implies that LF instances of Move α should display subjacency effects. In this section, we review some of the evidence suggesting that this is the case. However, before beginning, it is worth considering the evidence against this position.

WH-in-situ constructions can appear inside islands.

(83a) Who asked where Bill bought what
(83b) Who likes people who live where
(83c) Who said that pictures of what were sold
(83d) Who denied the claim that Bill bought what

The relevant interpretation of (83a) is the one in which what is paired with who. An appropriate answer would be: John asked where Bill bought his computer and Sheila asked where Bill bought his modem. With this interpretation we appear to have a violation of the WH-island condition. Overt instances of WH-movement result in unacceptability in analogous constructions. Compare (83) and (84).

(84a) *What did John ask where Bill bought
(84b) *Where does John like people who live
(84c) *What did John say that pictures of were on sale
(84d) *What did John deny the claim that Bill bought

These data can be accommodated if we treat subjacency as a well-formedness condition on SS chains rather than a condition on movement itself. However, there is some evidence that even LF movement is constrained by subjacency and that the cases in (83) are only in apparent violation of this principle.

Longobardi (1991) observes that some quantified expressions, e.g. negative quantifiers and solo NP ("only NP") constructions, can have scope wider than the clause that dominates them at SS but cannot scope out of islands. (85) exemplifies the first point and (86) the second.

(85) Non credo che lui pensi che io desideri vedere nessuno
Neg believe-I that he thinks that I wish to see no one
"I do not believe that he thinks that I wish to see anyone"

(86a) *Non approverei la tua proposta di vedere nessuno
Neg approve-I the your proposal of to see no one
"I don't approve your proposal of seeing anyone"

(86b) *Non ho incontrato chi potrebbe fare niente
Neg have meet who might to do nothing
"I did not meet (someone) who might do anything"

The examples in (86) are instances of the complex noun phrase constraint. As indicated, the negative expressions nessuno and niente cannot move to their scope marker non as this would involve moving out of an island. These negative constructions also display CED (Constraint on Extraction Domains) effects. (87a) is an instance of the subject condition and (87b) the adjunct condition.
(87a) *Chiamare nessuno sara possibile
to-call no one will-be possible
"To call no one will be possible"

(87b) *Non fa il suo dovere per aiutare nessuno
Neg does-he the his duty for to-help no one
"He does not do his duty in order to help anyone"

Thus, it seems that negative scope is sensitive to island conditions and this suggests that subjacency is involved. However, these data need not imply that subjacency per se is what is involved. To establish this, it would be necessary to show that these examples are not simply instances of antecedent government violations, a condition more restrictive than subjacency. Relevant cases are examples such as (88). These, however, are unacceptable. As such, these data cannot support the position that subjacency is what determines the licit distribution of nessuno.

(88) *Non mi chiedo dove Gianni abbia visto nessuno
Neg self ask-I where G. has seen no one
"I don’t wonder where Gianni saw anyone"

A second kind of data in support of subjacency at LF has to do with answers to certain questions in the East Asian languages. In Chinese, for example, it is possible to form questions while leaving the WH in situ, as noted above. Furthermore, this WH can be lodged within an island. If the interpretation of WH in situ requires movement of this WH to Comp at LF, then a subjacency violation would result. The following data illustrate the problem. These examples involve apparent extraction out of WH-islands, relative clauses and complex noun phrases.

(89a) Ni xiang-zhidao [shei mai-le shenme]
You wonder who bought what
"What do you wonder who bought"

(89b) Ni zui xihuan [piping shei de shu]
You most like criticize who REL book
"Who do you like books that criticize"

(89c) Ni renwei [shei de hua zui piaoliang] You think whose picture most pretty
"Who do you think that pictures of are most pretty"

Indeed, even extraction out of multiple islands is apparently possible.

(90) Ni zui tongqing [bei [shei xie de shu] piping de ren]
You most pity by who write REL book criticize REL person
"Who is the x such that you sympathize most with the persons who are criticized by the books that x wrote"

However, several have argued that these violations of subjacency are only apparent and that what occurs in cases such as these are movement of the container of the WH rather than the WH itself. They observe that the answers to the questions in (91) cannot specify the value of the WH-word alone but requires one to repeat other material in the island. In particular, (91c) is an infelicitous answer and this reflects the fact that more than the WH is in operator position at LF, as would be expected if pied piping were required to allow subjacency to be adhered to.

(91) Ni xihuan [shei xie de shu] You like who write REL book
"You like the book that who wrote"

(92a) Zhangsan xie de (shu) "The book that Z wrote"
(92b) ??Zhangsan

Piengo et al. (1988) observe several problems with this pied piping hypothesis. First, they observe that the "minimal" answer test does not work that well. Thus in (93) we should have pied piping to avoid violation of the sentential subject condition. However, (92b) is a felicitous answer to this question nonetheless.

(93) [Shei kan zheben shu] zui heshi
Who read this book most appropriate
"That who read this book is most appropriate"

They further point out that pied piping fails to adequately account for certain observed contrasts. Consider the sentences in (94).

(94a) *Who did you get angry because I spoke to t
(94b) Who got angry because I spoke to who
(94c) *Who got angry why

The problem is as follows. If we assume that the acceptable (94b) contrasts with the unacceptable (94a) due to pied piping the whole adjunct to Spec CP at LF then we are left with no account as to why doing the same thing at LF in (94c) results in unacceptability.

Or consider another case discussed in Aoun (1985: 62f). Consider the pair of sentences in (95).

(95a) *Who said that what was invisible
(95b) Who said that pictures of what were invisible

(95a) can be treated as a standard ECP effect. But, if pied piping is what allows the grammar to finesse subjacency effects at LF then (95b) should be structurally identical to (95a) at LF. To avoid violating the subject condition we must pied pipe the whole embedded subject to Spec CP. But this should then leave the resultant phrase marker structurally identical to (95a). The apparent discrepancy in relative unacceptability is then left unexplained.
Fiengo et al. cite several other problems for the pied piping proposal. Consider the most serious one. As they observe, there is at best a tenuous relationship between overt pied piping and what is proposed for LF movement. As they note, acceptable pied piping varies considerably across construction types (in English). Appositive relatives seems freest while embedded questions resist most forms of pied piping. The proposal that subjacency effects are cancelled by pied piping must therefore assume very different restrictions on overt pied piping and its covert cousin. However, it is at best unclear what theoretical advantage there is to trading uniformity of Move \( \alpha \) for non-uniformity on pied piping conditions.

In sum, there are empirical problems with the pied piping proposal and the particular data that support it are not overly compelling (the fragment answer test). It is, therefore, unclear whether compelling evidence exists from this domain for LF movement. Reinhart (1991) examines another construction, “exception”ellipsis (EE) (96), which bears on whether subjacency holds at LF.

(96) No one kissed his mother except for Felix

The argument is in three parts. First, Reinhart argues that in EEs the except remnant must be associated with another NP to be licit. In particular, one cannot interpret (96) as in (97) as the latter makes no sense. Thus, at some level, the except phrase and no one form a constituent in (96).

(97) No one kissed his mother except Felix kissed his mother

Second, Reinhart argues that EEs are not DS units with the except clause moving by extrapolation to its SS position. For example, (96) is not derived from (98) via extrapolation.

(98) No one except for Felix kissed his mother

The argument for this conclusion traces the differences between overt extrapolation and EEs.

(99a) *The editor agreed to publish many reviews when we pressed him [about this book]
(99b) The editor did not agree to publish anything when we pressed him except one short review
(100a) *Jokes about everyone were told [who went to school with me]
(100b) Jokes about everyone were told except for Felix

In (99), the PP is extrapolated and the result is unacceptable. The EE analogue, in contrast, is fine. In (100a), extrapolation is blocked, as it usually is from a strongly quantified NP, but the EE analogue is once again acceptable.

Reinhart proposes that in EEs the except clause and the NP it is semantically related to form a constituent at LF. For example, in (97), QR raises no one and adjoins it to the remnant except for Felix forming a single LF operator. This sets the stage for the third leg of the argument. Reinhart argues that this instance of QR is subject to subjacency. Two facts are relevant. First, Reinhart argues that EEs can be unbounded – (101). Second, she provides evidence that islands block the construction – (102).

(101) Lucie admitted that she stole everything, when we pressed her, except the little red book
(102) *The fact that everyone resigned got much publicity except the defence minister

The when adverbial phrase is taken to mark the end of the matrix clause in (101). If so the except remnant is not in the same clause as its correlate everything. This indicates that QR can move everything successive cyclically so that it can adjoin to the remnant. (102) indicates that this movement is bounded and cannot take place out of complex NPs.

In sum, given that the correlate and remnant in EEs must form a constituent for interpretive reasons and given that they are unable to do so at DS then they must do so at LF. Given that this association can be unbounded but is blocked by islands, subjacency is implicated.

There are problems with the analysis, however. First, it is not clear that all islands block EEs. Consider the following WH-island violation. There is a clear discrepancy between the case of overt movement in (103a) and the LF version in (103b). To my ear, the contrast is very sharp. This is unexpected given Reinhart’s analysis.

(103a) *What did you say how we might get t to Felix
(103b) Bill told us how we might get the diamonds to Felix, when I asked him, but not the money

Second, Brody (1993) makes two important points against the analysis. He suggests that examples like (101) are misleading. Pace Reinhart, he proposes that the except remnant is associated with the embedded clause and that a stylistic reordering process allows the when adjunct to be interpolated. To bolster this observation Brody notes that when material that is less easily interpolated is used to mark the matrix clause boundary, unacceptable results. In (104), to our friends is an indirect object argument which has been extrapolated from immediately after admitted to sentence final position. The resulting EE is considerably less felicitous than those Reinhart cites.

(104) *John admitted that Mary stole everything to our friends except the diamonds

Brody further correctly notes that the constructed LF quantifier cannot take scope over a matrix indefinite. In (105), everything except the car cannot take scope over someone. But this too is unexpected if as Reinhart proposes it hangs so far up. The analysis requires that at LF, everything except the car forms a
constituent hanging from the matrix IP. This should permit it to take scope over someone, contrary to fact.

(105) Someone will admit that we stole everything, if you insist, except the car

One further point. If EEs are formed by LF movement we would expect them to be subject to the ECP. However, EEs do not seem to display subject/object asymmetries.

(106a) John didn’t admit that Bill saw anyone, when I pressed him, except for Frank
(106b) John didn’t admit that anyone was missing, when I pressed him, except for Frank

Taken together, these observations weaken the claim that EEs are formed via an operation like Move α subject to subjacency.

In this section, I have reviewed the standard arguments in favor of restricting LF movement by subjacency. The evidence, I believe, is inconclusive. The place of subjacency in a Minimalist theory is addressed in chapters 8 and 9.

3
More on LF

Chapter 2 reviewed the standard arguments in favor of postulating an LF level to grammatically encode the semantic properties of natural language sentences. This chapter presents more recent proposals.

The first part reviews Aoun and Li’s theory of relative quantifier scope. To my knowledge, it is the only extant GB-style theory that systematically attempts to cover the intricacies of quantifier/quantifier scope interactions and WH/quantifier scope interactions in both English-type languages and East Asian languages like Chinese. The theory draws the right empirical distinctions by subtly exploiting the resources of an ECP-centered approach to the structure of LF. The aim is to review the details of this effort to better appreciate the scope and limits of GB-style, ECP-centered approaches of LF.

The second part of this chapter reviews recent work by Fiengo and May on ACD constructions. I review the rather impressive evidence that they marshal for the conclusion that VP elision sites manifest syntactic structure. In particular, the interpreted VP gaps are subject to various kinds of grammatical conditions.

1 Relative Quantifier Scope

1.1 Aoun and Li (1989)

Chapter 2 noted that QR can be used to represent the relative scope of quantified expressions. The ambiguous sentence (1a) has either of the representations (1b) or (1c), depending on whether QR applies first to the object or the subject.

(1a) Someone tried every dish
(1b) [[Every dish, someone, [t, tried t]]]
(1c) [Someone, [every dish, [t, tried t]]]

Additional evidence in favor of this QR approach to representing quantifier scope ambiguities comes from observing that certain instances of QR display apparent ECP effects in ECM (Exceptional Case Marking) constructions.