

This concludes our discussion of the foundations of reconstruction. To summarize what we have shown: A reconstruction is a set of occurrences of a (sub-)phrase marker over a given terminal vocabulary. When a sentence contains a reconstruction, it is possible to dispense with the phonetic realization of otherwise present syntactic structure of some of the occurrences. The central question regarding reconstruction and ellipsis is, When can we say that some bit of inaudible syntactic structure is sufficiently similar to some other audible bit? (There is thus no substantive issue, on our view, about whether there is a rule of copy or deletion, or some other operation, that effects this process.) However, ellipsis and reconstruction are distinct notions, and their relation may be complex. The former is part of the use of language and incorporates an asymmetrical relation between antecedent and ellipsis; the latter is part of the structure of language and incorporates a symmetrical relation between members of a reconstruction. Since reconstruction is an identity relation over phrase markers, all token occurrences, whether they be uttered or unuttered, overt or elided, preserve grammatical category, as well as linear, domination, and government relations; all occurrences are structurally composed in the same way. Reconstruction also preserves indexical type, but indexical value may vary among the occurrences in accordance with Dependency Theory. It also preserves lexical content, where this matters, for instance, with predicates. With nominal expressions, reconstruction cares about just those aspects of their structure that contribute to their status as arguments; it preserves the integrity of arguments. It is neutral, however, on other aspects of nominal structure: whether the expression is pronominal or not, and, if pronominal, what form the pronominal takes. In an elliptical context, then, a nominal may be taken in any way allowed within these boundaries of vehicle change, so long as the result is a well-formed structure. In this chapter we have examined cases of well-formedness turning on Binding Theory; in chapter 6 we will return to further vehicle change effects with these conditions and others. Reconstruction, then, is syntactic identity, up to vehicle change and indexical variation under Dependency Theory.

Chapter 6

Logical Form and Reconstruction

6.1 Antecedent-Contained Deletion

Reconstruction is an identity condition on structure. At what level of structural articulation is the definition of identity that reconstruction affords fully expressed? In our discussions thus far this issue has not been of any great concern, since the cases we have considered have not, for the most part, critically differed structurally at the various levels of grammatical representation. In this chapter, however, we will give a concrete answer to this question—namely, that reconstruction can be fully characterized only at the grammatical level of Logical Form (LF). It will turn out that there are constructions for which it is only with respect to the syntactic structure of LF that the appropriate structural identity holds. These constructions fall under the rubric of *antecedent-contained deletion*.¹

Sentence (1) is an elementary example of antecedent-contained deletion:

(1) Dulles suspected everyone that Angleton did

1. That having the same logical form is crucial to the characterization of ellipsis has been a central thesis in virtually all contemporary discussions of ellipsis. Thus, Sag (1976) entitled his doctoral dissertation "Deletion and Logical Form," and Williams (1977) called his article "Discourse and Logical Form." The idea that logical form was implicated arose from the view that to capture sloppy readings, pronouns had to be replaced by variables, which could be bound under predicate-abstraction. This in turn facilitated the definition of the identity condition relative to alphabetic variance among functional expressions. We have rejected this approach, and along with it the notion that reference need be made to the structure of predication (either syntactically or semantically represented); see chapter 4. Rather, our appeal to logical form turns on formal aspects of overt logical terms, such as quantifiers, *as this is syntactically represented at the grammatical level of LF*; see May 1985, 1991.

We want to account for (1) in such a way out that it has just the same structure as *Dulles suspected everyone that Angleton suspected*, in which the VP that is elided in (1) is overt. That is, (1) ought to have the structure in (2), where, following our usual convention, the ellipsis is indicated by boldface:

- (2) Dulles [_{VP} suspected everyone that Angleton [_{VP} **suspected *e***]]

In order for (2) to be well formed, there must be an antecedent occurrence of the VP reconstruction, that is, of [_{VP} *suspected e*]. There is, however, no such antecedent occurrence; all that occurs is a VP of which the overt occurrence of *suspect* is the head and which contains a complement relative clause, which in turn contains the ellipsis. Thus, in these constructions, since the ellipsis is contained within its putative antecedent, it is not possible to satisfy the identity condition for proper reconstruction, and (2) as it stands is not well formed.²

The fundamental insight that shows the way out of this conundrum is due to Sag (1976). He observes that the key to understanding antecedent-contained deletion is to recognize that the deletion site is contained within a *quantificational expression*—in (1) the universally quantified restrictive relative. May (1985) shows that this insight can be captured intuitively and straightforwardly in the context of the theory of Logical Form. As observed there, once Quantifier Raising (QR) has applied, the ellipsis site is no longer contained within its antecedent, so that the locus of reconstruction is not the S-Structure form of (1), but its structure at LF. Thus, the structural identity condition is evaluated relative to the structure in (3):³

- (3) [_{IP} [_{NP} everyone [_{CP} *O*₁ that [_{IP} Angleton [_{VP} **suspected *e*₁**]]]]]₁ [_{IP} Dulles [_{VP} **suspected *e*₁**]]]

In this structure, unlike in (2), the elided VP is identical to the unelided

2. It might be thought that (2) could be taken as well formed if the reconstruction were a result of vehicle change of the relative clause. But as pointed out in chapter 5, vehicle change is sensitive only to the full class of arguments as defined by the nominal typology; thus, it is applicable to variables but not the operators that bind them. Thus, (2) cannot be interpreted as the result of vehicle change.

3. If we follow the assumption made in chapter 5 that a quantified phrase adjoined to a VP is within the reconstruction of the VP, then in order to obtain a proper reconstruction, antecedent-contained deletion must involve adjunction to S.

occurrence, giving, as desired, a representation at LF identical to that of *Dulles suspected everyone that Angleton suspected*.⁴

In contrast, there is no way to meet the structural identity conditions for (4):

- (4) *Dulles suspected that Angleton did

Here, although the ellipsis is contained within its antecedent, it is not also contained within an NP subject to QR. Thus, any reconstruction of the ellipsis on the basis of the overt VP will be regressive: *Dulles suspected that Angleton suspected that Angleton suspected that*. . . . Of course, if (4) is in a context in which it can find an antecedent in some other sentence of the discourse, it will be perfectly acceptable:

- (5) Dulles suspected Philby, and he thought that Angleton did, too

External antecedents are also possible in contexts that otherwise license antecedent-contained deletion:

- (6) Dulles suspected everyone that Philby recruited, and Angleton suspected everyone that Burgess did

Here we can take the elided VP to be that headed by *recruited*. Therefore, antecedent-contained deletion is not some special sort of ellipsis; instead, it is just that case in which structural conditions as represented at LF allow an elliptical VP to take an intrasentential antecedent. At this level of

4. The initial discussion of antecedent-contained deletion is to be found in Bouton 1970. Williams (1977:fn. 4) notices the problem posed by this construction, but offers no analysis. In May 1985 the issue raised by antecedent-contained deletion is posed in a different light as a "reconstructive regress." The idea is based on the assumption that an elided VP is of the form [_{VP} *e*] and that reconstruction of this VP necessarily includes a copy of the ellipsis site within it. This in turn also needs to be reconstructed, but again contains an ellipsis site; and this process would continue ad infinitum. Given the current context, this manner of describing the problem raised by antecedent-contained deletion is no longer appropriate. Baltin (1987) argues against an analysis of the sort outlined in the text, proposing that antecedent-contained deletion is an instance of vacuous extraposition of the relative clause. Larson and May (1990) enumerate problems with Baltin's account. (See also Diesing 1992.) Among them are the inability to account for non-right-peripheral antecedent containment, for the interactions of the scopes of quantification and reconstruction, and for limitations on complementizer choice. These authors also point out that the structures Baltin gives do not in fact do away with the regressive nature of antecedent-contained structures. For detailed discussion of these matters, see Larson and May 1990, as well as the text below.

analysis the properties of antecedent-contained deletion, qua ellipsis, will be fundamentally the same as those of the “standard” sorts of non-antecedent-contained ellipsis we have considered thus far. For instance, they exhibit the ambiguity of strict and sloppy identity for pronouns, as shown in (7), in which Max can be introduced either to Oscar’s mother (strict) or to his own (sloppy):

(7) Oscar introduced his mother to everyone that Max did

This is because both of the representations in (8) are well formed:

- (8) a. everyone that Max₂ [_{VP} introduced his₁^a mother to *t*] [Oscar₁ [_{VP} introduced his₁^a mother to *t*]]
 b. everyone that Max₂ [_{VP} introduced his₂^b mother to *t*] [Oscar₁ [_{VP} introduced his₁^b mother to *t*]]

In this regard, (7) is the same as *Oscar introduced his mother to Sally, and Max did, too*. Various complexities can be added to these examples, and in this way the eliminative puzzles of ellipsis can be recreated in antecedent-contained contexts. So, to take one example, the many-pronouns puzzle reasserts itself in *Oscar said he introduced his mother to everyone that Max did*.

Our thesis, then, is that there can be proper reconstruction in antecedent-contained deletion because of syntactic structure that is represented at the level of LF, and only at this level. This structure arises through the agency of QR. That is, the derivation of antecedent-contained deletion constructions gives a representation of the logical aspects of quantification, namely, scope and binding, and in doing so gives rise to structure that meets the requisite identity conditions licensing ellipsis. The necessity of representation at LF will hold whenever the ellipsis is superficially contained within its own antecedent, although the position of the ellipsis within the antecedent may vary. Thus, whereas in (1) the ellipsis is contained within a verbal argument and right-peripheral, it may be within a verbal adjunct, as shown in (9), or internal and non-right-peripheral, as shown in (10a–g), pointed out by Larson and May (1990):⁵

5. Although we will limit our attention to antecedent-contained deletion with relative clauses, it is also found with adverbials (*Max succeeded more frequently than Oscar did*) and with comparative clauses, either nominal (*Max ate more caviar than Oscar did*) or adjectival (*Dulles is more suspicious than Angleton is*), as discussed by Larson (1987). Larson observes that in the latter case, after movement of the comparative clause, there is reconstruction of the AP, as opposed to the VP

(9) Max doesn’t love Sally the way that Oscar does

- (10) a. I gave everyone that you did two dollars
 b. Tommy put everything he could in his mouth
 c. Dulles believed everybody that Hoover did to be a spy
 d. Max considers everyone that you do smart
 e. Alice painted every barn that you did red
 f. I persuaded everyone you did to be polite
 g. Sally told everyone you did that Fermat’s last theorem had been proven

(10) displays a variety of constructions that admit internal antecedent-contained deletion; in each case the elided VP is construed with the matrix VP as the antecedent. So, for example, (10d) can be paraphrased as *everyone that you consider smart, Max considers smart as well*. This reading is represented roughly as follows:

- (11) everyone that you [_{VP} consider *e*₁^a smart]₁ [Max [_{VP} considers *e*₁^a smart]]

Such structures for antecedent-contained deletion are possible, therefore, just *because* the grammar encompasses this way of representing the logical structure of quantification. This observation is quite general, so that this construction is possible with relative clauses in which the head is modified by all sorts of determiners:

in other cases. In this comparative ellipsis construction, the auxiliary verb is optional prior to the site of the ellipsis, so that *Dulles is more suspicious than Angleton is* is an option. Larson (1987) argues that this is also a case of antecedent containment, but containment of an I’ constituent—that is, of [_{I’} *is t*]. That ellipsis is involved here can be garnered from observations by Sells, Zaenen, and Zec (1986), who note that *John defended his mother better than Peter* shows a strict/sloppy ambiguity, just like *John defended his mother better than Peter did*. The treatment proceeds as described for (7). Sells, Zaenen, and Zec also observe that this sentence has a third reading, where it means that John defended his mother better than his mother defended Peter. This reading arises, we believe, not from ellipsis, but from taking the phrase *than Peter* as a PP, as suggested initially by Hankamer (1973). It is no surprise that this sort of reading is absent when the auxiliary verb is present: *John defended his mother better than Peter did* has only the strict/sloppy ambiguity. Larson (1987) argues for other extensions of the antecedent-contained paradigm, including applications to missing subcategorized prepositions, as in *I’ve lived in every city that Max has lived*, proposing that these are cases of antecedent-contained PP-ellipsis, so that after LF movement of the quantified phrase, the PP *in e* can be reconstructed.

- (12) a. Dulles suspected some spy that Angleton did
 b. Dulles suspected the spy that Angleton did
 c. Dulles suspected many spies that Angleton did
 d. Dulles suspected five spies that Angleton did
 e. Which spy-master suspected which spy that Angleton did

Notice, given the dependence of antecedent-contained deletion on the logical form of quantification, that the construction can be taken as a diagnostic for quantification. As such, it can shed light on certain well-known controversies. Consider, for example, the nature of definite descriptions. Here the evidence decides for the Russellian view, given the grammaticality of (12b). The hallmark of the Russellian analysis is that definite descriptions are quantificational. And (12b) shows that definite descriptions have a property in common with other overtly quantificational expressions: they permit antecedent-contained deletion.⁶

One constraint on antecedent-contained deletion has been proposed by Carlson (1977:527–29), who argues that such ellipsis is found only with what he calls “amount relatives.” (13) is an example:⁷

6. Diesing (1992) observes that although determiners such as *many* and numerals are ambiguous between weak and strong interpretations, when they appear in antecedent containment contexts they can only be understood as strong. (Diesing, following Carlson (1977), holds that examples like (12c) and (12d) are ungrammatical; we disagree with these judgments.) Diesing argues that the reason for this is that because of the reconstruction problem, antecedent-contained deletion requires LF movement, which, she maintains, is limited to strong determiners. She then employs this construction as a diagnostic for occurrence of strong determiners. However, the undeleted counterparts are also unambiguously strong: *Dulles suspected many spies that Angleton suspected* is construed in just the same way as (12c), with *many* read as strong. Thus, that such determiners are strong is a function of their appearance in relative clauses, quite independently of whether the clause contains an ellipsis. Diesing's thesis is that weak determiners are interpreted as cardinality predicates, occurring in contexts subject to existential closure; in her terms, they occur within the “nuclear scope” and do not take restrictive clauses (cf. Heim 1982). In contrast, true (strong) quantifiers occur with both a nuclear scope and a restrictive clause. We conjecture that with restrictive relatives, the relative clause must form part of this restrictive clause. This will force the determiner of the head noun to be strong, but it will do so regardless of whether the relative clause is lexically fully specified or not. Thus, it seems to us that the effects Diesing observes stem from semantic properties of relative clauses, and not from antecedent-contained deletion.

7. Carlson argues that antecedent-contained deletion is incompatible with certain characteristics of restrictive relatives, such as *wh*-complementizers (as discussed

- (13) Max ate all that he could eat

Typically, amount relatives are understood comparably to a paired comparative clause, so that (13) is taken in the manner of *Max ate as much as he could eat*. According to Carlson, the amount reading is to be contrasted with the restrictive or individual reading standardly found in relative clauses. (14) is an example that is ambiguous between these construals:

- (14) Max ate everything that he could eat

(14) can mean what (13) means, that Max ate to satiation. This is the amount reading. On the other hand, suppose that Max keeps kosher. Then the truth of (14) is compatible with Max's remaining quite hungry, even though he partook of all of the allowable foods. This is the restrictive reading. Now, Carlson claims that antecedent-contained deletion is possible only with amount relatives and is not found with restrictive relatives; thus, as a counterpart to (13) we have *Max ate all that he could*. But we also have (15), as a counterpart to (14):

- (15) Max ate everything that he could

However, (15) is ambiguous in precisely the same way as (14), between amount and restrictive readings, counter to Carlson's thesis.

Antecedent-contained deletion remains possible when we juggle the examples so as to eliminate the amount reading altogether. The hallmark of amount relatives is that they are subject to a maximality condition—the amount involved must be, in some sense, the totality of the universe. Thus, the amount reading is possible with universal expressions like *all* and *everything* (and their *wh* counterparts, *what* and *whatever*), but examples like *Max ate those things that he could eat* and *Max ate many things that he could eat* are unambiguously understood with the restrictive reading. The amount reading is also excluded in the following sentences:

- (16) a. Max ate everything that Oscar could eat
 b. Max ate everything that he couldn't eat
 c. Max ate everything that he should eat

above) and head occurrences of determiners such as *many* or *three*, which are also incompatible with amount relatives. From this, Carlson concludes that antecedent-contained deletion is only possible with amount relatives, and not with restrictive relatives, although, as he says, this is “for reasons unknown at this time” (p. 528). Although we agree with Carlson regarding amount relatives, we are doubtful about his factual claims regarding antecedent-contained deletion. See discussion in the text.

In these examples no amount is specified; thus, (16a) can only mean that Max partook of those things allowed to Oscar, even though an amount reading, that expressed by *Max ate as much as Oscar could eat*, is a perfectly sensible meaning. The amount reading is therefore anaphora dependent. It is also affirmation/negation dependent: (16b) can only mean that Max ate things normally prohibited to him. In (16c) a modal with only a root meaning has been substituted for *could*, which can also have an epistemic reading; it means that Max ate those things he ought, amount again unspecified. Now observe that the examples above have antecedent-contained deletion counterparts:

- (17) a. Max ate those things that he could
 b. Max ate everything that Oscar could
 c. Max ate everything that he couldn't
 d. Max ate everything that he should

These are all well formed and unambiguously understood with restrictive readings. Thus, although we agree with Carlson that fully lexical relative clauses can be ambiguous in the way described, we do not agree with him that antecedent-contained deletion is limited to amount relatives. The fact appears to be that antecedent-contained deletion is possible in all of the following conditions: with unambiguous restrictive relatives (*Dulles suspected everyone that Angleton did*), with unambiguous amount relatives (*Max ate all that he could*), and with relatives that are ambiguous between the two (*Max ate everything that he could*).⁸

In the LF representation of antecedent-contained deletion structures, the structure corresponding to the ellipsis includes a trace that is bound by

8. It is Carlson's (1977) view that amount relatives and restrictive relatives are two distinct *types* of relative clauses, and that antecedent-contained deletion is diagnostic for the two types. On our view, "amount" and "restrictive" are descriptions of different *readings* of relative clauses, amount readings being possible subject to the constraints described above. Among the conditioning factors for amount readings is that *everything* (and its kin) is lexically ambiguous between two types of quantificational meanings. In addition to its standard meaning, it can also mean something like "the entire amount," comparable to the otherwise available meaning displayed by the comparative (13). (That is, *every* is lexically ambiguous between two quantifiers, and not between a quantifier and some sort of "group" reading, presumably interpreted in place. See Williams 1988 and May 1988 for some discussion.) The ambiguity of (14)/(15) thus merely reflects the lexical ambiguity found in even the simplest type of sentence: *John ate everything* is compatible either with John's having consumed the entirety of the food, or with his just having tasted it all.

the relative operator. This trace is licensed by being an occurrence of the trace in the antecedent VP, the trace that arises through the agency of QR. There are certain contexts, however, in which the ellipsis-contained trace is not properly reconstructed. Consider the ill-formedness of (18), due to May (1985):

- (18) *Dulles suspected everyone who knew Philby, who Angleton didn't

We cannot take the ellipsis in (18) as being resolved with respect to the VP headed by *suspect* (although it can be understood with ellipsis of the VP headed by *know*). However, the reading that is absent from (18) is present in (19):

- (19) Dulles suspected everyone who knew Philby, but Angleton didn't

(20) is the logical form we associate with (18):

- (20) *[everyone who₁ [_{*e*}₁ knew Philby₂, who₂ Angleton didn't **suspect** *e*₁]]₁
 [Dulles suspected *e*₁]

The problem here is that the index of the reconstructed trace is not that of *who* in the nonrestrictive relative, but rather that of the entire containing relative clause, which has undergone QR. These cannot be of the same value, since otherwise Principle C would be violated: the trace of *who* of the restrictive c-commands the NP *Philby*, with which it would be coindexed. The nonrestrictive *wh*-phrase is therefore vacuous, since it binds no trace/variable, accounting for the ungrammaticality of (18).⁹

Let us refer to the sort of case we have been considering thus far as *vacuous* antecedent-contained deletion. The reason for doing so is that relative to surface structures of sentences such as *Dulles suspected everyone that Angleton did*, there is no apparent trace bound by the relative operator, since it occurs within the elided material. At LF, however, there is a trace bound by the relative operator, one whose presence is licensed by reconstruction with respect to the trace resulting from QR. This can be seen by inspecting (3), repeated here:

- (3) [_{NP} everyone [_{CP} *O*₁ that [_{IP} Angleton [_{VP} **suspected** *e*₁^α]]]]₁ [_{IP} Dulles
 [_{VP} suspected *e*₁^α]]

9. Note that such an account would be necessary even if one were to assume an alphabetic variance principle along the lines proposed by Sag (1976) and Williams (1977). This is because the two predicates that would be involved, $\lambda y(y \text{ suspected } x)$ and $\lambda z(z \text{ suspected } x)$ are alphabetic variants, since each occurrence of *x* would be bound by the same operator—the universal quantifier—from outside its λ -expression.

Vacuous antecedent-contained deletion is to be contrasted with nonvacuous antecedent-contained deletion, an example of which is found in (21):

(21) Max talked to everyone who wanted him to

In this sentence the *wh*-phrase binds a trace in the overt material—the subject position of *want*—and as a result QR and reconstruction are not called upon to establish proper variable binding for the relative operator. Therefore, the structure of (21) is as follows:¹⁰

(22) everyone [_{who}₁ [_e₁ wanted him to [_{VP} talk to _e₁]]]₁ [Max [_{VP} talked to _e₁]]

Thus, vacuous and nonvacuous antecedent-contained deletion differ in that only in the former is the availability of a trace bound by the relative operator dependent on reconstruction.¹¹

10. Observe that (22) appears to display an improper movement configuration, since the reconstructed trace is c-commanded by the overt *wh*-trace. That is, at LF it is comparable to **Who wanted him to talk to*. We return to this matter in section 6.5, where we argue that (22) is akin not to this sentence, but to *Who wanted him to talk to them*.

11. Vacuous and nonvacuous antecedent-contained deletion also differ with respect to complementizer selection. Carlson (1977) initially observed that many speakers find a contrast between the examples in (i):

(i) a. Dulles suspected everyone that/∅ Angleton did

b. *?Dulles suspected everyone who Angleton did

(ib) is taken to contrast with *Dulles suspected everyone who Angleton suspected*. With nonvacuous cases, on the other hand, the *wh*-alternative becomes perfectly acceptable and is perhaps slightly preferred to the *that*-form:

(ii) a. ?Dulles talked to everyone that wanted him to

b. Dulles talked to everyone who wanted him to

(Of course, the null option is unavailable here, with short-subject relativization.) Presumably, the difference between (i) and (ii) arises because *wh*-phrases must bind traces that are overtly identifiable as *wh*-traces; this obtains in (iib), but not in (ib). Lacking *wh*-content, lexically empty operators and *that* are not so restricted and may occur in either type of antecedent-contained deletion. Carlson additionally observes that *wh* is incompatible with amount relative readings: *?*Max ate all which he could eat* versus *Max ate all that/∅ he could eat*. This contrast follows if we assume that although *wh* is limited to ranging over individuals, *that/∅* are semantically neutral and may occur with amount or restrictive relatives. The complementizer restriction carries over to antecedent-contained deletion with amount relatives:

Given that vacuous and nonvacuous antecedent-contained deletion differ in the levels at which a trace is available, it follows that if no trace can become available at LF in the reconstruction, then examples of the former type should be ungrammatical, but not those of the latter type. This is borne out by the contrast in (23):¹²

(23) a. *Max talked to everyone that Bill did it

b. Max talked to everyone who wanted him to do it

Instead of ellipsis, these sentences exhibit the VP-anaphor *do it*. The ungrammaticality of (23a) as compared to its counterpart with ellipsis falls under a generalization that *do it* is not possible where the corresponding VP would contain a trace; thus, we also find a contrast between (24a) and (24b), which are not antecedent-contained deletion structures:

(24) a. I know which book Mary read, and which book Bill didn't

b. *I know which book Mary read, and which book Bill didn't do it

Compare (24b) to *I know that Mary would read Portrait of a Lady, but that Bill wouldn't do it*. (23b), on the other hand, is well formed (if a bit stilted), just like (21) with ellipsis. Now suppose that *do it* lexically exhausts the VP, as opposed to ellipsis, in which there is lexically null structure. (We can see from *Bill didn't do it* that *do* is main verb *do*, with *it* presumably the object.) It then follows that (23a) and (24b) contain an operator that does not bind a trace, and hence these examples are ungrammatical. (23b), which is nonvacuous, is grammatical, since the *wh*-phrase otherwise binds a variable. The moral of this is that ellipsis cannot be just a type of anaphora, picking out some VP (or VP meaning) as a referent. That is, we cannot take it as the covert form of the overt anaphora in (23); for if we did, then (23a) ought to be just like *Max talked to everyone that Bill did*. Instead, ellipsis requires structural representation of members of a

(iii) a. Max ate all that/∅ he could

b. *Max ate all which he could

Note that the deviance of (iiiib) is exacerbated relative to its nonelided counterpart. This is because (iiiib) is both an amount relative and a vacuous antecedent containment structure. Speakers who find examples such as (ib) marginal find it, as we would expect, considerably better than (iiiib).

12. Carlson (1977:fn. 6) and Haik (1987) observe that examples like (23a) are ill formed; their cases use *do so* rather than *do it* anaphora. They do not observe the contrast with (23b), however, which is also acceptable with *do so*: *Max talked to everyone who wanted him to do so*.

reconstruction; what the contrast in (23) shows is that the full realization of such representations is to be had at LF.¹³

Haik (1985, 1987) points out another way in which nonvacuous antecedent-contained deletion appears to differ from vacuous antecedent containment. She observes that for (21), a reading on which the pronoun *him* is coreferential with the subject NP *Max* is strongly preferred. On our approach, this would follow if in this context the pronoun bears a β -occurrence; that it does is confirmed by observing that a sloppy reading is dominant for (25):

(25) Max talked to everyone who wanted him to, and Oscar did, too

If *him* bears a β -occurrence, then it must be in a dependency, hence coindexed. It cannot be coindexed with the trace of *who*, since this would violate Binding Theory (Principle B). The only other alternative is the

13. We should perhaps temper these comments somewhat by observing that certain properties of verb phrase ellipsis can also be observed with comparable examples involving *do it* and *do so*. Thus, *Max hit his friend, and Oscar did it, too* can have both strict and sloppy readings, presumably a consequence of Dependency Theory, and *Max* and *he* are just as much not-coreferential in *Oscar hit Max, and he did it, too* as in *Oscar hit Max, and he did, too*, presumably in both cases a consequence of Binding Theory. Although this parallelism of verb phrase ellipsis and verb phrase anaphora with respect to properties of indices might be taken as indicating the need for a more abstract relation between reconstruction and structural projection than we have envisaged so as to unify verb phrase anaphora and verb phrase ellipsis over these properties, any such development would have to countenance the difference between them shown by the cases in the text. One would also have to bear in mind that verb phrase ellipsis and verb phrase anaphora have different distributions, as do the different forms of verb phrase anaphora. For instance, although verb phrase ellipsis is possible with any verb whatsoever, with statives *do it* is not possible and *do so* only marginal. Thus, *Max knows French, and Oscar does, too* contrasts with the ungrammatical **Max knows French, and Oscar does it, too*, whereas *?Max knows French, and Oscar does so, too* has an intermediate status. Moreover, *do so*, unlike *do it*, can participate in movement paradigms. Thus, in addition to *Max read a book, and Oscar did so, too*, we find *Max read a book, and so did Oscar, too* and *Max read a book, and so Oscar did, too*. When placed in more complex structural contexts, the latter difference corresponds to a difference in the scope of reconstruction. Thus, compare *Max wants to read a book, and so did he* with *Max wants to read a book, so he did*. In the former sentence the understood VP is *wants to read a book*; in the latter, it is just *read a book*. (Also observe the change in the anaphoric possibilities of the pronoun in the two cases.) These brief remarks are meant to indicate the complexity of verb phrase anaphora phenomena. To do them full justice would take us far afield, so we leave these matters for another time.

matrix subject NP. In discussing these examples, Haik seeks to relate the bound anaphora effect to the possibility of ellipsis.¹⁴ However, the requirement on the indexical type of this pronoun does not appear to be related to the possibility of antecedent-contained deletion, either vacuous or not. Thus, consider the contrast in (26):

- (26) a. John talked to everyone who would have preferred that he had
b. John talked to everyone who would have preferred that he hadn't

Our intuition here is that (26a) is a case of not-coreference, as opposed to (26b), which is just like (21). This means that in (26a) the pronoun is an α -occurrence, so that it can be nonanaphoric, as opposed to the β -occurrence in (26b). Note that these examples are of the same structure,

14. Haik (1985) offers two accounts of (21). The first assumes that if a predication applies to an individual, then it must apply to that individual at all of its occurrences. Thus, (21) would have the logical form shown in (i):

- (i) everyone who [*t* wanted him₁ to talk to *t*][Max₁ talked to *t*]

Only if *him* denotes the same individual as *Max* can the appropriate parallelism of predication be established; if it applied to any other individual (that is, if the pronoun had some other index), then there would be no parallelism. This assumption is too strong, however. It would rule out vacuous antecedent-contained deletion cases such as *Dulles suspected everyone that Philby did*, since here the predication holds of distinct individuals at each occurrence of the predicate in logical form. The assumption behind Haik's second analysis is that bound elements, and in particular bound pronouns, move at LF, and in doing so pied-pipe their c-command domains. This gives (ii) as an LF representation, where the entire clause *him to talk to t* has been moved:

- (ii) everyone who [[him₁ to talk to *t*]₂ *t* wanted *e*₂][Max₁ talked to *t*]

After movement of the clause at LF, neither occurrence of *t* c-commands the other; in a sense, the reconstructed trace is now very much like a parasitic gap. If the pronoun were not bound, then there would be no clause movement, and then the subject trace would c-command the reconstructed trace. But as is well known, such configurations are illicit, comparable to the improper movement configuration found in **Who t wanted him to talk to t*. Although the mechanics of this analysis strike us as independently implausible, examples such as (iii), pointed out to us by B. Schein, cast further doubt on it:

- (iii) a. *An official who, after telling lies about *e*, *t* committed suicide ...
b. An official who, after telling lies about himself, *t* committed suicide ...

These examples show that insofar as a structure such as (ii) can be recreated overtly, the pattern of gaps it displays is not possible.

modulo the tensed complement clause, as (21). In particular, they are cases of nonvacuous antecedent-contained deletion. However, just the same contrast in anaphora is found in cases of vacuous antecedent-contained deletion:

- (27) a. John talked to everyone who Sally would have preferred that he had
 b. John talked to everyone who Sally would have preferred that he hadn't

The cause of the bound anaphora effect that Haik observes therefore seems to be a matter of context and plausibility of particular sentences, rather than of grammar per se. Thus, when such matters are favorable, α -occurrences are possible in the contexts Haik discusses. In (28) cross-sentential anaphora is allowed:

- (28) Mary didn't talk to anyone who wanted Bill₁ to leave, but Max talked to everyone who wanted him₁ to

Although the pronoun (pronounced with downstress) may assuredly corefer with *Max* here, it may also refer to *Bill*. Moreover, examples such as (29), brought to our attention by T. Reinhart, show that vacuous antecedent-contained deletion does not require any anaphoric connection at all:

- (29) a. The secretary of state wrote to everyone who would have rather the president did
 b. The president of the company personally fired everyone who didn't want the personnel manager to

A pronoun is also not needed in the following sentences, although again these are nonvacuous:

- (30) a. John fired everyone who should have been
 b. John fired everyone who said Max should have been

That ellipsis, and the matter of vacuity, should not be relevant here is not too surprising. Where it does make a difference is always with respect to reconstruction—whether the reconstructed material includes a trace to bind or not. But what is involved here is independent of matters of reconstruction; in cases of anaphora, the issues revolve just around matters of anaphora resolution.¹⁵

15. The sorts of cases considered in this section pose serious problems for a view of antecedent-contained deletion proposed by Cormack (1984) and echoed by

Summarizing to this point, in this section we have established the basic analysis of antecedent-contained deletion. The significance of this construction is that it shows that a full characterization of reconstruction in a discourse must include representation at LF. This is not a stipulation for this construction; rather, the nature of its structure and independent considerations of logical form lead to this conclusion. We have isolated some elementary properties of antecedent-contained deletion, distinguishing right-peripheral and non-right-peripheral, vacuous and nonvacuous ellipsis, since they will be significant in our discussion of reconstruction and logical form to follow.

Jacobson (1991). These authors wish to eschew empty categories in the grammar, and hence movement, including LF movement. This leads them to the view that what is elided in antecedent-contained deletion is just a transitive verb. The proposed account is placed in the context of categorial grammar. A few details. In categorial grammars, the construction of relative clauses such as *that Angleton suspects* proceeds by taking the subject NP to be of a categorial type that can compose only with a transitive verb, in turn giving a constituent that can be an argument of the relative pronoun (or perhaps the head of the relative) to form the relative clause. This will give the bracketing in (i):

- (i) (Dulles (suspected (everyone (that (Angleton (suspected))))))

With ellipsis, the construction is no different. Thus, what is reconstructed is just the transitive verb, since there is no object position, and not the verb phrase, as in verb phrase ellipsis, or as we have it, in antecedent-contained deletion. Although the treatment just analyzed might seem plausible for vacuous antecedent-contained deletion, it is less appealing for nonvacuous antecedent-contained deletion. Thus, *John talked to everyone who wanted him to* cannot involve just the reconstruction of a transitive verb. (This is observed by Cormack (1984).) The problem is that what is needed here is a full VP-meaning, and not just a transitive verb meaning. This is because the argument for the relative clause is already supplied by the subject slot of *want*, so no further argument can be supplied by another transitive verb. Hence, the reconstruction must be of an "intransitive" verb, that is, of a verb phrase. Difficulties are also posed by *John fired everyone who should have been*, if active and passive verbs differ in type; and it is unclear how the proposal would rule out **John believed that Max did that Harry is heroic*. Appeal to some analogue of an anti-c-command condition would not appear to be possible for the latter case, since that would undermine the analysis as originally proposed for antecedent-contained deletion. Note that these criticisms are over and above those that arise from the eliminative puzzles discussed in chapter 4 (both Cormack and Jacobson assume predication-based theories of ellipsis), from problems with accounting for the anaphora effects in ellipsis discussed in the subsequent sections of this chapter, and from strong reservations we have regarding categorial frameworks in general.

6.2 Scope of Quantification and Scope of Reconstruction

Given the dependence of reconstruction on quantification and LF movement, our analysis predicts that there should be an interaction between the scope of quantification and the “scope” of reconstruction. The greater the “distance” of LF movement and hence the broader the scope, the greater the number of VPs that can serve as the antecedent for the elided VP. This is because as QR effects movement farther up a complex structure with multiple VPs, when these VPs are “crossed” the elided phrase is no longer antecedent-contained, and further possibilities of antecedence arise. We thus expect to find a correlation between scope and reconstruction.

Observations by Larson and May (1990) show that the predicted interaction does occur. Consider (31), which exhibits sentence-internal antecedent-contained deletion:

- (31) Dulles believed everyone that Hoover did to be a spy

Here, the elided VP is understood as having the matrix VP, headed by *believe*, as its antecedent. For this to be so, the relative NP must have scope over the entire sentence; that is, it must have broad scope. That broad scope is possible from this position was established by May (1985) on the basis of the following case:

- (32) Dulles believed nobody to be a spy before Angleton did

This sentence is ambiguous, between a narrow scope reading (Dulles came to have a belief in a particular proposition, that nobody is a spy, prior to Angleton’s coming to have that belief) and a broad scope reading (there is nobody of whom Dulles formed a belief in his spyhood prior to Angleton’s coming to have that belief; that is, Angleton’s beliefs are all prior to Dulles’s). It is possible to clearly distinguish the readings in this context because they differ with respect to who had the beliefs first: on the narrow reading it is Dulles, on the broad reading it is Angleton. In (31) the NP containing the ellipsis site can only have broad scope (because only then is reconstruction possible), so the sentence can only have a broad reading. This is made clear by (33):

- (33) Dulles believed nobody that Hoover did to be a spy before Angleton did

This sentence only has the construal that involves temporal switching of beliefs, comparable to the broad scope reading of (32).

In (31) through (33), the quantified relative NP occurs in an exceptional Case-marking environment, as the infinitival complement subject of

believe. May (1985) points out that intuitions markedly differ when the complement clause is changed from infinitive to finite:

- (34) Dulles believed nobody is a spy before Angleton did

Here, the temporal switching indicative of the broad reading is absent; the most natural reading of (34) is narrow, on which Dulles’s belief is prior to Angleton’s. Thus, there is some constraint on quantification, perhaps related to the ECP and other general constraints on movement, that limits the scope of the quantified NP to the embedded clause in the finite context (May 1985, Aoun 1985, Hornstein and Weinberg 1990). That is, QR is admissible only within the complement clause. If this is so, then it predicts that antecedent-contained deletion should be impossible in this context, since for there to be a well-formed reconstruction, movement must be to the upper clause at LF. This prediction is confirmed:

- (35) *Dulles believed everyone that Hoover did is a spy

It is clear that the distribution of antecedent-contained deletion is tied to that of quantifier scope, that is, to the syntax of LF movement.

Further evidence of the scope/reconstruction interaction arises from considering antecedent-contained deletion in contexts such as that illustrated by (36), which also displays a well-known ambiguity between narrow and broad construals:

- (36) John wants to visit every city in Italy

The two readings here correspond to the possible scopes the quantified phrase may take relative to the verb *want*, where attachment to the embedded clause gives the former, narrow reading, attachment to the higher clause the latter, broad reading. Relative to this distinction, Larson and May (1990), developing observations by Sag (1976), contrast the sentences in (37), where the first is a case of antecedent-contained deletion:

- (37) a. John wants to visit every city you do
b. John wants to visit every city you visit
c. John wants to visit every city you want to visit

They observe that (37a) is ambiguous between the interpretations displayed by (37b) and (37c). On the narrow reading, comparable to (37b), the elided VP is understood to be the embedded VP, the one headed by *visit*, as it must be, since if the NP *every city that you do* is attached to the complement clause, it is still contained within the matrix VP. On the broad scope reading, corresponding to (37c), the elided VP is understood as the

matrix VP, the one headed by *want*. Here movement is to the matrix clause, with reconstruction of the matrix VP.¹⁶

Larson and May make a further observation regarding (37a). They point out that this sentence displays a sort of intermediate reading, one on which the quantifier is read with broad scope, but it is the embedded VP that is reconstructed. So although the quantifier has broad scope, reconstruction, so to speak, has narrow scope. In contrast, under the broad scope reading described in the previous paragraph, the scope of reconstruction is broad as well. Thus, QR can be to the embedded clause, in which case the embedded VP must be reconstructed, or QR can be to the higher clause, in which case either the lower or the upper VP can be reconstructed. The possibility of the mixed scope case can be made clearer by utilizing contexts that force a broad reading of the quantifier, to the exclusion of the narrow. The presence of *certain* gives the desired result, as Larson and May point out:

- (38) a. John wants to visit a certain city that you do
b. John wants to visit a certain city that you did

16. Jacobson (1991) also remarks on these cases, observing the ambiguity of *His father said he read every book that his teacher did*. Her proposal is that the composition of *said he read* is of the same category as *read* and hence a possible antecedent for the ellipsis. She notes a contrast between this example and (i), in that the latter disfavors a reading on which the ellipsis is understood as ... *said Mary put on the shelf*:

- (i) John said Mary put every book that Bill also did on the shelf

She poses this as a difficulty for our sort of approach, which should treat this example as it does others, allowing broad or narrow reconstruction (leaving aside here the correlation with quantifier scope). Jacobson's account is based on the idea that *said Mary put on the shelf* cannot be composed in a manner that makes it available as an elliptical antecedent, since it would not be of a category that allows the NP containing the ellipsis to be "wrapped" in as a constituent. This is because of conflicting requirements of *say* as the head of the constituent, and the syntactic position of the wrapped NP. We think that the judgments on this sort of sentence are less secure than Jacobson's analysis would suggest. Consider (ii), in which it seems possible to understand the longer ellipsis:

- (ii) John claims that Mary introduced everyone that Bill does to Max
Also, (iii) seems to us to easily permit the broad reconstruction, and it is identical in the relevant respects to (i):
(iii) John requires that Mary put every book that Bill does on the shelf
We feel that no very strong theoretical conclusions can be drawn from these data.

Varying just the tense of the final auxiliary element skews these sentences so as to illustrate clearly the desired distinction: in (38a) the elided VP is most naturally (although not exclusively) construed as that headed by *want*; in (38b), as that headed by *visit*. That is, the higher and lower VPs, respectively, are reconstructions, so that (38a–b) are understood in a manner parallel to (39a–b):

- (39) a. John wants to visit a certain city that you want to visit
b. John wants to visit a certain city that you visited

These facts are recapitulated in other contexts requiring broad scope of embedded elements. Larson and May point to multiple *wh* constructions:

- (40) a. Which student wants to visit which city that you do
b. Which student wants to visit which city that you did

Following the standard assumptions about this construction, the embedded "*wh*-in-situ" moves to the matrix (specifier-of-) Comp position in LF and hence must have broad scope, a movement that allows for the possibility of antecedent-contained deletion. But although the LF position of the phrase containing the elided VP is constant over both examples, they differ in interpretation in the same way as the sentences in (38). (40a), with present tense *do*, reconstructs the higher VP; (40b), with past tense *did*, reconstructs the lower VP.

In the above examples we have taken advantage of properties of the verb *visit* as it occurs in infinitival contexts to show our point clearly. Present tense *visit*, as in *John visits Mary*, has a repetitive or habitual sense; in the past tense, as in *John visited Mary*, it is punctual. In the particular sentences above the infinitival *visit* has the latter reading, so that use of a past tense trailing auxiliary will be most natural with reconstruction of the embedded VP ((38b)/(40b)), whereas use of a present tense auxiliary will accompany reconstruction of the matrix VP ((38a)/(40a)). Although a full account of these skewing effects is quite complex, our manipulation of them above allows us to illustrate a more basic point, namely, that it is *structurally possible* to reconstruct any verb phrase that resides within the scope of the phrase containing the elision site at LF, a point Larson and May stress.¹⁷ Thus, any verb phrase that LF movement passes in a

17. A number of factors influence the skewing effect. For instance, the skewing can be altered by adjusting the examples so that the infinitival *visit* is understood most naturally with the repetitive "present" sense. Compare (38a) with (i):

(i) John wants to visit every woman that you do

derivation becomes a possible antecedent for reconstruction. The correlation of broad scopes for quantification and reconstruction also manifests

In contrast to *visit*, the verb *want* shows no comparable variation in meaning depending upon tense, so that the same skewing effect emerges when the tense of the matrix verb is changed to past:

- (ii) a. ?John wanted to visit a certain city that you do
- b. John wanted to visit a certain city that you did

Whereas (iia) has the same favored broad reconstruction as (38a)/(40a), (iib) shares the favored narrow reconstruction of (38b)/(40b), although, as above, the other reconstructions are available, though more marginally. However, we do find (iia) somewhat less acceptable, as indicated. This we believe is because, although reconstruction is insensitive to inflectional markings such as number, gender, and presumably tense, so that there is no bar to reconstruction in (iia), the superficial mismatch in tense does give this sentence an air of markedness. It is clear that this markedness is a feature of reconstruction, since (iii) shows no comparable degradation of acceptability:

- (iii) John wanted to visit a certain city that you want to visit

If what were involved here were some general notion of sequence of tense, we would expect these cases to be comparably marginal. Shifting attention to cases in which the embedded clause is finite expands the class of possible cases, but skewing effects can still be observed:

- (iv) a. John believes Max visited a certain city that you do
- b. John believes Max visited a certain city that you did
- (v) a. John believed Max visits a certain city that you do
- b. John believed Max visits a certain city that you did
- (vi) a. John believes Max visits a certain city that you do
- b. John believed Max visited a certain city that you did
- (vii) a. John believes Max visits a certain city that you did
- b. John believed Max visited a certain city that you do

Although judgments are subtle, our understanding of the most natural construals is as follows. (iva) and (ivb) contrast in that the former shows reconstruction of the matrix VP, the latter of the embedded VP; that is, these cases are comparable to the infinitival cases in (38). In (v), where the tenses of the matrix and embedded verbs have been flipped, their natural construals are flipped as well: (va) skews toward an embedded VP reconstruction, (vb) toward a matrix reconstruction. In (vi) the trailing auxiliary is compatible with the tense of either verb, so that the skewing effect is the same relative to either verb. These cases seem to us fully ambiguous. On the other hand, in (vii), where the auxiliary is compatible with the tense of neither verb, there can be no skewing effect at all, and in this case there appears to be a preference for an embedded reconstruction, with appropriate adjustment of the meaning of *visit*. We are indebted to J. Huang for discussion of these points.

itself in cases of infinitivals with lexical subjects and finite complements:¹⁸

- (41) a. Betsy's father wants her to read everything her boss does
- b. His father said he read every book that his teacher did
- c. Mary thinks that Jane wrote more books than Barbara does
- d. Bertie thought the yacht was longer than I did

To conclude, then, there is a correlation between scope of quantification and scope of reconstruction. This correlation applies to the absolute scope of quantifiers, and not to their relative scope. Thus, (42) is well formed with the appropriate understanding of the elided VP regardless of the relative scopes of the quantifiers:¹⁹

18. Example (41a) is from Sag 1976; (41b) from Jacobson 1991. (41c) is to be contrasted with another sort of ellipsis found productively in comparative clauses but not elsewhere—namely, pseudogapping, which elides just a verb, as in *Jane writes more books than Barbara does articles*. Although there is much to learn about pseudogapping and its relation to gapping and verb phrase ellipsis, one apparent distinguishing characteristic is that it shows a locality effect in contexts in which antecedent-contained deletion does not. Thus, (ia), in which the elided verb is understood as *write*, contrasts with (ib), in which the elided material would be *thought that Jane writes*, which is not a verb:

- (i) a. Mary thought that Jane writes more books than Barbara does articles
- b. *Mary thought that Jane writes more books than Barbara did articles

Lappin and McCord (1990) claim that a proper account should treat pseudogapping and antecedent-contained deletion as the same, and fault an account of the sort presented here for not doing so. But given the difference between (i) and (41c), it is by no means clear that these constructions should not be distinguished.

19. Lappin (1991) claims that (i) is unambiguous, having only a construal on which Mary has a rate of success that is less than that of some other particular person:

- (i) Someone succeeded more frequently than Mary did

According to Lappin, this example lacks a “nonspecific” reading: for any given event, it is more frequent that Mary fails, and that some other person, who may be different for each event, succeeds. But, the argument runs, if the adverbial (which is presumably within the VP) moves at LF, the latter reading should be allowed. The force of this argument is unclear, however. First, there are sentences that, if anything, appear to favor the nonspecific interpretation that Lappin claims ought to be impossible:

- (ii) In this game, someone else (usually) succeeds more frequently than Mary does

(42) Someone suspected everyone that Angleton did

All that matters in the analysis of (42) is that the quantified expression superficially in the VP occurs outside this phrase at some level of representation. By hypothesis, that level is LF; it is at this level that reconstruction is fully expressed.

6.3 The Uniformity Thesis and Grammatical Constraints

In contemporary syntax, it is taken that there is an intimate relationship among lexical projection, the licensing of categorial structure, the transformational extension of this structure, and the application of grammatical constraints. The notion that ties these aspects of syntax together is that of level of linguistic representation, characterized most generally through the specification of a vocabulary of primitives and a set of well-formedness conditions governing concatenations over that vocabulary. For basic syntactic structure, the class of categorial concatenates is determined through lexical projection, respecting the selectional properties determined by lexical entries. This structure is then transformed into an extended class of levels of representation, the derivation of which gives rise to structures containing, among their other elements, various empty categories. Syntactic well-formedness conditions applicable to these derived levels, in particular those governing bounding and binding, are, at least in part, sensitive to the distribution of these empty categories.

There are syntactic structures, however, that contain phonetically unrealized elements whose genesis is not derivational in the sense just described. Such is the case with ellipsis. Underlying our view of elliptical structure is that in order for it to count as *projected* structure, it must be reconstructed, that is, satisfy structural identity conditions. In this regard, elliptical structure differs from those structures for which projection is lexically licensed. A question arises at this point. If elliptical and non-elliptical structure differ in the way they are projected, are grammatical constraints applicable to the former also applicable to the latter? Our answer will be yes. Note that this means that once projected grammatically, these two types of structure are indistinguishable, so that re-

Second, insofar as the observations regarding the particular example (i) are valid, they do not pertain to antecedent-contained deletion, since (iii) does not differ in interpretation:

(iii) Someone succeeded more frequently than Mary succeeded

For further discussion, see May 1991.

constructed structure will be the same as “constructed” structure. This identification amounts to a *uniformity thesis*, a thesis we have assumed throughout our investigations.

The significance of antecedent-contained deletion with respect to the uniformity thesis is that it allows us to explore a special version of the thesis: At what levels of representation are elliptical and nonelliptical structure fully projected, so that the full generality of the applicability of grammatical constraints can be determined? The specifics of our discussion will pertain to conditions of two sorts: those of bounding and government usually thought to constrain syntactic movement, which we address in this section, and those of binding and anaphora, stemming from Binding Theory, to which we turn in the next. When we ask at what level these constraints apply, we have a range of answers open to us, from “at one particular level” to “at all levels” (or even, we imagine, “at no level,” for instance, if they in some sense apply in the lexicon). Moreover, the answer could conceivably vary from level to level: certain constraints or parts of constraints could apply at one level and not at others. In fact, we will answer that the special version of the uniformity thesis holds of LF. It is at this level that overt syntactic structure is sufficiently articulated to support the identity conditions required for a full characterization of reconstruction. In this regard, ellipsis provides a probe into the nature of logical form, as well as affording a very restricted conception of reconstruction as parasitic on structure otherwise lexically licensed.

Our starting point is Haik’s (1987) observation that examples such as (43a) are ungrammatical, in contrast to (43b):

- (43) a. *Dulles suspected everyone that Angleton wondered why Philby did
 b. Dulles suspected everyone that Angleton believed that Philby did

This contrast parallels the one in (44), where (44a) violates the *Wh*-Island Constraint:

- (44) a. *Who did Angleton wonder why Philby suspected
 b. Who did Angleton believe that Philby suspected

And just as (45a) is a “weak” *Wh*-Island violation, so is (45b):

- (45) a. ?Who did Angleton wonder whether Philby suspected
 b. ?Dulles suspected everyone that Angleton wondered whether Philby did

These observations can be extended directly to other bounding effects. (46a), for instance, displays a reconstructed Complex NP Constraint violation:

- (46) a. *Dulles suspected everyone that Angleton made the claim that Philby did
 b. Dulles suspected everyone that Angleton claimed that Philby did

Again, these examples contrast to just the same degree as their counterparts without antecedent-contained deletion:

- (47) a. *Who did Angleton make the claim that Hoover suspected
 b. Who did Angleton claim that Hoover suspected

Examples of this sort show quite clearly that when the locus of the violation is within the VP, we will find island effects in ellipsis.

That the data should pattern as just described becomes quite apparent once LF representations are considered. To see this, observe (48), the structure of (43a):²⁰

- (48) everyone [O_1 that Angleton wondered why Philby **suspected** e_1]
 [Dulles suspected e_1]

Plainly, this is exactly the structural configuration that gives rise to the strong bounding violation for (44a), except that here the violation arises only relative to reconstructed structure. Similar considerations carry over directly to the weak *Wh*-Island violations in (45) and the Complex NP violations in (46a)/(47a). In contrast, (43b) has the structure in (49):

- (49) everyone [O_1 that Angleton believed [e_1 that Philby **suspected** e_1]]
 [Dulles suspected e_1]

This structure is consistent with the bounding conditions, since the complement clause no longer constitutes an island domain.

The reconstructed island violations we have been observing all have the structural property that in their surface structure, the ellipsis contains the island context. We can also construct cases with the inverse embedding, that is, with the island containing the ellipsis. Thus, consider the examples in (50), where the ellipsis is contained within a *wh*-island:

20. Our comments here are modulo vehicle change of traces into their pronominal correlates. See section 6.5 for discussion.

- (50) a. John wondered who visited every city that Bill did
 b. John wondered why Max visited every city that Bill did

These sentences are inverses of examples such as (43a). In contrast to that example, however, (50a–b) are both grammatical, comparable to (51a–b), which contain no island context:

- (51) a. John wondered whether to visit every city that Bill did
 b. John expected to visit every city that Bill did

These sentences do differ in a significant way, however: whereas (51a–b) are ambiguous, (50a–b) are unambiguous. As discussed earlier, sentences like (51a–b) are ambiguous in that the elided material can be understood as being either the matrix or the complement VP. Thus, (51a) admits the readings expressed by the sentences in (52):

- (52) a. John wondered whether to visit every city that Bill visited
 b. John wondered whether to visit every city that Bill wondered whether to visit

By contrast, (50a) cannot be understood in the manner of (52b). Its meaning is comparable to that of (53):

- (53) John wondered who visited every city that Bill visited

This sentence has no reading on which the ellipsis has matrix “scope.” Why should this be? Suppose that the ellipsis in (50a) had matrix scope; then its representation would be (54):

- (54) *every city [O_1 that Bill **wondered who visited** e_1] [John wondered who visited e_1]

But this structure is ill formed, since there is an island violation in the relative clause: the trace bound by the relative operator is within a (reconstructed) *wh*-island. No island context, however, will be reconstructed in the examples in (51), so that for them both broad and narrow reconstructions are possible.

Parallel examples can be constructed for other islands such as complex NPs and adjuncts; particularly interesting is the specificity island, illustrated in (55):

- (55) a. *John bought the picture of every city that Bill did
 b. John bought a picture of every city that Bill did

Here the introduction of an island leads to ungrammaticality, since—

there being only one VP—(56) is the only possible representation for (55a):

- (56) *every city [O_1 that Bill **bought the picture of e_1**] [John bought the picture of e_1]

Again, note that the ill-formedness stems from an island violation involving the reconstruction within the relative clause. In this regard, we are saying that the island effects are a result of the bounding patterns associated with *wh*-movement. One might suppose, on the contrary, that this is not the cause of the observed effects—that instead, they result from the extraction, via QR, of the relative clause from the overt island. This would be incorrect, however, since the contexts we have examined are *not* scope islands. For example, *wh*-complements are known not to be LF movement islands, since, for instance, the embedded *wh*-phrase can be associated with the matrix *wh* in multiple questions:

- (57) Who remembered when John visited which city

In (58), however, the ellipsis can only be understood with narrow scope, as *visited*:

- (58) Who remembered when John visited which city that Max did

The effects we observe, therefore, are keyed by LF movement, through whose agency the reconstructed trace becomes available. And it is this trace, with respect to its occurrence bound by the relative operator, that directly gives the island violation.

Constraints on bounding (Subjacency) are not the only sort of constraint whose effects can be detected in antecedent-contained deletion. Consider (59a), with its accompanying reconstructed LF representation (59b):

- (59) a. *Oscar talked to everyone who did
b. everyone who₁ [e_1 **talked to e_1**]₁ [Oscar talked to e_1]

Here *wh*-movement has taken place from the subject position of the relative clause, outside the ellipsis site. Upon reconstruction, we arrive at a configuration in which the reconstructed trace is not free, since it is c-commanded by this other trace. Thus, this is an “improper movement” configuration (May 1979, 1981), variously thought to run afoul of either Principle C of Binding Theory (Chomsky 1981), or the θ -Criterion/chain formation (Rizzi 1986). (59a) is to be compared with the well-formed (60):

- (60) Oscar talked to everyone whose mother did

Inspection of its logical form reveals the reason for this difference:

- (61) everyone₁ [_{CP} whose₁ mother₂ [_{IP} e_2 **talked to e_1**]]₁ [Oscar talked to e_1]

We follow Safir (1986) regarding the indexing of relatives with pied-piped heads, so that the *wh*-phrase and its containing phrase have different indices. It then follows that in this structure the trace of *wh*-movement does not have the same index as the reconstructed trace. Rather, it bears the index of the embedded *wh*-phrase, which in turn is the index of the head of the relative as well as the entire NP, and consequently of its trace under QR. Since the two traces in the relative clause have different indices, (60) is not a case of improper movement, and the requisite contrast is derived.²¹

Examples such as (62a), with the LF structure indicated in (62b), would appear to indicate that antecedent-contained deletion can also be used to show that the ECP is in effect at LF:

- (62) a. *Dulles suspected everyone Angleton believed that did
b. everyone [O_1 Angleton believed that e_1 [**suspected e_1**]] [_{DP} Dulles suspected e_1]

Here we find the classic “*that*-trace” configuration, hence an ECP effect. Unfortunately, it is not apparent that we can draw this conclusion so facilely, given that (63) is just as ill formed as (62a):

- (63) *Dulles suspected everyone Angleton believed did

One possible account would be that, for some reason, verb phrase ellipsis is just excluded contiguous to an empty category. But the grammaticality of (60) shows that this is not the right approach. A more promising line of analysis arises when we observe that (62b), besides violating the ECP, is also a configuration in which a trace in an argument position is c-commanded by a coindexed trace also occurring in an argument position: the reconstructed trace is c-commanded by the trace following *that*. Thus, here too we have reconstructed an “improper movement” configuration. If this is the reason for the ungrammaticality of (62a), it then follows that (64) should also be ungrammatical, since improper movement violations are not complementizer sensitive:

21. In (60) e_1 is apparently not in a position of proper binding; but this case must be considered in the context of vehicle change. See section 6.5, where we argue that at LF it is comparable to *Oscar talked to everyone whose mother talked to him*.

- (64) a. *Who did Angleton believe that suspected
 b. *Who did Angleton believe suspected

Thus, although the ECP may very well be in effect here, and in fact may cause (62a) to be slightly worse than (64), its effects will be essentially masked by the more general constraints limiting coindexing of argument positions. We return to ECP effects in section 6.5.

We can see from these observations regarding the uniformity thesis that various constraints on movement are satisfied or violated in elliptical as well as nonelliptical contexts. These conditions apply regardless of whether the structural configurations to which they are sensitive are licensed directly by lexical projection, or indirectly through reconstruction. This shows directly that ellipsis must have a structural representation no different from that of comparable unelided forms. Notice that this result does not turn on whether *wh*-movement has applied in the antecedent-contained deletion cases. For all intents and purposes, we can assume it has applied in exactly the same fashion as in their unelided counterparts, and so we may assume that whatever formulation of the constraints applies to the unelided forms applies equally well to the elided ones.²² Given that there is structural and derivational uniformity, the issue still remains, At what level of representation is the *projected* structure of the elided and unelided forms the same; that is, at what level is reconstruction fully defined? The importance of this issue is that grammatical conditions are only applicable to structure whose presence is projected or licensed; with antecedent-contained deletion constructions, structure is only fully licensed at LF. Insofar as we can give a general account of the proper level of structural projection, we will shed light on a fundamental theoretical issue: the role of grammatical conditions in the characterization of linguistic levels. In the next section our task will be to extend this account to Binding Theory, and to its interaction with reconstruction and logical form.

6.4 Logical Form and Binding Theory

In this section we turn our attention to Binding Theory. We will show that all of its clauses are in effect in antecedent-contained deletion. However,

22. In this regard, we thus remain agnostic concerning the approach to bounding and proper government effects, be it Subacency/ECP (Chomsky 1981), barriers (Chomsky 1986a), Relativized Minimality (Rizzi 1990), or others formulated in other grammatical approaches, and concerning whether the conditions hold of rule application or derived representations.

the application of these clauses will be quite surprising, at least superficially. We consider the clauses individually, starting with Principle C.

6.4.1 Principle C

Observe the properties of the sentences in (65), to be understood (as are all examples to follow unless specifically noted) under anaphoric interpretations of the pronouns:

- (65) a. Dulles suspected everyone that he did
 b. Dulles suspected nobody that he did

These sentences are grammatical, but semantically trivial: (65a) is a tautology, (65b) a contradiction. Importantly, from the viewpoint of Binding Theory, there is apparently nothing out of the ordinary about these sentences. Since the pronoun in either case is free in its governing category, the embedded relative clause, it is unproblematic to take the higher subject NP *Dulles* as the pronoun's antecedent. Turning to a slightly different construction, we also find examples that exhibit the same semantic triviality:

- (66) a. Mary introduced John to everyone that she did
 b. Mary introduced John to nobody that she did

And for exactly the reasons just adumbrated, there is nothing to bar the possibility of the pronoun taking *Mary* as its antecedent, since the latter NP stands outside the governing category of the pronoun.

At first glance, then, nothing very surprising seems to be going on here: Principle B is apparently satisfied in the usual ways, and the sentences have the sorts of readings we would expect them to have if the pronouns are read anaphorically. But if these cases seem rather mundane, a simple change reveals a surprise. Consider the result of substituting a masculine pronoun for the feminine one in (66a):

- (67) *Mary introduced John to everyone that he did

This sentence displays a not-coreference effect; standardly, we understand it with the NP *John* and the pronoun denoting different people. But clearly, from the perspective of Binding Theory, (67) ought to be just like (66). The pronouns in all these sentences are just as much in anaphorically transparent positions as the pronoun in *Mary introduced John to everyone he met at the party*, which allows coreference perfectly well. In all cases, Principle B is equally well satisfied. Further small changes return things to what we would expect. Thus, replacing the pronoun in (67) with one embedded in an NP restores the possibility of an anaphoric construal:

(68) Mary introduced John to everyone that his mother did

Again this is quite normal in Binding Theory terms, since the pronoun is properly free. Note, however, that the anaphoric reading here does not occasion a trivial interpretation of the sort observed above.

If we are to view the cases we have been describing from the perspective of S-Structure constituency, then these observations are, to say the least, problematic for Binding Theory. It is far from clear what modifications one would have to make in either Binding Theory or the assigned constituency in order to bring these cases under the theory. This would be a useless exercise, however, since it is based on an incorrect assumption, namely, that only constituency at S-Structure is relevant to Binding Theory—that is, that its clauses are applicable only at S-Structure. Once we shift our gaze to their structure at LF, the properties of the data come into crisp focus. If Binding Theory holds of this level, then our observations no longer fall into the categories of “normal” and “weird”—all of them are straightforward consequences of Binding Theory, and there is nothing strange about them.

To see this, consider first example (65a), which under the analysis developed above will have the LF structure (informally) given as (69):

(69) everyone that he₁ [_{VP} **suspected t**] [Dulles₁ [_{VP} suspected t]]

Between this LF representation and the S-Structure form from which it is derived, there is a significant structural difference with respect to the position of the pronoun and its antecedent, the subject NP *Dulles*. Whereas at S-Structure the pronoun will be c-commanded by this NP, not so at LF, where there is no c-command relation. This difference, however, makes no difference in the possibilities of anaphora; the pronoun is equally free of its antecedent (in its governing category) in (69). This difference that implicates no change holds for the LF representation of (66a):

(70) everyone that she₁ [_{VP} **introduced John to t**] [Mary₁ [_{VP} introduced John to t]]

Once again the pronoun is free, as it must be, and may take the NP *Mary* as its antecedent. These LF structures will, for obvious reasons, lead directly to the trivial interpretations that we so clearly intuit for the corresponding strings.

The two cases we have looked at so far have the property that although LF movement affects the structural relationship between the pronoun and its antecedent, reconstruction does not. That is, both the pronoun and its antecedent reside outside the elision site. When we look at our “weird” case, (67), we find a situation in which part of the pronoun-antecedent

pairing is within the reconstruction. Thus, consider the derivation of the LF structure of (67), given as (71):

(71) *everyone that he₁ [_{VP} **introduced John₁ to t**] [Mary [_{VP} introduced John₁ to t]]

Here an occurrence of the NP *John* has been reconstructed. Although the occurrence of this NP in the antecedent VP neither c-commands nor is c-commanded by the pronoun, and hence is in a structurally comparable position to the antecedent NPs in (69) and (70), the reconstructed occurrence does stand in a c-command relation to the pronoun: *the pronoun, with which it is coindexed, c-commands it*. We thus arrive at the heart of the matter: at LF (71) violates Principle C of Binding Theory, which requires that names be free: the reconstructed occurrence of *John* is not free of the pronoun. We thus account for the not-coreference effect observed in (67).

Reorienting ourselves to Binding Theory applying at LF relative to “post-reconstructive” structure, we turn to (68), where coreference is perfectly permissible. That this is as it should be is clear from (68)’s LF representation:

(72) everyone that his₁ mother [_{VP} **introduced John₁ to t**] [Mary [_{VP} introduced John₁ to t]]

In this structure, in which, comparable to (71), an occurrence of *John* has been reconstructed, the pronoun *his* is equally well free. Since the pronoun is embedded in an NP, it does not c-command the contents of the reconstructed VP, so that both occurrences of the NP *John* are free of the pronoun (and of each other). Coreference thus remains a viable possibility, since Principle C is not brought into play in this structure.

Now clearly, from the perspective of their superficial structure, it would appear that all the examples just considered should satisfy Binding Theory; in every case a pronoun is free in its governing category. For certain cases, however, the derivation onto LF had the effect of *feeding* Principle C. Thus, in virtue of its LF representation (71), (67) is now rightly seen as violating Binding Theory. Derivations also exist that *bleed* Binding Theory. Thus, consider the examples in (73), all of which we would categorize as “weird,” since anaphoric interpretations are possible:

- (73) a. Mary always buys him whatever John’s other friends do
 b. Mary gave him for his birthday the same thing that John’s mother did
 c. Mary introduced him to everyone that John’s mother wanted her to

These all violate Principle C at S-Structure, but not at LF. As a case in point, consider (74), the LF representation of (73c):

- (74) everyone that John₁'s mother wanted her to [_{VP} **introduce him₁ to t**]
[Mary introduced him₁ to t]

Here Principle C is no longer contravened, since the NP *John* is now free, as it must be, but was not at S-Structure. Moreover, both occurrences of the pronoun are properly free; thus, *John* can serve as their antecedent.²³

These cases show that LF movement can both feed and bleed Binding Theory. This talk of feeding or bleeding Binding Theory should not be taken, however, as suggesting that Binding Theory applies to both S-Structure and LF. The evidence we have reviewed thus far indicates that at least as far as antecedent-contained deletion is concerned, LF is the sole locus of application of the structural conditions on anaphora. The reason for this, we believe, stems from the nature of reconstruction: since all the relevant structure is not "visible" prior to LF, Binding Theory cannot yet come into play. We return to this matter in section 6.6. For now, we simply note that as expected, we find a uniformity between our antecedent containment cases and the following structurally analogous cases:

- (75) a. *After he introduced John to everyone, Mary introduced John to everyone
b. After she introduced John to everyone, Mary introduced John to everyone
c. After his mother introduced John to everyone, Mary introduced John to everyone
d. After John's mother introduced him to everyone, Mary introduced him to everyone

Whereas these examples illustrate these anaphoric patterns in base-generated structures, the antecedent-contained deletion examples illustrate them in derived structure. It is the derived structure as it occurs at LF that is crucial for Binding Theory.

The examples we have considered thus far pertain to the application of Principle C. The question immediately arises whether the claim that Bind-

23. The cases under discussion should be kept distinct from ones like *He suspected everyone that Angleton did*, which show not-coreference effects arising from a Principle C violation. In this regard, this example is no different from a circumstance in which ellipsis has not occurred: *He suspected everyone that Angleton investigated*. See section 6.6 for implications of such observations.

ing Theory applies at LF extends to Principles A and B. Does Binding Theory in its full generality apply at LF? The answer, quite clearly, is yes.

6.4.2 Principle A

Principle A first. (76) is the relevant example:

- (76) Max introduced himself to everyone that Oscar did

This sentence has a sloppy reading; to wit, Max introduced himself and Oscar introduced himself. Now, if we again focus on S-Structure, that this construal should exist is quite puzzling, since it would require what we know to be impossible, namely, that the NP *Oscar* can be the antecedent of a reflexive pronoun that c-commands it. But focusing on LF once more changes matters for the better:

- (77) [everyone that Oscar₂ [_{VP} **introduced him₂ + self to t**]] [Max₁
introduced him₁ + self to t]

After reconstruction, there are two occurrences of the reflexive *himself*. Their positions are such that the reconstructed occurrence can have *Oscar* as its antecedent, and the other can have *Max*; they can have different indices because their pronominal parts will bear β -occurrences. This structure is in strict accordance with Principle A, since the reflexives are properly bound in their governing categories. Evidence exists, therefore, that Principle A as well applies at LF.

These observations carry over to reciprocal pronouns:

- (78) The men introduced each other to everyone that the women did

This sentence has a sloppy reading in which the reciprocal applies to both *the men* and *the women*. On this reading, it means something like *Each person the women introduced each other to, the men introduced each other to that person as well*. As with reflexives, this follows directly from the sentence's representation at LF:

- (79) everyone that the women [_{VP} **introduced each other to t**] [the men
introduced each other to t]

Here, the reciprocals can each be related to their antecedents in accordance with Principle A. Notice that the following slight variant of (78) contrasts markedly with it in grammaticality:

- (80) *The men introduced each other to everyone that the women each did

If what is going on here is based on reconstruction to a form like (79), then the deviance of (80) can be reduced to that of **The men each introduced each other to Max*. For reasons discussed by Heim, Lasnik, and May (1991b), the distributor element *each* is incompatible with the reciprocal *each*. It is just this incompatibility that we observe in (81), the proposed LF structure for (80):

- (81) *everyone that the women each [_{VP} introduced each other to *t*] [the men introduced each other to *t*]

Here again the properties of overt structures are seen surfacing in their elided counterparts.

Before proceeding, we should point out that the reciprocal sentence (78) also has a strict reading alongside the sloppy reading we have described. On this construal, the women, rather than introducing other women, introduced the men, so that every man was introduced by (at least) a man and a woman. (The existence of this sort of reading is noted independently by Kitagawa (1991a).) To show why this is, we need to be more specific about our theory of reciprocals. The essentials of the treatment, which we draw from the analysis of Heim, Lasnik, and May (1991b), is that *each* bears a β -occurrence and is subject to Principle A, and the overall expression *each other* bears an α -occurrence and is subject to Principle C. Thus, the structure of (78) can be fleshed out somewhat more as in (82):²⁴

- (82) everyone that the women₃ [_{VP} introduced each₃ ^{β} other₂ ^{α} to *t*] [the men₁ introduced each₁ ^{β} other₂ ^{α} to *t*]

24. More precisely, Heim, Lasnik, and May (1991b) assume that it is the trace of *each* and the trace of *other* at LF that are subject to Binding Theory. Thus, *Max and Oscar saw each other*, for instance, would have the representation in (i):

(i) [_{IP} [_{Max and Oscar}₁] each₂] [_{IP} *e*₂ ^{α} [_{VP} [*e*₃ ^{β} other]₃ [_{VP} saw *e*₃ ^{α}]]]

In (i) *each* is moved and attached to the “antecedent” NP, and its trace is subject to Principle A. (Or, under an alternative suggested in Heim, Lasnik, and May 1991a, *each* is unmoved but is bound by a covert distribution operator attached to the antecedent NP.) Moreover, *e other* (*e* the trace of *each*) is moved and attached to VP, and its trace is subject to Principle C. As shown in the semantics given in Heim, Lasnik, and May 1991b, the complex phrase with *each* attached and the *other*-phrase correspond to quantificational conditions. (ii) is the semantics given there for (i), where “ $\cdot \Pi$ ” is glossed as “is-an-atomic-part-of”:

(ii) $\forall x_2 (x_2 \cdot \Pi \text{Max and Oscar}_1) \forall x_3 (x_3 \cdot \Pi \text{Max and Oscar}_1 \wedge x_2 \neq x_3) x_2 \text{ saw } x_3$

The representation in (82) glosses over the movements involved in the LF representation of reciprocal sentences in the service of clarity to the point at hand.

(82) represents the sloppy reading of (78), given the β -occurrences borne by the occurrences of *each*. The *other*-phrases do not bear novel indices, even though one ranges over the men, the other over the women. This is unproblematic, however, since this is a quantificational sloppy reading—semantically, an *other*-phrase is a quantifier, so that the (simplified) semantics of *The men introduced each other to Max* will be something like *Each of the men introduced each man different from himself to Max*. Now observe that the *other*-phrase can have a pronominal correlate, so that (78) has not only the representation in (82), but also the one in (83):²⁵

- (83) everyone that the women₃ [_{VP} introduced ^{\bar{P}} them₂ ^{α} to *t*] [the men₁ introduced each₁ ^{β} other₂ ^{α} to *t*]

The pronominal correlate will be an E-type pronoun; given its indexing, its reference will be the men, since this is what the *other*-phrase with which it is coindexed ranges over. Hence, (83) represents the strict reading of (78), comparable to *The men introduced each other to everyone that the women introduced them to*.

In being ambiguous between strict and sloppy readings, (78) interestingly contrasts with its fully lexical counterpart, which has only a sloppy reading:

- (84) The men introduced each other to everyone that the women introduced each other to

This is because this sentence is already, so to speak, “constructed” to a form equivalent to (79), and no reconstruction is involved in arriving at its LF representation. It is just when we add reconstructive effects in ellipsis that the other reading, the strict one, becomes possible, given the indeterminacy of ellipsis with respect to vehicle change.

6.4.3 Principle B

We now turn to the remaining clause of Binding Theory, Principle B, which determines the anaphoric domains of personal pronouns. The first case we consider is (85):

- (85) *Mary introduced him to everyone that he did

25. More precisely, the pronominal correlate will be of the trace of the *other*-phrase, given the movement that this expression undergoes in virtue of its quantificational status; see footnote 24. For clarity, however, we have represented the correlate as *them*.

This sentence rates as a “weird” example. Although both pronouns meet the condition of being free in their respective governing categories, they cannot be construed anaphorically: not-coreference is required. Once again, the sentence’s representation at LF tells the story:

- (86) *everyone that he₁ [_{VP} **introduced him₁ to t**] [Mary introduced him₁ to t]

In the LF representation the reconstructed occurrence of the pronoun must be free in its governing category. But it patently is not. For well-formedness to obtain, it must not be coindexed with the pronoun *he* with which it is a clause-mate. We thus must have the following representation, which is one of not-coreference:

- (87) everyone that he₂ [_{VP} **introduced him₁ to t**] [Mary introduced him₁ to t]

In this structure both occurrences of *him* bear the same index, so that the reconstructed pronoun corefers with the antecedent pronoun. On the other hand, it follows from Binding Theory at LF that both of these pronouns not be coindexed with the other pronoun *he*.

It is revealing in this context to contrast (85) with (88), brought to our attention by I. Sag, which seems considerably better with coreference:

- (88) Mary introduced me to everyone that I did

In terms of indices, (85) and (88) are identical, since Binding Theory is blind to the person of the pronoun. The point to notice here is that the contrast is echoed by the contrast in (89):

- (89) a. Mary introduced me to everyone that I introduced me to
b. Mary introduced him to everyone that he introduced him to

Similar observations hold in (90):

- (90) a. Mary introduced me to everyone, and I introduced me to everyone, too
b. Mary introduced him to everyone, and he introduced him to everyone, too

In our view, these considerations show the following. (88) *does* obey Binding Theory and is a context of not-coreference in virtue of noncoindexing. Such contexts do not necessarily preclude coreference, however, and in fact may allow it under certain linguistic or pragmatic conditions. (88) is such a case. Coreference is allowed in virtue of the lexical meaning of first person pronouns, but not in virtue of the lexical meaning of third

person pronouns, as in (85). Thus, given this line of reasoning, the contrast between (85) and (88) is just what we would expect.²⁶

(85) contrasts with the “normal” cases in (91) and (92):

- (91) a. Mary introduced him to everyone that his mother did
b. Mary introduced his mother to everyone that he did
c. Mary introduced his mother to everyone that John did

- (92) *Mary introduced him to everyone that John did

These examples count as “normal” in the sense that their anaphoric properties can be determined from their S-Structure form: whereas the examples in (91) are consistent with Binding Theory at this level, so that coreference is perfectly well possible, (92) is not, since it violates Principle C, and not-coreference is required. From the standpoint of LF the results are effectively no different. For (91) this is because the derived constituent structure remains consistent with Binding Theory:

- (93) a. everyone that his₁ mother [_{VP} **introduced him₁ to t**] [Mary introduced him₁ to t]
b. everyone that he₁ [_{VP} **introduced his₁ mother to t**] [Mary introduced his₁ mother to t]
c. everyone that John₁ [_{VP} **introduced his₁ mother to t**] [Mary introduced his₁ mother to t]

In these structures all the pronouns are free in their governing categories, so that no violations, particularly Principle B violations, can ensue. Turning to the LF representation of (92), its derivation has the interesting property of *bleeding* Principle C, since QR will remove the NP *John* from the c-command domain of the pronoun:

- (94) [everyone that John₁ [_{VP} **introduced him₁ to t**]] [Mary introduced him₁ to t]

However, this derivation also has the effect of *feeding* Principle B, which requires that the pronoun not be coindexed with the c-commanding proper name. If it were, it would be bound in its governing category. Thus, the facts follow here as well.

26. Another possibility is that (88) involves vehicle change, so that the personal pronoun is realized under reconstruction as reflexive. We disfavor this account because the context under consideration is not one that would normally admit reflexives bearing α -occurrences; hence the absence of the reflexive reading for *Mary introduced him to everyone that he did*.

The examples in (95) illustrate Specified Subject Condition (SSC) effects falling under Principle B:

- (95) a. Mary introduced him to everyone that John wanted her to
 b. *Mary introduced him to everyone that she wanted John to

We have here a clear and surprising contrast, surprising because expectations are that (95a) should be just as much a not-coreference case as (95b), since in both cases the pronoun *c*-commands its antecedent at S-Structure, and hence both violate Principle C. But quite counter to our expectations, (95a) does allow coreference. Thus, although we classify (95b) as normal, (95a) is weird. Both cases normalize, however, when we shift our focus away from their superficial structure to their logical forms. Consider the representations in (96):

- (96) a. everyone that John₁ [_{VP} wanted her to **introduce him₁ to *t***]
 [Mary introduced him₁ to *t*]
 b. *everyone that she [_{VP} wanted John₁ to **introduce him₁ to *t***]
 [Mary introduced him₁ to *t*]

These structures conform to Binding Theory as expected. In (96a) both occurrences of *him* are locally free of the antecedent NP *John* and hence may be coreferential with it. In (96b), on the other hand, the reconstructed occurrence of the pronoun is *not* locally free; *John* is the subject of its clause. What we have reconstructed, therefore, is a Specified Subject Condition effect at LF. Note that these cases also involve the feeding/bleeding relation among the clauses of Binding Theory. QR bleeds Principle C, but reconstruction feeds Principle B and causes (96b) to violate this clause. Consequently, (96b) must be replaced with (97):

- (97) everyone that she [_{VP} wanted John₂ to **introduce him₁ to *t***] [Mary introduced him₁ to *t*]

This can only be construed as a structure of not-coreference.²⁷

27. There is also an interaction between Principle B and quantifier scope, as shown by (i):

(i) John proved Max had slandered her to everyone he thought she hadn't yet

Understanding the ellipsis as broad, that is, as *proved ...*, the pronouns can be taken as coreferential. This is because the reconstructed occurrence of *her* is free in its governing category, in particular, free of the pronoun *she*. If the reconstruction is narrow, on the other hand, then this case is just like those discussed in the text.

In the context of Principle B effects, the contrast in (98), involving control and antecedent-contained deletion, is of particular interest:

- (98) a. Bill promised John to introduce her to everyone that Sally did
 b. Bill persuaded John to introduce her to everyone that Sally did

Understanding the elided VPs to have the higher VPs as their antecedents—that is, with *promise* or *persuade* as their heads—we judge that although an anaphoric interpretation of the pronoun is completely excluded in the former, it is not in the latter. The relevant LF representations are as follows:

- (99) a. *everyone that Sally₃ [_{VP} **promised John₂ PRO₃ to introduce her₃ to *t***] [Bill₁ promised John₂ PRO₁ to introduce her₃ to *t*]
 b. everyone that Sally₃ [_{VP} **persuaded John₂ PRO₂ to introduce her₃ to *t***] [Bill₁ persuaded John₂ PRO₂ to introduce her₃ to *t*]

The difference between these examples is that in (99a) the controller of the reconstructed PRO is *Sally*, and the reconstructed occurrence of the pronoun is therefore bound in its governing category, by PRO. In (99b), on the other hand, PRO is reconstructed along with its controller. This then allows the pronoun to be free in its governing category, and take *Sally*, in this case not the controller of PRO, legitimately as its antecedent. (We are grateful to M. den Dikken for bringing these examples to our attention.)

We conclude that Principle B holds at LF, and more generally that Binding Theory in toto holds of this level of representation.

6.5 Vehicle Change

In the previous section we were concerned with the relation between antecedent-contained deletion and Binding Theory. We observed cases indicating that the various principles are applicable at LF. In this light, consider the rather puzzling contrast in (100) (cf. (95)):

- (100) a. Mary introduced John₁ to everyone that he₁ wanted her to
 b. *Mary introduced John₁ to everyone that she wanted him₁ to

Under the indicated indexing, only (100a) is acceptable; (100b) displays a not-coreference effect. Now, of course, if we calculate the effects of Binding Theory relative to the superficial structure of these examples, we get the wrong results, since this would predict that (100a) and (100b) are the

same. But as we have seen, in this context we must consider their relevant structure at LF:

- (101) a. everyone that he₁ wanted her to **introduce John₁ to t** [Mary introduced John₁ to t]
 b. *everyone that she wanted him₁ to **introduce John₁ to t** [Mary introduced John₁ to t]

Given the discussion in the previous section, this result is rather surprising. This is because both of these cases run afoul of Principle C; in neither does the reconstructed NP *John* have the requisite freedom. However, there is another option here: vehicle change. Since the sentences contain a proper name, we can realize it alternatively as its pronominal correlate, allowing for the representations in (102):

- (102) a. everyone that he₁ wanted her to **introduce ^PJohn₁ to t** [Mary introduced John₁ to t]
 b. *everyone that she wanted him₁ to **introduce ^PJohn₁ to t** [Mary introduced John₁ to t]

Since the reconstructed NP is pronominal, rather than being subject to Principle C, it is subject to Principle B. But then the structures in (102) correctly characterize the data: in (102a) the pronominal correlate is properly free in its governing category, and the structure is well formed; but in (102b) the correlate is bound in this domain and hence contravenes Binding Theory.

A consequence of the theory of vehicle change is that elements that are otherwise subject to Principle C will have the option of being submitted to Principle B, but only under reconstruction. Note that for the cases discussed in the previous section with reference to Principle C, vehicle change will have no impact. For instance, reconsider the analysis of (67):

- (67) *Mary introduced John to everyone that he did

In addition to the representation given in (71), we now also have (103):

- (103) *everyone that he₁ [_{VP} **introduced ^PJohn₁ to t**] [Mary introduced John₁ to t]

But this structure is no better than its predecessor. Rather than violating Principle C, it violates Principle B. Conversely, the correlated LF representation of (68)

- (68) Mary introduced John to everyone that his mother did

- (104) everyone that his₁ mother [_{VP} **introduced ^PJohn₁ to t**] [Mary introduced John₁ to t]

satisfies Principle B for just the same reason that (72) satisfied Principle C, since none of the coindexed elements c-command any of the others. Here again, any empirical effects of vehicle change will be unobservable. They will not go unnoticed for (105), however:

- (105) Mary introduced John's mother to everyone that he did

Under simple reconstruction, we would expect this case to violate Principle C, since the reconstructed occurrence of *John* would be c-commanded by the pronoun. But this is not a case of not-coreference. On the contrary, coreference is possible, just as in (68).²⁸ This is because we can derive for (105) the LF representation in (106), with vehicle change:

- (106) everyone that he₁ [_{VP} **introduced ^PJohn₁'s mother to t**] [Mary introduced John₁'s mother to t]

Thus, the analysis of (105) at LF is in effect identical to that of (107):

- (107) Mary introduced his mother to everyone that he did

The only difference is that in the latter case the pronoun occurs overtly.

Thus far we have considered cases that involve possible anaphoric pairings of names and pronouns. But what of examples that contain two proper names, also known to be subject to not-coreference effects? (108) gives the significant paradigm:

- (108) a. Mary gave John whatever John's mother did
 b. Mary gave John's mother whatever John did
 c. *Mary gave John whatever John did
 d. Mary gave John whatever John wanted her to

Now, if we were going by superficial constituency, we would be led to classify (108a) and (108d) as weird, and (108b) and (108c) as normal—the apparent c-command relations indicate that the former should display the sort of not-coreference effects characteristic of pairings of proper names. (See chapter 1.) But this is not what we observe; rather, coreference is possible in these two cases. Turning to their LF representations, our classification changes: (108b) and (108d) are now judged “weird.” This is

28. The intended reading is perhaps highlighted by adding an emphatic reflexive: *Mary introduced John's mother to everyone that he himself did*. A similar facilitation can be obtained via stress as well.

because for these two cases reconstructed occurrences of the object NP will be c-commanded by the subject of the relative clause. But again, this violates our intuitions. Representations consistent with our intuitions arise, however, in those LF representations with vehicle change:

- (109) a. whatever John₁'s mother **gave** ^PJohn₁ *t* [Mary gave John₁ *t*]
 b. whatever John₁ **gave** ^PJohn₁'s mother *t* [Mary gave John₁'s mother *t*]
 c. *whatever John₁ **gave** ^PJohn₁ *t* [Mary gave John₁ *t*]
 d. whatever John₁ wanted her to **give** ^PJohn₁ *t* [Mary gave John₁ *t*]

In (109a), (109b), and (109d) the pronominal correlate is properly free. In (109a) it is not c-commanded by a coindexed element, in (109b) it is free in NP, and in (109d) it is free in the embedded clause. Since all are free in their governing categories, they satisfy the requisite condition of Binding Theory, Principle B. (109c), on the other hand, contains a pronominal correlate that is *bound* in its governing category; hence, this case exhibits the not-coreference effect, in just the same way that such effects are found overtly with pairs of proper names.

The observations of this section lead to a rather surprising conclusion: *no Principle C effects are observable at LF under reconstruction*. Given vehicle change, the various cases of Principle C effects will collapse into Principle B effects. Hence, if the pronominal correlate is appropriately local to its antecedent, then the consequences of the two conditions will be indistinguishable, but if it is distant, then they will diverge. Since Principle B makes available as well formed structures that would be proscribed under Principle C, with vehicle change any effects of the latter clause will be rendered invisible. The residue of Principle C effects will be reducible to Principle B. All that will be seen at LF under reconstruction are Principle B and Principle A.

6.5.1 Crossover

Now we know that pronouns bearing α -occurrences of their indices can play two roles in the grammar: their normal role as referring expressions or, where markedness conditions permit when no alternative with a β -occurrence is available, the role of variables. In the cases of vehicle change above, we observed pronominal correlation of a name in antecedent-contained deletion; we can also observe the effects of pronominal correlation of a variable.

Consider (110):

- (110) *Mary introduced every boy to someone he did

This is a case of strong crossover—the pronoun cannot be construed as a variable bound by the quantifier *every boy*. (111) reveals the reason:

- (111) every boy₁ [someone he₁ **introduced** *e*₁ **to** *t* [Mary introduced *e*₁ to *t*]]

This representation violates Principle C, since the reconstructed variable is not free—a standard crossover violation. But by hypothesis, we have the option of taking the pronominal correlate of the trace:

- (112) every boy₁ [someone he₁ **introduced** ^P*e*₁ **to** *t* [Mary introduced *e*₁ to *t*]]

The result here is a Principle B violation. However, an interesting prediction is lurking here: strong crossover under reconstruction should show SSC (Principle B) effects. The critical examples are just the quantificational counterparts of the sentences in (100):

- (113) a. Mary introduced every guy to every woman he wanted her to
 b. *Mary introduced every guy to every woman she wanted him to

Although a bound variable construal is impossible in (113b)—in other words, it is a case of crossover—this construal is perfectly possible in (113a). The same observations hold for the slightly varying cases in (114):

- (114) a. Mary introduced every boy to someone he thought Sally was going to
 b. *Mary introduced every boy to someone Sally thought he was going to

Taking the examples in (113), we again have two possibilities: one where the variable is reconstructed, the other where the pronominal correlate is reconstructed. These are shown in (115) and (116), respectively:

- (115) a. every guy₁ [every woman he₁ wanted her to **introduce** *e*₁ **to** *t* [Mary introduced *e*₁ to *t*]]
 b. every guy₁ [every woman she wanted him₁ to **introduce** *e*₁ **to** *t* [Mary introduced *e*₁ to *t*]]

- (116) a. every guy₁ [every woman he₁ wanted her to **introduce** ^p*e*₁ to *t*
[Mary introduced *e*₁ to *t*]]
b. every guy₁ [every woman she wanted him₁ to **introduce** ^p*e*₁ to *t*
[Mary introduced *e*₁ to *t*]]

Following our line of reasoning, (115a), (115b), and (116b) are all ill formed: the first two violate Principle C, the latter violates Principle B. (116a), however, is well formed. Since this structure contains a pronominal correlate, and it is free in its governing category, this structure is consistent with Binding Theory. In this configuration strong crossover is ameliorated under reconstruction.

Weak crossover is also ameliorated. Consider (117):

- (117) Mary introduced every boy to someone his mother did

Despite the fact that its LF representation (118)

- (118) every boy₁ [someone his₁ mother **introduced** *e*₁ to *t* [Mary introduced *e*₁ to *t*]]

seems to directly display the structural configuration giving rise to this effect, our intuition is clear that the pronoun *can* be anaphorically connected to the quantifier phrase *every boy*. There is no weak crossover. However, we have the option of vehicle change, so that the pronominal correlate of the trace can be substituted:

- (119) every boy₁ [someone his₁ mother **introduced** ^p*e*₁ to *t* [Mary introduced *e*₁ to *t*]]

This configuration, however, is *not* a weak crossover configuration, as initially pointed out by Safir (1984). Examples like (120), cited by May (1985), adapting examples of Safir's, show no crossover effects:

- (120) Every student whom Mary was wondering whether or not his professor failed him is sitting over there

Once the possibility of vehicle change in reconstruction is taken into account, the lack of weak crossover in antecedent-contained deletion becomes explicable.²⁹

29. There is a more general problem lurking in the analysis of weak crossover: Why doesn't a weak crossover violation arise from the relation of the quantifier, the pronoun, and the nonreconstructed trace of QR in (119)? Although the answer is not altogether clear, it is worth noting that the problem is endemic to the account of bound variable anaphora: Why shouldn't the LF representation of *Someone saw everyone he loves* also be a crossover violation?

6.5.2 Crossed Anaphora

Given the possibility of internal antecedent-contained deletion, there can be double antecedent containment, that is, two instances of ellipsis within one verb phrase. (121) illustrates this possibility:

- (121) Max promised everything that Oscar did to everyone that Sally did

The LF representation of this sentence is (122); we indicate the presence of pronominal correlates:

- (122) everything *O*₁ that Oscar [**promised** *e*₁ to ^p*e*₂]₁ [everyone *O*₂ that Sally [**promised** ^p*e*₁ to *e*₂]₂ [Max promised *e*₁ to *e*₂]]

By contrast, a structure in which there was no vehicle change would incorporate two sorts of violations. If it contained an occurrence of *e*₂ rather than its pronominal correlate, this trace would be free, and if it contained an occurrence of *e*₁, it would violate Subjacency. (122) suffers from neither of these problems. Notice that the binding properties of (122) are not unique; they are the same as those found in the logical form of Bach-Peters sentences such as *Every pilot who shot at it hit some MIG which chased him*:

- (123) [every pilot who₁ *e*₁ shot at it₂]₁ [[some MIG which₂ *e*₂ chased him₁]₂ [*e*₂ hit *e*₁]]

As discussed in May 1985, since adjuncts of a single category c-command one another, it follows that the occurrence of *e*₁ contained within NP₂ is bound by NP₁, and the occurrence of *e*₂ contained within NP₁ is bound by NP₂. As such, this structure is subject to interpretation by the semantics of absorbed quantification developed in Higginbotham and May 1981b, and placed in the context of the scope analysis of May 1985 in May 1989.

6.5.3 Improper "Movement"

The amelioration effects that we have observed extend to other grammatical constraints that turn on the distribution of variables. They can also be shown to obtain, for instance, in improper movement configurations (May 1979). Thus, consider (124), the case of nonvacuous antecedent-contained deletion discussed by Haik (1985, 1987):

- (124) Oscar talked to everyone who wanted him to

As discussed above, in (124) the relative *wh*-operator is not superficially vacuous, since it has an overt source—the subject position of *want*. LF movement gives the following representation:

(125) everyone who₁ *e*₁ wanted him to **talk to** *e*₁ [Oscar talked to *e*₁]

This structure contains a trace—the reconstructed one—that is c-commanded by another coindexed trace. This configuration is the familiar one of improper movement, a violation of Principle C (or perhaps the θ -Criterion). Hence, the grammatical status of (124) should be the same as that of (126):

(126) *Who₁ [*e*₁ wanted him to talk to *e*₁]

Once again, however, we can conclude that these results are only *prima facie*, for we have not factored in the effect of vehicle change, and the realization of the reconstructed variable as its pronominal correlate. Thus, we have the additional representation (127):

(127) everyone who₁ *e*₁ wanted him to **talk to** ^P*e*₁ [Oscar talked to *e*₁]

This structure comes under the purview of Binding Theory with respect to Principle B, not Principle C. But with respect to this principle, (127) is well formed, since the pronoun is properly free in its governing category. The plausibility of this account of (124) is bolstered by observing that its most natural paraphrase contains an overt pronoun: *Oscar talked to everyone who wanted him to talk to him*. Although (126) is a case of improper movement, we conclude that (124) is a case of *proper* reconstruction.

Cases comparable to nonvacuous antecedent-contained deletion can be constructed with nonrestrictive relative clauses:

- (128) a. Dulles suspected Philby, who didn't really want him to
b. John proposed to Mary, who thought that Bill would have ages ago

In chapter 5, we considered simpler cases of this construction such as *Dulles suspected Philby, who Angleton did, too*, which, extending our terminology, would be a case of vacuous ellipsis, since it contains no overt trace bound by the *wh*-phrase. On the analysis given there, the reconstructed trace results from a nonfeatural vehicle change of a name to its null counterpart. In cases like (128), on the other hand, featural vehicle change is at work, so that (129) contains a pronominal correlate of a name:

(129) Dulles suspected Philby₁, who₁ *e*₁ didn't really want him to
suspect ^PPhilby₁

This structure is well formed, conforming to Binding Theory by satisfying Principle B. If we had reconstructed without taking the pronominal correlate, the result would not have conformed to Binding Theory; it would have violated Principle C.

Vehicle change will not be able to save examples like the following, which repeats (59a):

(130) *Oscar talked to everyone who did

Like the Haik examples, (130) is nonvacuous; it differs in that the source of *wh*-movement is contiguous to the elided VP. Its LF representation, with vehicle change, is (131):

(131) *everyone who₁ *e*₁ **talked to** ^P*e*₁ [Oscar talked to *e*₁]

This structure violates Principle B, since the pronominal correlate is bound in its governing category. Recall that (130) contrasts with (132); (132b) (=61)) is the representation we gave for this sentence:

- (132) a. Oscar talked to everyone whose mother did
b. everyone₁ [whose₁ mother₂ [_{IP} *e*₂ **talked to** *e*₁]]₁ [Oscar talked to *e*₁]

As it stands, it is not apparent that this structure is well formed, since the reconstructed trace is not properly bound. However, if we take its pronominal correlate, the resulting structure definitely is well formed:

(133) everyone₁ [whose₁ mother₂ [_{IP} *e*₂ **talked to** ^P*e*₁]]₁ [Oscar talked to *e*₁]

Given this structure, the construal of (132a) will be just that of *Oscar talked to everyone whose mother talked to him*, with the pronoun bound by the quantifier.

Principle B is also at work in accounting for the curious pair given earlier as (62a) and (63):

- (134) a. *Dulles suspected everyone Angleton believed that did
b. *Dulles suspected everyone Angleton believed did

Like (130), these examples involve movement from an immediately pre-ellipsis position. Our expectation is that they should contrast as ECP effects, which are standardly sensitive to the lexical presence of the complementizer with movement from this position. ECP effects, however, will be masked here by Binding Theory. Thus, the LF structures in (135) violate Principle B, even if the vehicle change option is taken, since neither of the pronominal correlates is appropriately free:

- (135) a. *everyone [O_1 Angleton believed that e_1 [suspected Pe_1]] [Dulles suspected e_1]
 b. *everyone [O_1 Angleton believed e_1 [suspected Pe_1]] [Dulles suspected e_1]

ECP effects can be unmasked, however, by constructing contexts in which the pronominal correlate is free, erasing the improper movement (Principle B) violation. Consider the contrast in (136):

- (136) a. Dulles suspected everyone Angleton believed wanted him to
 b. *Dulles suspected everyone Angleton believed that wanted him to

These examples show a straightforward *that*-trace effect; they have the LF representations in (137):

- (137) a. everyone [O_1 Angleton believed e_1 wanted him to [suspect Pe_1]] [Dulles suspected e_1]
 b. *everyone [O_1 Angleton believed that e_1 wanted him to [suspect Pe_1]] [Dulles suspected e_1]

If we had reconstructed without vehicle change, the resulting structures would have been ill formed, cases of improper movement (Principle C). But, with vehicle change, the pronominal correlates are properly free in the embedded clauses, and the structures are differentiated with respect to proper government and the ECP.

6.5.4 Subjacency Effects

In section 6.3 we pointed to the presence of Subjacency effects under reconstruction, observing contrasts such as the following:

- (138) a. *Dulles suspected everyone who Angleton wondered why Philby did
 b. Dulles suspected everyone who Angleton believed that Philby did

The account is straightforward, since the postreconstruction LF representation will violate the *Wh*-Island Constraint:

- (139) *everyone [who₁ Angleton wondered why Philby [suspected e_1]] [Dulles suspected e_1]

It might be thought that since trace/variables can be reconstructed as their pronominal correlates, and since it is well known that pronominal binding

is not subject to bounding constraints, bounding effects such as these ought not be observable. That is, (138a) will have an alternative LF representation with vehicle change:

- (140) everyone [who₁ Angleton wondered why Philby suspected Pe_1] [Dulles suspected e_1]

However, this case has a different status than other cases of vehicle change of variables, since it is only through the reconstruction of the pronominal correlate that the vacuity of the *wh*-phrase is relieved. In just these sorts of cases, therefore, the pronominal correlate would be functioning as a resumptive pronoun. But English does not allow resumptive pronouns in this context, so that on this analysis the ungrammaticality of (138a) is comparable to that of (141):

- (141) *Who did Angleton wonder why Philby suspected him

In contrast, examples such as (142), brought to our attention by M. Rooth, are markedly better than (138a):

- (142) Dulles suspected everyone who wondered why Philby did

This sentence has the following LF representation, with vehicle change:

- (143) everyone [who₁ e_1 wondered why Philby suspected Pe_1] [Dulles suspected e_1]

The pronominal correlate here is free in its governing category and bound by the occurrence of the variable outside its governing category. Obviously, if we had not chosen the vehicle change option, the resulting structure would have been ill formed, a case of improper movement. Thus, just as (138a) is to be compared (with respect to its logical form) with (141), (142) is to be compared with (144), which has an overt pronoun in place of the pronominal correlate:

- (144) Dulles suspected everyone who wondered why Philby suspected him

6.5.5 Parasitic Gaps

One of the functions of resumptive pronouns, where they can occur, is to allow operator binding into island configurations that do not otherwise allow binding of traces. The considerations of the previous section turn in part on the limitations on such resumptive pronouns in English. There are, however, environments in which empty pronominal categories can occur in syntactic islands without leading to violations. These are parasitic gaps.

It turns out that the existence of this type of element can also be shown under reconstruction. The example to consider is (145):

- (145) Who did John introduce to everyone that Max did

Here the *wh*-phrase has been extracted from the direct object position, so that its trace will be part of the VP that is reconstructed into the ellipsis site, after LF movement. The resulting structure is (146):

- (146) who_1 [everyone that Max **introduced** e_1 to t [John introduced e_1 to t]]

On initial inspection, we would expect (146) to violate Subjacency, since the reconstructed trace, bound by the *wh*-phrase, is contained within a relative clause. However, we have the option of deriving a structure with vehicle change:

- (147) who_1 [everyone that Max **introduced** pe_1 to t [John introduced e_1 to t]]

Our claim is that the pronominal correlate in (147) is an occurrence of a (derived) parasitic gap as found in examples like (148a), shown with its counterparts with overt pronominals:

- (148) a. Which book did John file without reading
 b. Which book did John file without reading it
 c. *Which book did John file it without reading

The occurrence of the pronominal correlate in (147) bears certain basic similarities to other parasitic gaps. Like them, it neither c-commands nor is c-commanded by the “real” gap, nor is it subject to bounding conditions, if licensed. Also like other parasitic gaps, it cannot be further embedded in a second island (Contreras 1984). Thus, we find the contrasts illustrated in the complex NP examples in (149) and the *wh*-island examples in (150):

- (149) a. Which book did John file without reading the blurb that Bill wrote about it
 b. *Which book did John file without reading the blurb that Bill wrote about
- (150) a. Which book did John read without wondering why the author wrote it
 b. *Which book did John read without wondering why the author wrote

And similar contrasts are found with antecedent-contained deletion. Observe example (151) and the contrast in (152):

- (151) *Who did John introduce to everyone that Bill knows someone that Max did
- (152) a. *Who did John introduce to everyone that Bill wondered why Max did
 b. Who did John introduce to everyone that Bill believed that Max did

(153) is the LF structure of (152a):

- (153) * who_1 [everyone that Bill wondered why Max **introduced** pe_1 to t [John introduced e_1 to t]]

Here we see plainly that the reconstructed category—a reconstructed parasitic gap—resides in a position that is illicit for such a category.³⁰

Although we have framed our discussion of parasitic gaps in terms of *wh*-constructions, directly comparable examples can be given with quantifiers:

- (154) John introduced someone to everyone that Max did

This shows the same interaction with islands that we have just observed:

- (155) a. *John introduced someone to everyone that Bill wondered why Max did
 b. John introduced someone to everyone that Bill believed that Max did

(154) has the representation in (156):

- (156) someone_1 [everyone that Max **introduced** pe_1 to t [John introduced e_1 to t]]

Aside from the lexical identity of the operator, this structure is identical to (147) for all intents and purposes.

These observations advance our understanding of parasitic gaps. Because of the contrast between **John filed every book without reading and*

30. Rooth (1981) observes sentences like *Which document did someone who shouldn't have see*, which although not a case of antecedent-contained deletion, is a case of a reconstructed parasitic gap. Here the VP *see t* is reconstructed into the relative clause, with the trace, in our terms, being realized as its pronominal correlate.

(148a), it is usually maintained that parasitic gaps are an S-Structure phenomenon and that they cannot be generated by LF operations (Chomsky 1982). The examples above falsify this view, since LF movement and reconstruction play a vital role in deriving syntactic environments that can license parasitic gaps. Interestingly, these cases of LF parasitic gaps involve both *wh* gaps and QR gaps. Thus, it appears to be the case that the occurrence of these parasitic gaps is constrained only by the conditions that determine well-formedness at LF as this interacts with reconstruction.

6.6 What Is Reconstruction?

We have now arrived at a more comprehensive characterization of reconstruction: a reconstruction is a set of token structures, closed under identity of syntactic structure up to variance in indexical value and vehicle change. Now, insofar as ellipsis is licensed by reconstruction, it follows that ellipses are syntactically specified. Since elided constructions share this syntactic specification with their unelided counterparts, grammatical principles apply equally well to elided and unelided structures. Our observations regarding the applicability of these principles in antecedent-contained deletion lead us to conclude that the full class of structures falling within reconstructions is to be found with respect to representations at LF.

One can imagine alternatives to our perspective on reconstruction. Let us consider two, one syntactic and the other semantic. Although the syntactic alternative agrees that what is reconstructed is the form of the verb phrase, it differs in denying that this is its *logical* form. By contrast, the semantic alternative denies that it is the form of the verb phrase that is reconstructed and claims instead that it is its *meaning*. Although these alternatives indicate very different lines of analysis, they agree that reconstruction does not depend upon logical form. What content is there to these alternatives?

What makes the argument for the role of LF in reconstruction, we have claimed, is the necessity of referring to the logical form of quantification in accounting for antecedent-contained deletion. This is what has taken us beyond mere superficial structure. That quantification plays a role in the description of antecedent-contained deletion is perhaps unarguable; but one could still take exception to the claim that it is the *logical form* of quantification that is relevant. For suppose that there were some mechanism within the semantics that is functionally equivalent to QR in assigning an analogue of scope to quantifiers. In taking on this role, it might be

argued, this mechanism would create contexts that are not antecedent-contained, just as QR does, and that could be reconstructed. Reconstruction would be semantic, since it could only occur after this quantifier operation defined on meanings had applied. The results we have observed, and claimed to be matters of logical form, would then carry over to the ways in which meanings are composed out of other meanings. This would then be a form of the semantic alternative.

Such semantic analogues for quantification have indeed been advanced in the form of the “quantifier-stores” proposed by Cooper (1983). Informally, the idea is that if a quantifier is encountered in the course of interpreting a sentential structure, its meaning, a function of a particular type, can be “stored,” while a pronoun-meaning is composed in its place. When the level of the clause is reached, the quantifier is retrieved, and quantified in, the pronoun-meaning serving as the variable it binds. This treatment of quantification differs from ours in the requisite sense, in that the scope analogue affects *meanings* (functions), storing and retrieving them, as opposed to QR, which affects syntactic entities. In this context, Rooth (1981) offers a precise answer to our question about reconstruction. He proposes that along with NPs, VPs can also be stored, their place in the composition being taken by a variable of the appropriate type. An elided VP (actually the stranded auxiliary element) also translates as a VP-type variable. Reconstruction is the quantifying in, via λ -conversion, of a previously stored VP-meaning into the positions of the occurrences of the VP variable. It is an arguable virtue of this approach that reconstruction is not any kind of special operation, but rather just another case of λ -conversion.³¹

When applied to a sentence such as *John talked to everyone Max did*, that is, to antecedent-contained deletion, the composition would proceed by first building up and storing an NP-meaning containing a VP variable, then building up and storing a VP-meaning, leaving appropriate variables in their places, and then retrieving the NP- and VP-meanings in turn. After this retrieval the sentence would have, informally, the following translation, where Φ is a variable over VP-meanings:

$$(157) \lambda\Phi(\forall x(\lambda x_i[\Phi(\text{Max}')](x) \rightarrow \lambda x_i[\Phi(\text{John}')](x)))(\text{talk-to}'(x_i))$$

31. Bear in mind that we consider this analysis in the context of our rejection, in the face of the eliminative puzzles, of predication-based theories of ellipsis, of which this proposal is an instance. That is, in assuming that ellipsis is based on identity of λ -expressions—here, occurrences that are quantified in—it takes on the empirical shortcomings associated with this general approach.

Reconstruction via λ -conversion then yields (158), which is equivalent to (159):

$$(158) \forall x(\lambda x_i[\text{talk-to}'(x_i)(\text{Max}')](x) \rightarrow \lambda x_i[\text{talk-to}'(x_i)(\text{John}')](x))$$

$$(159) \forall x(\text{talk-to}'(x)(\text{Max}') \rightarrow \text{talk-to}'(x)(\text{John}'))$$

Placing this in a more formal context, and following the line of analysis suggested by Rooth, the treatment would proceed as follows, where each line is a 4-tuple consisting of a syntactic phrase, its category, its translation, and a store; for perspicuity, we have ignored intensionality and dispensed with taking names as generalized quantifiers:

1. did, VP, Φ_1 , \emptyset
2. Max did, IP, $\Phi_1(\text{Max}')$, \emptyset
3. Max did, CP, $\lambda x_2 [\Phi_1(\text{Max}')](x)$, \emptyset
4. everyone Max did, NP, x_2 , $\{\langle \lambda P \text{ everyone}' (\lambda x_2 [\Phi_1(\text{Max}')](x), P), 2 \rangle\}$ (STORE NP)
5. talk to everyone Max did, VP, Φ_1 , $\{\langle \lambda P \text{ everyone}' (\lambda x_2 [\Phi_1(\text{Max}')](x), P), 2 \rangle, \langle \text{talk-to}'(x_2), 1 \rangle\}$ (STORE VP)
6. John talked to everyone Max did, IP, $\Phi_1(\text{John}')$, $\{\langle \lambda P \text{ everyone}' (\lambda x_2 [\Phi_1(\text{Max}')](x), P), 2 \rangle, \langle \text{talk-to}'(x_2), 1 \rangle\}$
7. John talked to everyone Max did, IP, $\lambda P \text{ everyone}' (\lambda x_2 [\Phi_1(\text{Max}')](x), P) \lambda x_2 [\Phi_1(\text{John}')](x)$, $\{\langle \text{talk-to}'(x_2), 1 \rangle\}$ (RETRIEVE NP)
8. John talked to everyone Max did, IP, everyone' $(\lambda x_2 [\Phi_1(\text{Max}')](x), \lambda x_2 [\Phi_1(\text{John}')](x))$, $\{\langle \text{talk-to}'(x_2), 1 \rangle\}$ (λ -CONVERSION)
9. John talked to everyone Max did, IP, $\lambda \Phi_1 (\text{everyone}' (\lambda x_2 [\Phi_1(\text{Max}')](x), \lambda x_2 [\Phi_1(\text{John}')](x))) (\text{talk-to}'(x_2))$, \emptyset (RETRIEVE VP)
10. John talked to everyone Max did, IP, everyone' $(\lambda x_2 [\text{talk-to}'(x_2)(\text{Max}')](x), \lambda x_2 [\text{talk-to}'(x_2)(\text{John}')](x))$, \emptyset (λ -CONVERSION)
11. John talked to everyone Max did, IP, everyone' $(\text{talk-to}'(x)(\text{Max}'), \text{talk-to}'(x)(\text{John}'))$, \emptyset (λ -CONVERSION)

The last three lines of this derivation correspond to (157) through (159). Although such a derivation would yield the correct result, Larson (1986) points out that it involves the illicit capture of a free variable within the λ -expressions in the step from (157) to (158). That is, the λ -conversion that brings the VP-meaning inside improperly involves the variable x_i being captured within the scope of $\lambda x_i [\dots]$. Larson locates the root of the problem in the idea that ellipsis involves VP-meanings and suggests a departure from this assumption. He suggests replacing the variable over VP-meanings with a variable over transitive verbs, that is, over functions from individuals to VP-meanings. In a sense, what is being reconstructed

is just the (meaning of the) verb *talk to*, and not that of the entire VP that it heads. Then rather than (157), we would have (160), which by proper λ -conversion/reconstruction would lead to (161), and then to (162), the desired interpretation:

$$(160) \lambda \Phi (\forall x (\Phi(x)(\text{Max}') \rightarrow \Phi(x)(\text{John}')))(\lambda x_i [\text{talk-to}'(x_i)])$$

$$(161) \forall x (\lambda x_i [\text{talk-to}'(x_i)](x)(\text{Max}') \rightarrow \lambda x_i [\text{talk-to}'(x_i)](x)(\text{John}'))$$

$$(162) \forall x (\text{talk-to}'(x)(\text{Max}') \rightarrow \text{talk-to}'(x)(\text{John}'))$$

The trick involved here is to provide for a prior encoding of a to-be-resolved dependency (regardless of the adicity of the predicate), which would subsequently allow for proper λ -conversion, resulting in a circumstance, as Larson observes, where although reconstruction has been made semantically explicit, this is done at the cost of abandoning the notion that reconstruction is defined relative to VP-meanings per se. Antecedent-contained deletion would therefore not be of a piece with other forms of verb phrase ellipsis, where a VP-meaning, not a transitive VP-meaning, is reconstructed.³²

Setting aside general problems afflicting this approach (e.g., those of the eliminative puzzles), it is of some interest to consider how the meaning reconstruction/storage approach fares with the previously discussed cases of interaction between antecedent-contained deletion and anaphora. After all, we have made a virtue of the manner in which an LF-based approach allows for proper application of Binding Theory. The needed extensions are provided by Partee and Bach (1984), and assumed by Rooth (1981). The idea is that there is an additional store, the Local Pronoun Store (LPST), into which the indices of pronouns are entered; their anaphoric possibilities are then derived from conditions on the stores. So, for instance, the not-coreference of the NPs in *He saw him* follows from requiring that the NP pronoun store, which contains the index of the subject NP, and VP pronoun store, which contains the index of the object NP, have no members in common: if these NPs are coindexed, then the stores will have a nonnull intersection. The conjointness in *He believes Max saw him* arises from conditions requiring that the LPST of S be null, so that the indices of the pronouns will not be passed up to the pronoun store of the

32. In requiring that a transitive verb phrase be reconstructed, the storage approach is like the approach of Cormack (1984) and Jacobson (1991) stated in terms of categorial grammar. For problems endemic to this class of treatments, see footnote 15.

higher VP. With this much in mind, consider the analysis of (85), repeated here:

(85) Mary introduced him to everyone that he did

In giving its composition, the elided VP would be translated as a VP variable, which would then combine with the pronoun, the index of which would be placed in the LPST. This index would then be discharged from the store, at the point of composition of the relative clause, just as it would in the analysis of *Mary introduced him to everyone he likes*. The translation in (163a) would be built up, via storage and retrieval, and (163a) would in turn be converted into (163b):

- (163) a. $\lambda\Phi[\forall x(\Phi(x)(\text{he}') \rightarrow \Phi(x)(\text{Mary}'))](\lambda x_1[\text{introduce}'(\text{him}')(x_1)])$
 b. $\forall x(\text{introduce}(\text{him}')(x)(\text{he}') \rightarrow \text{introduce}(\text{him}')(x)(\text{Mary}'))$

In this translation, however, there is nothing that blocks the pronouns from being coindexed and hence coreferential. But the pronouns in (85), as discussed, must be not-coreferential. Thus, the approach fails here, just as it fails to characterize the difference between (164a) and (164b):

- (164) a. Mary introduced him to everyone that he wanted her to
 b. *Mary introduced him to everyone that she wanted him to

This is because in general the indices of embedded pronouns are not retained in the LPST associated with the meanings of higher constituents.

It might be argued that a way to circumvent this problem could be constructed, based on the observation that after reconstruction (λ -conversion) in (163b), the two pronouns are coarguments of a predicate. The LPST could then be recalculated at this point to account for the observed facts. This would be a rather curious direction to take, however. First, it would mean that to get the right result, we would have to map one semantically equivalent translation into another— λ -conversion, so to speak, is “meaning preserving.” Second, in a storage system meanings are calculated over syntactic representations; hence, if there is to be a recalculation, there must be a new syntactic representation. But this is not what (163b) is; rather, it is a translation, a meaning, associated with exactly the same syntactic structure as (163a). And finally, and perhaps most egregiously, allowing such a recalculation would undermine the very notion of compositionality that the storage approach seeks to implement: once the meanings of the parts are composed, one doesn’t want to have to go back and compose those very sentence parts again. In contrast, the theory of ellipsis we are espousing does not violate even the spirit of composi-

tionality. This is because reconstruction is syntactic, and is accomplished prior to interpretation, in deriving LF. Once such structures are obtained, the calculation of anaphora and the determination of meaning can proceed, in a strictly compositional manner.

These considerations lead us to dismiss the semantic alternative to logical form. What of the syntactic alternative, which also eschews this notion? On one form of this view, the elided VP, although lexically unspecified at S-Structure (and perhaps also D-Structure), is *not* categorially unspecified, so that the structure of *Dulles suspected everyone that Angleton did* would be exactly the same as that of the nonelliptical *Dulles suspected everyone that Angleton suspected*. The two would differ only in their lexical realizations. One apparent advantage of this approach is that antecedent-contained deletion would be a misnomer, and any matter of reconstruction turning on LF or LF movement would be moot. A treatment that makes reconstruction explicit in this fashion has been broached by Lappin (1991) and Lappin and McCord (1990).³³

A number of problems arise on this approach. First, since it disassociates quantifier scope and reconstruction scope, it cannot account for their interactions. For instance, there would seem to be no reason that we could not have narrow quantifier scope with broad reconstruction, a circumstance that is not possible (recall section 6.2). Second, since the structure of elided VPs would be all there is at S-Structure, it ought to be possible to define Binding Theory at this level. If getting the binding facts “right” requires looking at “reconstructed” structure, then since this structure is present at least at S-Structure, representations at this level should be equal to the task. For many cases this is indeed so. To take but one example, recall (67):

- (67) *Mary introduced John to everyone that he did

33. Lappin (1991) takes the view that whereas antecedent-contained deletion involves categorial specification, standard ellipsis does not, the elided VP being empty in this construction at LF. He bases this on a putative contrast between *I know which book John read and Mary didn’t* and *I know which book John read and which book Mary didn’t*, finding the latter marginal relative to the former. The reason for this, according to Lappin, is that since the VP is empty in the latter case, there is no trace for the second *wh*-phrase to bind. Operator vacuity, however, standardly gives rise to strong ungrammaticality, and at best the case in question is only marginally ill formed, if ill formed at all. Lappin proposes that this sentence can be “repaired” by copying at another level, presumably LF. But if such copying is available for this type of ellipsis, why not for antecedent-contained deletion? See May 1991.

Its hypothesized S-Structure representation would be something like (165):

- (165) [_{IP} Mary [_{VP} [_V introduced] [_{NP} John]₁] [_{PP} [_P to] [_{NP} everyone] [_{CP} that [_{IP} he₁ [_{VP} [_V e] [_{NP} e]₁] [_{PP} [_P e]] [_{NP} e]]]]]]]]]

Since the layered trace contains a category corresponding to the NP *John*, and since this category is c-commanded by the pronoun, a Principle C violation ensues. This line of reasoning can be extended to many of the other cases we have explored, although notice that it will have to incorporate vehicle change to accommodate sentences such as *Mary introduced John to everyone that he wanted her to* (= (100a)), which allow coreference. One should not be led astray by such demonstrations, however. This is because, with respect to Binding Theory, S-Structure and LF are in a feeding/bleeding relation. Any case in which S-Structure Binding Theory violations are *bled* through the derivation onto LF will remain unaccounted for. Recall the following examples:

- (73c) Mary introduced him to everyone that John's mother wanted her to
 (95) a. Mary introduced him to everyone that John wanted her to
 b. *Mary introduced him to everyone that she wanted John to

Each of these, as it stands, violates Principle C; amelioration is afforded, as described, via the derivation to LF. But if only S-Structure is available—with or without elided structure specified—then these should all display not-coreference effects. Thus, (166) contrasts minimally with (73c), and (167) with (95a), where (166) and (167) lack the readings indicated by the indices:

- (166) *Mary introduced him₁ to everyone that John₁'s mother introduced him₁ to
 (167) *Mary introduced him₁ to everyone that John₁ wanted her to introduce him₁ to

On the approach under consideration, there should be no difference between the elided and nonelided sentences. Similarly, there should be no difference between (78) and (84), repeated here:

- (78) The men introduced each other to everyone that the women did
 (84) The men introduced each other to everyone that the women introduced each other to

There is no apparent reason why there should be an additional strict reading created by ellipsis in (78), since here too the elided and nonelided

forms should be indistinguishable for Binding Theory. These considerations therefore lead us to reject this syntactic alternative as well.

The view of reconstruction we have defended is one in which elliptical material is syntactically specified at LF and, we have assumed, at other levels as well. Standardly, syntactic structure is lexically projected, licensed by the selectional and thematic information encoded in lexical entries. But this is precisely what does *not* happen in ellipsis: ellipsis is the *absence of lexical projection*. But from this it does not follow that ellipsis also involves *absence of structure*, only that this structure has not been licensed lexically. Projection of elliptical material is instead determined *structurally*, by conditions that determine structural identity. That is, elliptical structure is licensed by its relation to other, lexically projected, structure. This difference between structural and lexical projection is just the difference between elided and nonelided material. It is only at the point in a derivation at which the identity condition is satisfied that a structure containing ellipsis can be said to be projected, and the elided material reconstructed. Prior to its projection, then, elided structure although syntactically present is, to all intents and purposes, invisible. Only when it is projected can it fall under the purview of grammatical principles.

Antecedent-contained deletion is of special interest here. This is because the elided structure it contains can only be projected at LF. Prior to QR, the antecedence condition for the elided VP simply is not satisfied; no noncircular structural projection can be established without LF movement. For antecedent-contained deletion, QR is tantamount to reconstruction; it is a reflex of this operation. Once such movement occurs, the antecedence condition is satisfied, and the structure projects, that is, becomes visible. At prior levels the structure, although present, would be dysfunctional, since it is unprojected. Syntactic constraints become applicable at the point of projection, since constraints apply only to projected structure. Thus, conditions that involve the elided material in antecedent-contained circumstances will become applicable only at LF, and not at prior structural levels.

Consider the case of Binding Theory. It applies to indices borne by various elements: it is with respect to occurrences of indices that the crucial notions of bound and free are defined. For Binding Theory to be applicable to an element, then, its index must be structurally projected. An index is projected, let us say, just in case *all* of its occurrences appear within the projected structure. The indices in (168a) and (168b) will count as projected by this definition:

- (168) a. *He₁ suspected everyone that Angleton₁ investigated
 b. *He₁ suspected everyone that Angleton₁ did

Binding Theory will be applicable to both, making them cases of not-coreference. This is so, even though these cases differ in that only in (168a) does the projected structure exhaust the phrase marker; (168b), in containing elliptical material, is only partially projected at S-Structure. The unprojected structure contains no occurrence of the relevant index. This is not the case, however, in (169), the S-Structure representation of *You introduced him to everyone that John wanted you to*, which allows coreference:

- (169) You introduced him₁ to everyone that John₁ wanted you to
 introduce him₁ to *t*

Here there are occurrences of the index that fall outside the projected structure; hence, the well-formedness of this index cannot yet be evaluated. This will become possible after reconstruction. Therefore, Binding Theory will become applicable just at LF, with respect to the fully projected structure (170):

- (170) everyone that John₁ wanted you to introduce him₁ to *t* [you introduced him₁ to *t*]

Now all occurrences of the index are within the projected material; hence, the index itself is projected and may be evaluated by Binding Theory. On the other hand, the index will be projected in the S-Structure representation of *You introduced him to everyone that John likes*, correctly occasioning a Principle C violation. A Principle C violation also ensues in (171), where we take the ellipsis as non-antecedent-contained:

- (171) I introduced him to everyone that John wanted me to meet, and
 you introduced him to everyone that John wanted you to

Although the second clause is string identical to (169), where the ellipsis is antecedent-contained, it differs in that the index is projected (since here the ellipsis corresponds to *meet t*).³⁴

The view we are advancing is that strings must be associated with well-formed phrase markers at every level of representation, up to projectability; that is, whatever *part* of a string's structure is projected must be well formed. Full projectability, required at LF, is the syntactic face of

full interpretation. Antecedent-contained deletion is a case in point where there will be structures that are fully projected at certain levels (LF), but only partially projected at others (D-Structure, S-Structure). Because of this, antecedent-contained deletion allows us to isolate phenomena peculiar to LF; but with other types of ellipsis, matters can be determined at other levels, since the conditions determining projection can be satisfied at other levels. The approach to reconstruction we are advocating thus partially answers a central question raised by our observations regarding Binding Theory and other grammatical conditions: At what level of representation do they apply? The answer is, with respect to indices, the level at which those indices are projected. Clearly, our view has wide-ranging consequences for the theory of grammar, for it says that a sentence need not be projected at all levels to have a well-formed syntactic structure. Exploring these implications, however, will have to wait for future research.

34. We would like to thank K. Johnson for bringing these considerations to our attention.