

## SLUICING AND LOGICAL FORM\*

This paper presents a novel analysis of Sluicing, an ellipsis construction first described by Ross (1969) and illustrated by the bracketed portion of *I want to do something, but I'm just not sure [what \_]*. Starting from the assumption that a sluice consists of a displaced Wh-constituent and an empty IP, we show how simple and general LF operations fill out the empty IP and thereby provide it with an interpretable Logical Form. The LF operations we appeal to rely on the influential theory of indefinites developed by Irene Heim and Hans Kamp, and are in harmony with certain aspects of Chomsky's Minimalist Program for linguistic theory. The analysis accounts directly for the familiar properties of Sluicing, as well as some facts which have not previously been observed.

### 1. INTRODUCTION

Sluicing is the name given by Ross (1969) to the ellipsis construction bracketed in (1):

- (1) a. Somebody just left – guess [who]. (Ross 1969, 252)  
b. They claimed they had settled on something, but it wasn't clear [what].

In this construction, a displaced Wh-phrase occurs in isolation in a syntactic environment where one might have expected to find a complete constituent question. Compare the sluices in (1) with the corresponding complete embedded questions in (2):

- (2) a. Somebody just left – guess [who *t* just left].  
b. They claimed they had settled on something, but it wasn't clear [what they had settled on *t*].

Working within classical transformational theory, Ross argued that Sluicing sentences were derived from complete constituent questions by a deletion transformation. The transformation he proposed was noteworthy in several

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ways: the deleted material evidently did not form a constituent, and the deletion itself, though unbounded, did not observe island constraints.

Our approach to the analysis of Sluicing is different from Ross's. Starting from the assumption that there is no content in the d-structure of a sluice corresponding to the ellipsis, we ask how this radically reduced structure is interpreted. Our answer is that the interpretation is read off a Logical Form which is constructed for the sluice via simple and principled LF operations.

Here we present and motivate the LF operations that supply a Logical Form for sluices. Our overall aims are two: First, we argue that our LF approach offers the best available account of Sluicing (other accounts can be found in Ross 1969; Rosen 1976; Williams 1977; Levin 1982; Chao 1987; Lobeck 1991, 1992; and Ginzburg 1992). Second, we show that the LF operations we appeal to are both general and well-behaved – almost expected – from the viewpoint of current syntactic and semantic theory. If we are correct, then the existence of this ellipsis construction, which seemed rather arcane when first documented by Ross, follows immediately from the overall architecture of the LF component and the operations it makes available. In this sense, our investigation can be read as an extended argument in favor of a certain conception of Logical Form.

A central element of our account is the idea that the Logical Form created for the sluice must supply a free variable for the interrogative operator to bind. This aspect of our analysis depends on the influential theory of indefinites developed by Irene Heim (1982) and Hans Kamp (Kamp 1984; Kamp and Reyle 1991). It leads us directly to an account of some curious restrictions which, as far as we know, have not been observed before, and which constitute our main empirical contribution to the study of Sluicing.

Also central to our approach is the idea that the Logical Form created for the sluice reuses (or recycles) available linguistic structure, which can then be further elaborated. This idea leads us to a specific conception of the relationship between argument structure and syntactic structure – one which clearly violates the Projection Principle of Chomsky (1981), but which is remarkably compatible with the view of grammar sketched in Chomsky's (1993) 'Minimalist Program for Linguistic Theory'. We defend this conception against pure deletion approaches to Sluicing, of the sort advocated by Ross (1969) and (for different sorts of ellipsis) Fiengo and May (1994) and Chomsky (1993). As we show, only our approach handles the empirical complexity of Sluicing's interaction with the constraints on movement – a complexity first observed in unpublished work by Chris Albert.

Section 2 presents Sluicing in a nutshell, classifying the basic facts which

any adequate analysis will have to account for. Sections 3–5 present our analysis and show how it accounts for the facts. The analysis and its conceptual underpinnings are compared with other approaches to Sluicing in Section 6, and then refined further in Section 7. Finally, Section 8 returns to the LF operations that constitute the core of our analysis, drawing out their larger implications for syntactic theory and the theory of Logical Form.

## 2. SLUICING: THE BASIC CASES

The classical examples of Sluicing discussed by Ross (1969) and others fall into three groups, which can be characterized informally as follows.

In the first group, the *displaced constituent* – the Wh-category which constitutes the only overt material in the sluice – is an adjunct that corresponds to nothing in the surrounding linguistic structure:

- (3) a. He's writing, but you can't imagine where/why/how fast/with whom. (Ross 1969, 252)  
 b. This opera was written in the 19th century, but we're not sure by whom.  
 c. If Sam was going, Sally would know where.

In the second group, the displaced constituent corresponds to an overt adjunct or argument in the surrounding linguistic structure. In all the examples in the literature, this *inner antecedent* happens to be an indefinite or other weak DP:<sup>1</sup>

- (4) a. He's going to give us *one old problem* for the test, but which problem isn't clear. (Ross 1969, 255)  
 b. She's reading *something*. I can't imagine what.  
 c. They're going to serve the guests *something*, but it's unclear what.

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<sup>1</sup> The displaced constituent in the sluice of (3b) is a PP. Note that P and its object may invert as in (4d) – a fact first noted by Ross (1969, 265–266), who analyzed the inverted P as a stranded preposition. The viability of Ross's original analysis is questioned by Rosen (1976, 208–209), who observes that inversion is more restricted than a preposition stranding analysis would predict. We claim that inversion is (idiosyncratically restricted) movement of P's complement to its specifier (as seen more productively in other Germanic languages). This enables us to maintain – contra Ross – that, even when inversion has occurred, the s-structure of the sluice contains a displaced PP and a completely null IP. In any event, whatever the best analysis, inversion is one of the distinguishing characteristics of Sluicing. For this reason, we often cite sluices with inverted PP's to verify that we are indeed dealing with Sluicing and not some other kind of ellipsis.

- d. This opera was written *by someone* in the 19th century, but we're not sure by whom/who by.
- e. If Sam was going *somewhere*, Sally would know where.

Finally, in the third group, the displaced constituent corresponds to an implicit argument – an element licensed by the argument structure of the surrounding linguistic material, but not overtly expressed:

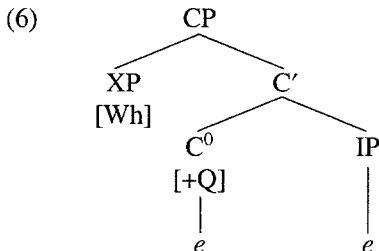
- (5) a. She's reading. I can't imagine what.
- b. He shouted again, but I don't know to whom/who to.
- c. They're going to serve the guests, but it's unclear what.

Any adequate analysis must account for the existence of sluices of these three types. It must also account for the fact that the sluices in (3)–(5) are interpreted the way they are; in other words, as complete constituent questions.

Finally, we assume that Sluicing is a unitary phenomenon – that is, the three subcases of (3)–(5) deserve a unified analysis. We take this stand because every language known to us exhibits Sluicing for all three cases. If the three types represented different analytical phenomena, this co-occurrence would be accidental and mysterious.

### 3. IP RECYCLING, SPROUTING, AND MERGER

Let us begin by adopting the X-bar theory of Chomsky (1986), according to which the X-bar principles extend to functional and lexical heads alike. Let us assume further that the syntactic representation of ellipsis consists of categories, either heads or maximal projections, that happen to be null (see Wasow 1972). This combination of assumptions admits the s-structure for Sluicing shown in (6). The sluice consists of an interrogative CP whose specifier is occupied by the displaced constituent, but whose C<sup>0</sup> and IP subconstituents are null (see Lobeck 1991):



The task of interpreting Sluicing is to derive a question type meaning for

the defective structure (6). As already stated, our strategy is to construct a Logical Form for the sluice from which the question type meaning can be determined. Our fundamental contention is that if a legal LF can be constructed for the sluice, then the sluice *has* an interpretation, one similar in all relevant respects to the interpretation of the corresponding constituent question. But if the sluice is uninterpretable, then that can only be because no legal LF can be constructed for it.

Specifically, following the tradition of interpretive approaches to ellipsis (Wasow 1972; Williams 1977; Chao 1987), we propose to remedy the defects of (6) by supplying the empty IP with a more articulated internal structure. We do this by reusing the content of some discourse-available antecedent IP, via a process we call *recycling*. IP recycling is, we assert, a very general LF operation; the existence of Sluicing follows simply from the ability to license s-structures containing subtrees like (6).

Since the end result of recycling must be a structure interpretable as a constituent question, we now lay out our assumptions about the interpretation of constituent questions in general.

### 3.1. *The Interpretation of Interrogative CP's*

Consider (7), which contains the embedded question whose syntactic structure is shown in (8):

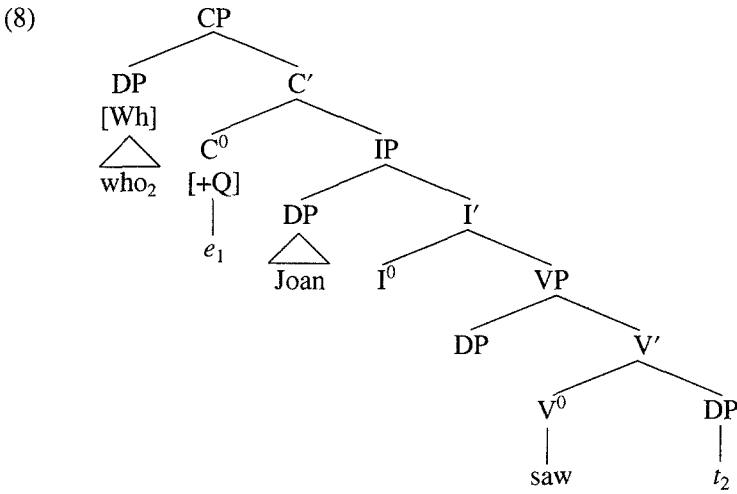
(7) I wonder [who [Joan saw *t*]]

We assume that this sentence expresses the claim that the speaker stands in the wonder relation to the question meaning expressed by the complement CP. For concreteness (and following Hamblin 1973; Karttunen 1977; Berman 1991; Lahiri 1991; Chierchia 1992), we take the meaning of the complement CP to be a set of propositions that represents its answer space, in this case, the set of propositions denoted by the intensional logic formula in (9).<sup>2</sup>

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<sup>2</sup> So far, we have not found any crucial reason to prefer this over the 'partition' approach of Higginbotham and May (1981) or Groenendijk and Stockhof (1982). Nor is the issue of restricting membership in this set of true propositions at issue here.

We will assume that every embedded question contains an interrogative operator, despite the analysis of the so-called Quantificational Variability Effect for complement questions (Berman 1991; Lahiri 1991), because, as far as we know, it is irrelevant for our present concerns.



(9)  $\lambda p[(\exists x : person(x))[p = \wedge[see(Joan, x)]]]$

Such an interpretation is, we assume, read off a Logical Form for (8) which conforms to the following syntactic and semantic specifications, which jointly define a constituent question.

On the syntactic side, the displaced constituent must syntactically bind a position within the IP complement of C<sup>0</sup>. On the semantic side, the displaced constituent must contain a Wh-indefinite that is interpreted as a variable semantically bound by an interrogative operator. Third and finally, the displaced constituent must contribute to semantic interpretation just as if it were sitting in the syntactically bound position. These requirements govern how the parts of the structure in (8) are composed to yield the set of propositions in (9).

In the specific context of Berman's (1991) proposals, constituent questions are tripartite quantification structures. In this conception, three elements are crucial to the building of the interpretation in (9) – the interrogative operator, a nuclear scope, and a restrictive clause. The nuclear scope provides a propositional function ( $[see(Joan, x)]$  in (9)). The restrictive clause defines restrictions on the domain of this propositional function, and the interrogative operator forces the interpretation as a set of propositions.

In structure (8), the CP consists of an invisible interrogative complementizer; the displaced constituent, which contains a Wh-indefinite; and an IP containing an empty category syntactically bound by the displaced constituent. The empty complementizer is identified with the interrogative operator (Q-operator). The displaced constituent supplies the restrictive clause, which in this case restricts the Q-operator to persons.

In (8), the displaced constituent is simply the interrogative pronoun. In such cases it is relatively harmless to identify the trace in object position with the variable targeted by the Q-operator. In the general case, however, this identification is pernicious. The content of the displaced constituent and the interrogative variable diverge when material has been pied-piped, as in (10):

- (10) They asked [<sub>CP</sub> in whose house<sub>i</sub> [<sub>IP</sub> John slept  $e_i$ ]]

In such cases, the IP does not supply all of the information needed to formulate the propositional function which serves as the nuclear scope of the Q-operator. The answer space of this question contains not propositions about places where John slept, but rather propositions about individuals such that John slept in their house. That is, the complement must be interpreted exactly as if the displaced constituent consisted only of the interrogative pronoun, as in (the ungrammatical) (11):

- (11) [<sub>CP</sub> who<sub>j</sub> [<sub>IP</sub> John slept in  $e_j$ 's house]]

This divergence between what the syntax moves and what the semantics requires for correct interpretation has been dealt with by various strategies, all of which have the same goal: to assimilate the interpretation of (10) to the more straightforward interpretation of (11). This, for instance, is the effect of (Wh-)reconstruction (see May 1985, 79). Whatever strategy is chosen, we claim that its intent is to satisfy our third specification: the displaced constituent should contribute to semantic interpretation just as if it were sitting in the (syntactically) bound position within IP.

The distinction between the syntactic binding created by movement and the semantic binding relevant to interpretation will be important below. Therefore, we have chosen to make the difference explicit by using subscripted letters in the range [ $i-k$ ] to indicate syntactic binding and superscripted letters in the range [ $x-z$ ] to indicate semantic binding. These conventions yield the more complete representations shown below:

- (12) [[in whose<sup>x</sup> house]<sub>i</sub>  $e^x$  [John slept  $e_i$ ]]

- (13) [[who<sup>x</sup>]<sub>i</sub>  $e^x$  [Joan saw  $e_i$ ]]

Syntactic movement insures that a constituent interpreted with a semantic variable bound by the Q-operator is located within the specifier of CP.

### 3.2. *IP Recycling*

What does this view of constituent questions tell us about the interpretation of Sluicing? Consider the sluice in (14):

- (14) A: John said Joan saw someone from her graduating class.  
 B: I wonder who.

Without an internally articulated IP, the LF of the complement CP in (14) would be defective in two ways. First, the displaced constituent would not syntactically bind any position in the IP, and consequently would have no way to contribute to the interpretation of the sentence – a violation of Full Interpretation. Second, the empty IP would provide no content for the nuclear scope of the Q-operator, thereby violating the ban on vacuous variable binding.

IP recycling remedies both defects. Put differently, a good interpretation for Sluicing results when and only when the solution to the first problem provides a solution to the second.

IP recycling can be thought of as copying the LF of some discourse-available IP into the empty IP position. However, simply filling the empty IP with content will not be enough. The displaced constituent must be syntactically coindexed with an appropriate position inside the IP, in such a way that the IP can be interpreted as a nuclear scope for the interrogative operator.

## 4. SPROUTING

In the first and third subtypes of Sluicing (e.g. (3) and (5)), the recycled IP does not come supplied with a syntactic position for the displaced constituent to bind. When such a position does not already exist, it must be created, by an additional part of the recycling process we call *sprouting*.

Sprouting is, we claim, a freely available process for building structure in a Logical Form, subject only to the constraints of X-bar theory and the requirement that the structures created be licensed by the appropriate properties of the elements in the LF. Sprouting contributes to the construction of an LF for the sluice in (15) in the following way.

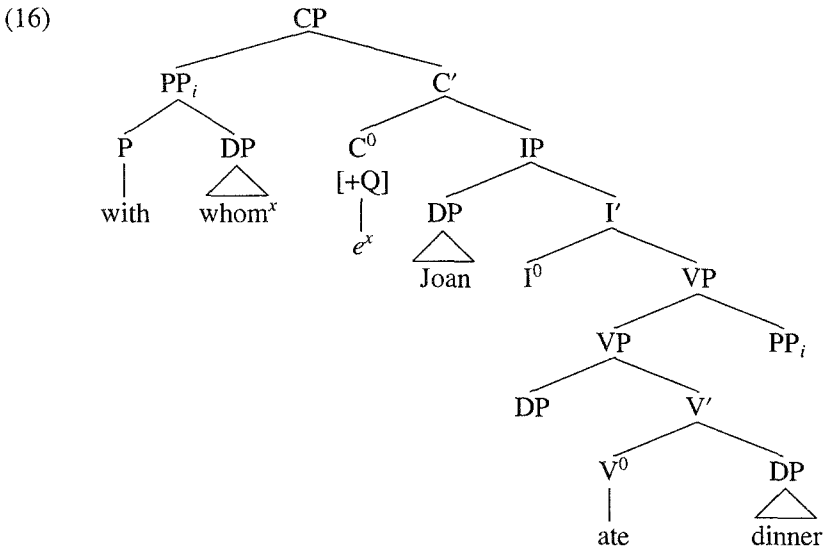
(15) contains only one internally articulated IP whose LF can be recycled into the IP of the sluice: namely, the LF of *Joan ate dinner*.

- (15) Joan ate dinner but I don't know with whom.

Once this LF is copied into the IP of the sluice, there is still no appropriate syntactic position for the displaced constituent to bind, until the defect is remedied by sprouting an extra PP-position, as shown in (16).



With sprouting and subsequent syntactic binding of the empty PP by the displaced constituent, the two defects of the LF are remedied. The displaced constituent can now be interpreted as if it occupied the position of the syntactic category it binds. Further, given that the displaced constituent can be interpreted as a comitative adjunct, the recycled IP can be interpreted as a proposition open on the semantic variable bound by the Q-operator. A good interpretation for the sluice has been achieved.



Of course, sprouting could have provided any number and variety of categories in the LF. But the overall requirement that LF's be interpretable serves to restrict the operation of sprouting to just the cases for which it is useful. Two constraints in particular deserve mention. First, sprouting must provide a syntactic constituent of the right category type for the displaced constituent to bind (e.g., a PP, and not some other category, in (16)). Second, the sprouted category must satisfy the licensing constraints imposed by lexical items within the recycled IP. Included here are requirements of argument structure, on the one hand, and constraints on the licensing of adjuncts, on the other.

It has been clear since Ross (1969) that the displaced constituent must satisfy the particular licensing requirements imposed by the argument structure of lexical items in the antecedent IP (see below and also the discussion of Section 6.2). This is illustrated, for instance, by the sluices in (17) and (18), which are uninterpretable:

(17) \* John ate dinner but I don't know who(m).

(18) \* She mailed John a letter, but I don't know to whom.

In (17), the problem is that the argument structure of the verb *eat* has all its positions satisfied, and there is no way to license the sprouting of an additional DP within the recycled IP. In (18), the argument structure of *mailed* has all its positions satisfied, leaving no way for an additional goal PP to be licensed.

The sprouting of complements must be sensitive to details of the particular *use* of the verb within the antecedent IP. An instructive case is provided by the ditransitive verb *serve*, which has two different argument structures, given in (19) in the style of Levin and Rappaport (1968):

- (19) a. *server* <meal (*diner*)>  
 b. *server* <diner (*meal*)>

The argument structures in (19a) and (19b) license the examples in (20a) and (20b), respectively:

- (20) a. I served leek soup (to my guests).  
 b. I served my guests (leek soup).

Consider now the Sluicing examples in (21). Of interest is the fact that the displaced bare DP *who* in (21b) is uninterpretable, but the displaced *what* in (21c) is fine:

- (21) a. She served the soup, but I don't know to whom.  
 b.\*She served the soup, but I don't know who.  
 c. She served the students, but I don't know what.

Evidently, the argument structure of *serve* is responsible for this contrast. The use of *serve* found in the antecedent IP of (21a–b) is licensed by the argument structure in (19a). Consequently, the antecedent IP can be legally extended only by the sprouting of a new dative PP – a PP corresponding to the optional argument of (19a), which comes to be bound by the displaced constituent *to whom* in (21a). In order for the anomalous (21b) to be interpreted in a way consistent with normal assumptions about who and what gets served, a DP argument would have to be sprouted for the Wh-phrase *who* to bind. But since the use of *serve* in the antecedent IP corresponds to (19a) rather than (19b), this extension is not licensed. (21c) works differently. In this case, the use of *serve* found in the antecedent IP is licensed by the argument structure (19b), which includes an optional DP argument. As a consequence, a DP argument can be sprouted to legitimize the sluice, and the example is well-formed. We will return to these examples later. Let us point out here, however, that they indicate that the verb of the recycled IP must represent exactly the same lexical choice as is made in the antecedent IP.

This effect is quite general. Consider, as an additional case, the contrast in (22), observed by Levin (1982):

- (22) a. She was reading, but I couldn't make out what.  
 b.\*She was bathing, but I couldn't make out who.

(22a) is straightforward. The verb *read* has an optional second argument, unrealized in the antecedent IP of (22a). When the antecedent IP is recycled, however, and integrated into the sluice, the ability to license the second argument becomes important. An extra DP is sprouted and provides the crucial variable for the Q-operator to bind. The lexical entry for intransitive *bathe* must be different, however. It must indicate an obligatory binding relationship between its subject and (implicit) object arguments. There is, obviously, no such restriction in the case of transitive *bathe*. But when the antecedent IP is copied into the sluice, the restriction associated with the intransitive use of the verb will necessarily be inherited; then the object position of *bathe* in the sluice will be unavailable for further binding by the Wh-phrase, and the ungrammaticality of (22b) is expected.

Adjuncts, we claim, must also be licensed. The examples in (23) are ungrammatical because inappropriate adjuncts have been used:

- (23) a. \* She knew French for Tom.  
 b. \* The ship sank with a torpedo.  
 c. \* They noticed the painting for an hour.  
 d.?\*John is tall on several occasions.

As a consequence, the sluices in (24) are also ungrammatical. In each case, the sluice requires the antecedent IP to be extended by the sprouting of an adjunct. What goes wrong is that the kind of adjunct the Wh-phrase must bind – a *for*-PP in (24a), for instance – is not licensed by the content of the recycled IP.

- (24) a. \* She knew French, but I don't know for whom.  
 b. \* The ship sank, but I don't know with what.  
 c. \* They noticed the painting, but I don't know for how long.  
 d.?\*John was tall, but I don't know on what occasions.

The examples in (3) above illustrate the range of adjuncts permitted in Sluicing. All require sprouting as part of their interpretation. Though the adjunct or argument is in some cases semantically implicit in the antecedent IP, this is by no means required. We discuss the relation between sprouting and implicit arguments below.

In short, sprouting is not an unconstrained operation. Rather, it is limited by the requirement that the new material added to the copy of the antecedent

IP respect the licensing potential of that IP, as regards both arguments and adjuncts, and in all its fine detail.

### 5. INNER ANTECEDENTS AND MERGER

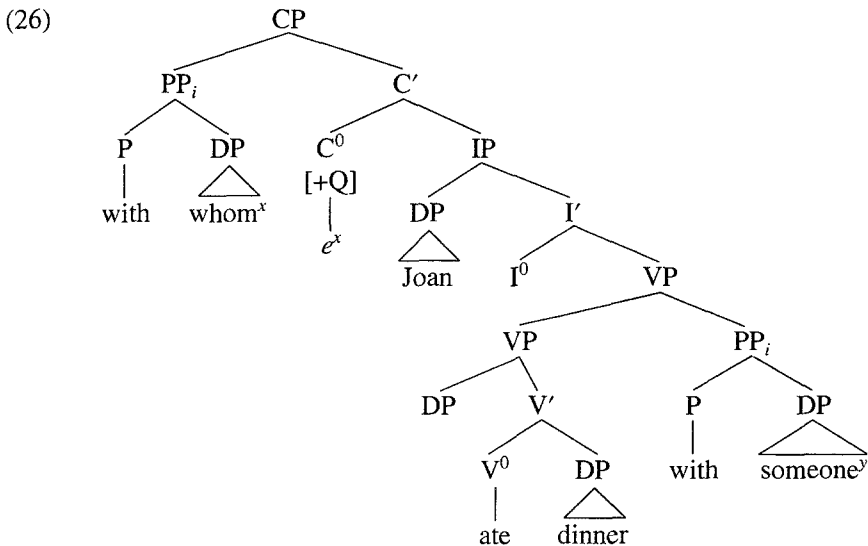
Examples such as (25) represent the second subtype of Sluicing:

- (25) Joan ate dinner with someone but I don't know who (with).

The central feature of these cases is that the antecedent IP contains a phrase (what we have called the *inner antecedent*) whose position in the antecedent IP corresponds to the position bound by the displaced constituent of the sluice. Here we demonstrate that the notion of IP recycling, simple as it may seem, accounts for the puzzling fact that such examples are interpretable at all. Second, we show that certain restrictions exhibited by these cases follow directly from our hypothesis, once it is combined with further assumptions that are independently motivated.

#### 5.1. Merger

Consider the Logical Form of the sluice in (25). The result of simply recycling the antecedent IP into the sluice is shown in (26).



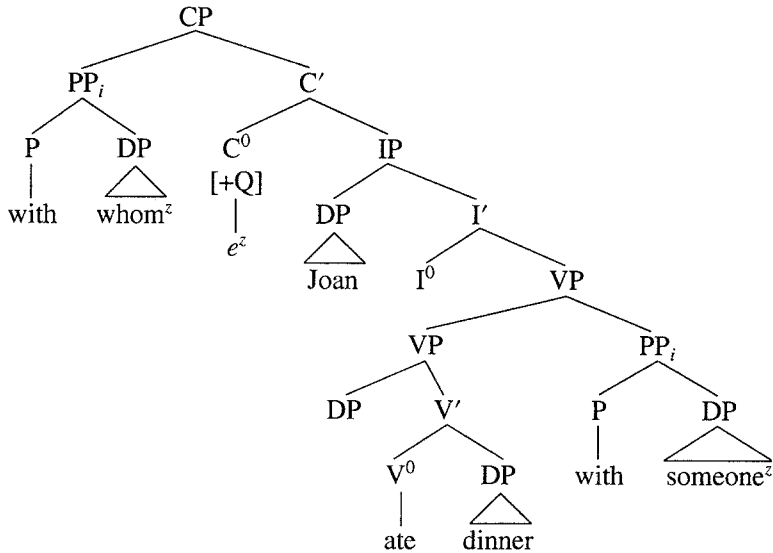
How can such a structure be interpreted?

Under the Kamp/Heim theory of indefinites, an indefinite like *someone* is interpretable not as a referential expression, but rather as a referential parameter whose domain of values is restricted by the content of the term. As it is usually expressed, indefinites are interpreted as ‘restricted free variables’, available for discourse-level assignment of a referent or for binding by some other operator. We assume (following Nishigauchi 1986, 1990; Berman 1991; Li 1992; and ultimately Chomsky 1963) that Wh-pronouns and all weak DP’s can be interpreted in this way. That being so, the IP of (26) can be interpreted as a propositional function, open on the variable associated with the indefinite. This means in turn that the LF in (26) is not different in essential respects from the tripartite quantification associated with any question (see Section 3.1 above and also Section 8 for an extended discussion of the implications of this view). All that happens is that the variable bound by the Q-operator must be restricted by the lexical content of two phrases – the Wh-indefinite and (the relevant subportion of) the inner antecedent. The inner antecedent occupies the position which would have been occupied by the trace of Wh-movement in the full question corresponding to (25). We have already seen that the displaced constituent must be interpreted as if it occupied that position. Therefore, the task of interpreting (26) and the task of interpreting the corresponding full question are fundamentally alike.

We will use the term *merger* for the process whereby the conditions on the semantic variable bound by the Q-operator are inherited from the content of two phrases, the Wh-indefinite and (the relevant subportion of) the inner antecedent.

Under what circumstances can merger succeed? (26) provides two pairs of items to be merged: *with* and *with*, and *whom* and *someone*. Evidently, these mergers succeed. That identical formatives should merge successfully into one occurrence does not seem surprising. It is the second merger that is crucial to an understanding of this type of Sluicing. The merger works, we claim, because the interpretive procedure does not distinguish between the parameters which interpret indefinites. Parameters with unspecified referents can be unified, inheriting the content of both indefinites. In our representations we have kept track of these parameters by superscripted variable names, so the merging of indefinites in (26) can be recorded by co-superscripting the two indefinites, as shown in (27).

(27)



As a result of coindexation, the displaced constituent is now linked with a syntactic position within IP, one which subsumes a free variable. As a consequence, the variable within the inner antecedent will be bound by the interrogative operator of the sluice. A further consequence is that the values of the variable will now be limited in two ways – by the lexical content of the inner antecedent, and by the content of the Wh-phrase of the sluice. As long as the two phrases do not contribute contradictory requirements, the result is an interpretable Logical Form. In (27), the final result is a set of propositions of the form *Joan ate dinner with  $x$* , where  $x$  is instantiated by individuals drawn from a set of persons. This is exactly what would result from the interpretation of the corresponding full question.

The effects of merger are relatively trivial in a case such as this, but they are not always so, as we will see in Section 5.2.

Our hypothesis, then, accounts straightforwardly for this subtype of Sluicing. More importantly, it generates a number of empirical predictions, which we now investigate.

These predictions center on the availability or not of the crucial free variable within the antecedent IP. The structure in (27) is interpretable exactly because the copied IP subsumes a referential parameter around which the propositional function [*Joan ate dinner with  $z$* ] can be constructed. If such a variable is not provided by IP recycling, then no interpretable LF will result and Sluicing should fail. This expectation is realized over a broad range of cases.

To begin with, Sluicing is predicted to fail when the potential inner antecedent introduces no variable at all. In such cases there would be nothing

available in the LF of the sluice for the Q-operator to bind. This expectation is most clearly borne out when the potential candidates for inner antecedent are referential expressions, such as names or demonstratives:

- (28) a.?\* I know that Meg's attracted to Harry, but they don't know who.  
 b.?\* Since Jill said Joe had invited Sue, we didn't have to ask who.  
 c. \* Because we suspected Joe had given it to Max, we then asked to whom/who to.

The fact that the corresponding constituent questions in (29) are well-formed reveals that there is nothing wrong with the interpretation ultimately intended for (28a–c). Rather, the problem is that there is no way of arriving at such an interpretation – in our terms, no way of constructing the LF from which the interpretation could be derived:

- (29) a. I know that Meg's attracted to Harry, but they don't know who Meg's attracted to.  
 b. Since Jill said Joe had invited Sue, we didn't have to ask who Joe had invited.  
 c. Because we suspected Joe had given it to Max, we then asked who he had given it to.

Necessarily quantificational DP's induce the same kind of failure:

- (30) a.\* She said she had spoken to everybody, but he wasn't sure who.  
 b.\* Each of the performers came in. We were sitting so far back that we couldn't see who.  
 c.\* She's read most books, but we're not sure what/which.  
 d.\* He attempted to argue for both positions. It was terribly unclear what/which.

This failure follows from the fact that such expressions denote generalized quantifiers. Consequently, the IP's containing them are quantificationally closed (in the absence of any other expression which might provide an unbound variable), and, when recycled, cannot function as the nuclear scope of the interrogative operator.<sup>3</sup>

Even though pronouns can be interpreted as 'variables', the variable they provide cannot function as the semantic variable for the sluice:

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<sup>3</sup> Alternatively, we might assume that as quantificational expressions they are subject to Quantifier Raising (QR), which leaves behind an empty category treated as a bound pronoun. Hence merger fails in this case for the same reason that it fails in the case of pronouns, on which see below.

- (31) \*Joan ate dinner with her, and they all wonder (with) whom/who with.

Evidently, there is a crucial difference in the way that pronouns and indefinites are assigned referents – a difference that groups pronouns with the other directly referential terms. We suggest, without going into detail, that the crucial difference is related to the observation that pronouns specify reference, whereas indefinites describe restrictions on reference. Expressions for which reference is specified do not provide a variable for merger. That pronouns should pattern with strong DP's in this is unsurprising, given that pronouns also resemble strong DP's in being excluded from the post-copular position of existentials (see the discussion in Heim 1987):

- (32) \*There were they/them on the fence.

Summarizing, the analysis developed so far predicts the range of contrasts seen in (33):

- (33)
- |                      |   |  |   |           |
|----------------------|---|--|---|-----------|
| Joan ate dinner with | { | someone<br>several students in her class<br>a woman from San Jose<br>*them<br>*most first year students<br>*every student in her class<br>*John<br>*nobody | } | and we're |
|----------------------|---|--|---|-----------|
- all wondering (with) who.

There is another set of circumstances in which our analysis predicts that Sluicing should fail. If the potential inner antecedent were to introduce a variable that was already bound, then such a variable should not be available for binding by the Q-operator.

According to the Kamp/Heim theory of indefinites, an indefinite typically suffers one of two fates – either it remains free, in which case it is available for discourse-level assignment of a referent, or else it falls within the scopal domain of some other operator. Consider (34), which is ambiguous:

- (34) She didn't talk to one student.

The ambiguity of (34) turns on the question of whether the indefinite (*one student*) is construed as falling outside or inside the scopal domain of the negation. On the former reading, the indefinite is free and establishes a discourse referent. On the latter reading, the indefinite falls within the scopal domain of negation. We will use the term *roofing* for the relationship



between a closure-inducing operator and an indefinite on such a construal, saying that on the relevant construal of (34), the indefinite is roofed by negation.

Now, when the indefinite in the potential inner antecedent has a binder or scopal 'roof' within the antecedent IP, it should be unable to support sluicing, for the following reason. When the antecedent IP is recycled, it is crucial that the indefinite in the inner antecedent be free. If the indefinite is already bound, then it could not simultaneously be bound by the Q-operator without violating the Bijection Principle (see Koopman and Sportiche 1982). Consequently, we expect merger to succeed only when the antecedent IP is interpreted in such a way that the inner antecedent is unroofed.

This prediction is correct. (35), for instance, is grammatical only if the antecedent IP is interpreted so that the indefinite has wider scope than negation:

- (35) She didn't talk to one student; I wonder who.

Significantly, such an interpretation is unavailable in (36):

- (36) a.\*They never talk to any students. It's unclear who/which.  
 b.\*She doesn't meet anyone for dinner. They can't figure out who.  
 c.\*No one signed any documents, but he's not sure what/which.

This is because the indefinite in such cases is a negative polarity item and therefore necessarily roofed by the negation. Sluicing is, as a consequence, impossible.

The effect is quite general. It is also seen, for instance, when a quantificational adverb, or a necessarily quantificational DP, roofs an indefinite in the antecedent IP:

- (37) a. She always reads *a book* at dinnertime. We can't figure out what/which one.  
 b. Everyone relies on *someone*. It's unclear who.  
 c. Both dogs were barking at *something*, but she didn't know at what/what at.  
 d. Each student wrote a paper on *a Mayan language*, but I don't remember which one.

The sluice in (37a), for instance, forces the reading of the antecedent IP on which there is something she always reads at dinner. Similar comments apply, *mutatis mutandis*, for all the examples in (37).

This effect follows from our account. In (37a), if the inner antecedent is already bound by *always* in the antecedent IP, the merged indefinite will have two binders (the other binder being the Q-operator):

- (38) [what<sub>i</sub><sup>x</sup> e<sup>x</sup> [always<sup>x</sup> she reads something<sub>i</sub><sup>x</sup> at dinner]]

Assuming that a given bound variable is bound by exactly one operator, the result will be an ill-formed Logical Form.

Ambiguous sluices can arise when the discourse supplies more than one potential antecedent IP for recycling. Consider the sluice in (39), which can be interpreted as (40a) or (40b):

- (39) [<sub>IP</sub> The newspaper has reported [<sub>CP</sub> that [<sub>IP</sub> they are about to appoint someone]]], but I can't remember who.
- (40) a. . . . but I can't remember [<sub>CP</sub> who [<sub>IP</sub> the newspaper has reported that they are about to appoint]].  
 b. . . . but I can't remember [<sub>CP</sub> who [<sub>IP</sub> they are about to appoint]].

Clearly, copying of either the matrix or the embedded IP in (39) is legal, because the indefinite *someone* is free in both. But consider a case like (41), which is ambiguous:

- (41) [<sub>IP</sub> Most columnists claim [<sub>CP</sub> that [<sub>IP</sub> a senior White House official has been briefing them]]].

On one interpretation of (41) (according to which there is a single official who allegedly briefs most columnists), the indefinite *a senior White House official* is free within both the matrix and the embedded IP. Unsurprisingly, this reading supports Sluicing:

- (42) [<sub>IP</sub> Most columnists claim [<sub>CP</sub> that [<sub>IP</sub> a senior White House official has been briefing them]]], and the newspaper today reveals which one.

Consider now the other reading of (41), according to which different officials are claimed to have been briefing different columnists. If we ask if the indefinite is free in the embedded IP, the answer, we would maintain, is yes. As a consequence, the embedded IP in (41) is suitable to remedy the defects of the LF, and Sluicing based on the lower IP alone should be acceptable. It is:

- (43) [<sub>IP</sub> Most columnists claim [<sub>CP</sub> that [<sub>IP</sub> a senior White House official has been briefing them]]], but none will reveal which one.

What is crucial for our purposes is this: Even if the antecedent IP is interpreted so that *most columnists* roofs the indefinite in the antecedent IP, Sluicing is still possible, as long as what is recycled is only the embedded IP; that is, as long as the interpretation is that shown in (44):

- (44) [<sub>IP</sub> Most columnists claim [<sub>CP</sub> that [<sub>IP</sub> a senior White House official has been briefing them]]], but none will reveal which one has been briefing them.

That this is indeed so offers strong confirmation of the correctness of our account.

The account also extends to cases of merger like (45):

- (45) a. We know how many papers this reviewer has read, but we don't know which ones.  
 b. Bill wondered how many papers Sandy had read, but he didn't care which ones.  
 c. I never know which papers Sandy has read, but I usually know how many.

Such examples are impeccable. How can this be? Recall we are assuming that displaced constituents contribute to the interpretation of the question as though they were located in the position of the Wh-trace. We can therefore represent the LF of the antecedent IP of (45b) crudely as in (46):

- (46) [<sub>IP</sub> Sandy had read [how many papers]<sup>?</sup>]

Can (46) support merger when recycled into the sluice? The answer is yes, since the indefinite *how many papers* is free within the recycled IP (just as in the noninterrogative (43)). The acceptability of (45), then, is not unexpected.

The final instance of merger we discuss here, brought to our attention by Donka Farkas, involves a subtle aspect of the interaction between Sluicing and quantifier scope. An example is shown in (47):

- (47) Everybody gets on well with a certain relative, but often only his therapist knows which one.

Such examples marginally permit a reading of the antecedent IP according to which there need not be a specific individual with whom everyone gets on well. Rather, different people get on well with different people and only therapists know for a given individual who he or she gets on well with. What is constant across cases, however, is the relation holding between individuals and the family members they get along with. Two questions arise here: Why are such interpretations possible at all? And why are they only marginally available?

What we have here is the appearance under Sluicing of the phenomenon of 'relational' (or 'functional') readings of Wh-questions (see Engdahl

1986, 1988; Groenendijk and Stockhof 1984; and Chierchia 1992). Engdahl (1988) argues that a question like (48) is three ways ambiguous:<sup>4</sup>

(48) Which book did each author recommend?

The ambiguity emerges in the three kinds of answers that may be given to (48), illustrate below:

- (49) a. *Finnegan's Wake*.  
 b. Chung recommended *The Poems of Emily Dickinson*; Ladusaw recommended *The Diaries of Samuel Pepys*; McCloskey recommended *Valley of the Dolls*.  
 c. His or her least-known work.

The distinction reflected in the answers in (49a) and (49b) has often been taken to derive from a scope ambiguity, turning on the interaction between the universal quantifier represented by *each author* and the Wh-indefinite represented by *which book*. Wide scope for the universal determines the pair-list answer in (49b); narrow scope for the universal determines what Engdahl calls the 'individual' answer in (49a) (for discussion of this line of analysis, see May 1985, 1988; Williams 1988; Jones 1990; Chierchia 1992). (49c) is the relational interpretation. This reading arises when the addressee provides a value in answer to the question not by referring to an individual, but rather by providing a way of correlating authors with books they recommended. The reading arises naturally when the addressee does not know who all the relevant authors are, but does have a theory of how to predict for a given author what book he or she will recommend. The sluice in (47), we claim, has the relational interpretation.

It would require a more extensive discussion of relational interpretations than we can provide here to do full justice to this aspect of the Sluicing problem. It seems clear at least in outline, though, what the line of analysis should be.

The consensus which runs through the literature on relational or functional interpretations is that they involve higher order quantification – quantification over functions from individuals to individuals. In (48), for instance, the question asks for the identity of a certain function – a function which associates authors with books. In such questions, the semantic variable bound by the Q-operator is not an individual level variable, but rather a variable over functions from individuals to individ-

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<sup>4</sup> Chierchia (1992) follows earlier work of Engdahl's (1986) in arguing that the pair-list interpretation is actually a special case of the relational interpretation.

uals. The denotation of the question in (48) on this view will be the set of (true) propositions of the form: each author  $x$  recommended  $f(x)$ , where  $f$  is some function linking authors with books that they wrote. Appropriate answers will provide values for  $f$  (a function, say, that links authors with their most recent books, or with their first books, or with their favorite books, or with their least-known books, etc.). On this view, the crucial difference between individual and relational interpretations is that in relational questions the semantic variable restricted by the Wh-indefinite and bound by the Q-operator is of a higher type than the corresponding variable in individual questions.

For us, this means that relational interpretations in Sluicing should be available to the extent that the antecedent IP provides an unroofed variable of the appropriate (higher order) type. In general, then, a relational interpretation should be possible for a sluice to the extent that such an interpretation is possible for the antecedent IP.

In fact, Engdahl (1988) has argued that relational interpretations are not restricted to interrogatives, citing examples like (50) (Engdahl 1988, 68):

- (50) John has problems with *a certain relative*; everybody else has problems with *a certain relative* also.

On the crucial reading, everyone has problems with a relative who stands in the same relation to them as John's difficult relative stands to John (mother, for instance, or stepfather or whatever). If this is so, then the indefinite *a certain relative* must have as its interpretation something more complex than a restricted individual level variable (at least as an option). What the indefinite provides, rather, is a variable over functions which associate individuals with relatives. As Engdahl observes (1988, 65), such interpretations arise even when the indefinite is not within the scope of the other quantifier (in our terms: when the indefinite is not roofed by the other quantifier). It is the availability of this kind of reading for the antecedent IP in (47) that provides the basis for the relational interpretation of the sluice.

Engdahl observes that relational interpretations are extremely marginal for declaratives such as (50). If we combine her view of such interpretations with our analysis of Sluicing, we predict that relational interpretations of sluices should be available; but we also expect that they should be marginal – as marginal as the relational interpretation of the corresponding declaratives. The issue is difficult to judge, but it seems to us that these twin expectations are borne out.

### 5.2. *Inheritance of Content*

There is a final prediction of our approach which needs to be discussed. In analyzing the second subtype of sluicing as involving merger, we differ from Ross's original proposal and from Levin's (1982) analysis, according to which the inner antecedent is excised as part of the process of supplying an interpretation for the sluice. In these other accounts, the LF of a sluice resembles routine Wh-questions in that only the content of the Wh-phrase of the sluice restricts the variable bound by the Q-operator.

By contrast, our account predicts that the semantic variable of the sluice inherits conditions from two distinct sources – from the Wh-indefinite itself and from the inner antecedent. As long as the content of both phrases can be coherently merged, interpretable LF's result. The correctness of this general approach is indicated by examples like the following.

- (51) a. Joan said she talked to *some students* but I don't know who.  
 b. John read *three of the books* but I don't know which ones.  
 c. They were going to meet *sometime on Sunday*, but the faculty didn't know when.  
 d. We should put them (*somewhere*) *in the dinning room* but it's not clear where.

In each of these examples, the question constructed from the sluice must be understood against specific background assumptions attributed to the speaker. In (51a), for instance, the question presupposes that the individuals spoken to were students. (51b) presupposes that what were read were three familiar or contextually relevant books; what is unknown is exactly which three of the contextually relevant books were read. Similarly for (51c) and (51d).

This inheritance of the content of the antecedent into the interpretation of the sluice follows from our approach. After IP recycling, all information provided about the inner antecedent comes to restrict the range of the variable bound by the Q-operator of the sluice. Restrictions on the range of the variable are determined jointly by the content of the inner antecedent and the content of the displaced constituent.

These observations are not obviously accounted for by an analysis in which the inner antecedent is excised before interpretation, one in which the sluice in, for instance, (51a) would have only the LF representations seen in (52b). This should be contrasted with (52a), which is the representation given to this example on our proposal.

- (52) a. I don't know [who [she talked to some students]]  
 b. I don't know [who [she talked to e]]

This inheritance of information is not a general pragmatic effect, but is particular to Sluicing. Contrast the sluice in (51c), for example, with the full question in (53), which shows no similar effect:

- (53) They were going to meet sometime on Sunday, but the faculty didn't know when they were going to meet.

## 6. ALTERNATIVES

Our analysis of Sluicing makes use of four LF operations: copying of the content of IP, sprouting of empty categories, coindexation, and the merger of indefinites. The machinery provides a formal characterization of the interpretation of the sluice and, further, delimits the class of possible inner antecedents in a principled fashion. We raise in Section 8 the question of where these devices fit in a larger theoretical structure. First, though, we want to compare our account with others that have been offered since Ross's original exploration of the territory.

### 6.1. *Levin 1982*

Our account is perhaps closest to Levin's (1982) analysis of Sluicing within the framework of Lexical-Functional Grammar. Like us, Levin argues that the constituent structure of Sluicing crucially contains an empty constituent. For her, the fact that a crucial constituent is missing means that the sluice's functional structure will be incoherent. She proposes to remedy this defect by copying in a functional structure from context and then copying the displaced constituent into it.

There are two important points of divergence between Levin's analysis and ours.

The first concerns the cases we analyze as involving merger. In discussing these cases, Levin observes that the displaced constituent "takes over the grammatical and thematic functions of its antecedent", with which it "agree[s] in case and various other features" (1982, 635). She proposes that the displaced constituent is coindexed with the inner antecedent and the content of the inner antecedent is then excised. This proposal leaves unexplained several important facts. Merely identifying the relation between the inner antecedent and the Wh-phrase of the sluice as one of 'coreference' (1982, 636) does not explain why only certain DP's may function as inner antecedents (see Section 5.1). Nor does her proposal account for the inheritance effects discussed in Section 5.2 (since the content of the inner antecedent is removed). Finally, none of the roofing effects of Section 5.1 are discussed.

The second point of divergence is subtler. It concerns the Sluicing cases we analyze as involving the sprouting of an argument. Here Levin rightly observes that the displaced constituent must be integrated into the functional structure of the sluice in such a way that the assignment of grammatical functions to other constituents in the copied structure is not altered. More generally, the argument structure of the sluice must be a monotonic extension of the argument structure of the antecedent IP.

Ideally, this generalization should follow from the fact that Sluicing is an ellipsis construction, and ellipsis is interpreted by reuse of contextually available structure *qua* token. That is, the interpretation of the sluice is constructed from information supplied specifically by the antecedent IP, not by reference to the full lexical resources of the language.

The issue is clarified by the *serve* examples discussed earlier in Section 4:

- (54) a. She served the soup, but I don't know to whom.  
       b. \*She served the soup, but I don't know who(m).  
       c. She served the students, but I don't know what.

Like most ditransitive verbs, *serve* has two argument structures associated with it, which we take to be different (sub)entries in the lexicon. In the first, the direct object is linked to the theme argument and the goal is optionally expressed in a PP flagged by *to*. In the second, the direct object is linked to the goal argument and the theme is optionally expressed as an unflagged oblique. Given this and our view of ellipsis, the ill-formedness of (54b) follows immediately. Each of (54a) and (54c) licenses the antecedent IP via a different argument structure for *serve*. In each case, the sluice must be licensed by an extension of the particular argument structure used in the antecedent IP. (54b) attempts to change argument structures between the antecedent IP and the interpretation of the sluice, and hence is ill-formed.<sup>5</sup>

The version of Lexical-Functional Grammar employed by Levin recognizes a clear distinction between the lexical information used to license well-formed structures and the structures so licensed. The lexicon consists of lexical forms for predicates, which serve as well-formedness conditions on constituent structures and functional structures. It is not clear that there is any well-defined sense in which lexical forms are a part of the functional structures they license.

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<sup>5</sup> Crucial to this result is the assumption that the ditransitive argument structure of *serve* does not allow the direct object – the position associated with the goal argument – to be optional. The evidence of (54) confirms the correctness of this assumption, but we do not offer any independent motivation here.



As a consequence, Levin must view the integration of the displaced constituent as a return to the lexicon to locate the relevant licensing conditions for the functional structure of the sluice. In order to account for the contrast seen in (54), the process must be constrained by additional conditions, which must be stipulated.<sup>6</sup>

This ability to ‘return to the lexicon’ constitutes an important difference between Levin’s analysis and our own. It highlights a fundamental conceptual difference between the interpretation of ellipsis and the original licensing of the reused material. Ellipsis is reuse of a structure token. The guiding assumption that the Logical Form of ellipsis recycles available material, employing only the licensing information relevant to the tokens of the antecedent, makes exactly the right distinctions among the examples considered above.

## 6.2. Ginzburg 1992

Equally important to our analysis is the idea that the basic nature of LF is structural rather than semantic. The LF’s we assume are syntactically particular in that they contain lexical items of English, carrying with them specific syntactic licensing conditions. Hence it is not surprising that Sluicing is sensitive to case government and other idiosyncracies of lexical structure, as observed originally by Ross (1969, 253) and illustrated by the German example in (55):

- (55) Er will jemandem schmeicheln,  
 he wants someone [DAT] flatter  
 aber sie wissen nicht wem/ \*wen.  
 but they know not who [DAT]/ who [ACC]  
 ‘He wants to flatter someone but they don’t know who.’

In (55), the displaced constituent must be dative, because that is the case required by the verb *schmeicheln*. The observation strongly suggests that

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<sup>6</sup> As a consequence of certain technicalities in the treatment of implicit arguments, Levin’s conditions do not have the correct effect in every case. In her system, verbs like *eat* and *bathe* involve an alternation between a transitive lexical form and an intransitive lexical form in which the second argument is existentially quantified over (for *eat*) or bound by the subject argument (for *bathe*). In order to permit Sluicing to be triggered by the implicit object argument, Levin’s conditions must countenance a shift between lexical forms to enable the displaced constituent to be licensed. Formally, this would incorrectly allow for the ill-formed *\*She bathed but I don’t know who*, since a shift between the two argument structures of *bathe* would also count as a monotonic extension of the argument structure. Our analysis of these cases is considered in Section 4 above.

a token of the verb appears in the ellipsis site at some level of representation.

By contrast, in an approach which treats ellipsis as re-reference to semantic interpretation, it remains a mystery why the semantic extensions required to interpret Sluicing are sensitive to these idiosyncratic details. Just such an approach has been pursued in recent work by Ginzburg (1992).

In his analysis of the semantics and pragmatics of questions, Ginzburg argues against the kind of LF approach to Sluicing we have taken here. Like us, he assumes that interrogative phrases are interpreted as restricted variables which are closed in various domains. But he offers (in his Section 4.2.7) two arguments against the hypothesis that the interpretation of Sluicing involves the reuse of linguistic material.

His first argument is that such a hypothesis supplies a non-optimal Logical Form for Sluicing (1992, 301–302). On his view, recycling would provide the second conjunct of (56a) with the Logical Form (56b). But, he observes, a better paraphrase would be (56c):

- (56) a. John likes some students, but I don't know who.
- b. I don't know who John likes.
- c. I don't know who the students John likes are.

We agree that (56c) is better than (56b) as a paraphrase of (56a). The observation, though, follows directly from our analysis, which involves merger of the displaced constituent with the inner antecedent:

- (57) John likes some students, but I don't know [<sub>CP</sub> who<sup>x</sup> [<sub>IP</sub> John likes [some students]<sup>x</sup>]]

Given merger, it follows right away that the restriction to students will be inherited from the antecedent IP in the interpretation of the sluice. This means in turn that the answer space for the sluiced question will be built from propositional functions of the form (58):

- (58) [like (John, (x: student(x)))]

It is not clear that more than this needs to be said to do semantic justice to (56a).

Ginzburg's second argument is based on the observation that certain bare interrogative phrases can receive a deictic interpretation.

- (59) a. Coffee sounds good, *When?* (When shall we have coffee?)
- b. Said by a taxi driver: *Where to, lady?* (Where do you want to go to?)
- c. Distraught homeowner staring at ashes of his house: *Why?*

Ginzburg takes the examples in (59) to argue that Sluicing is not, as Hankamer and Sag (1976) claimed, a type of 'surface anaphora', and further that any theory (such as ours) which derives the basic properties of Sluicing from its dependence on a linguistic antecedent must be incorrect.

This argument is aimed at a particularly naive version of the interpretative theory, one which would claim that there is no way to assign interpretations to fragmentary utterances other than by reference to a linguistic antecedent. But we do not believe that. It is certainly within the powers of pragmatic reasoning to infer an intended interpretation from an utterance of *John?*, a name with question intonation. It could, depending upon context, be the question expressed by *Is that you, John?* or *Should we hire John?*. The fundamental pragmatic reasoning at work here makes use of the linguistic material as a resource, but is not limited to finding its interpretation in the linguistic material. Taking the broader pragmatic view, then, the interpretability of the examples in (59) is unsurprising; what would be surprising would be the assumption that all cases of Sluicing were so interpreted.

The relation between ellipsis and the pragmatic interpretation of fragments is discussed by Hankamer (1978). As he notes, most if not all surface anaphors can be interpreted in a limited fashion by such inference, especially if they are relatively conventionalized (as are the examples above).

The examples in (59) degrade severely when placed in embedded contexts (i.e., when the Wh-phrase is not the entire utterance), though even then it is not beyond the range of a very accommodating interlocutor to interpret them:

- (60) a. Taxi driver to colleague: ?\**She never said where to.*  
 b. Distraught homeowner staring at ashes of her house: ??*I just can't understand how.*

This is presumably because conventionalized utterances may not be embedded.

## 7. MERGER RECONSIDERED

As it stands, our account of the inner antecedent cases of Sluicing employs a very simple notion of merger. The displaced constituent must overlay the inner antecedent in such a way that the corresponding constituents are either identical (e.g. pied-piped prepositions) or else referential parameters which can be unified – the merger of indefinites.

Successful cases of merger have so far all looked like *She went to San*

*Francisco with someone but I don't know who*. In such cases, both the inner antecedent and the displaced constituent contribute their content to the interpretation of the sentence, avoiding a violation of Full Interpretation. Unifying the two referential parameters enables both to be part of the interpretation of the sluice.

But apparently there are strategies of merger besides simple unification. We discuss some of these more complex cases in this section. Many of the issues here are difficult, and we do not claim to understand them fully. Nevertheless, it is possible to indicate in a general way how these cases could be made consistent with our approach, even if it is not always possible to give a detailed treatment.

Consider, to begin with, definite descriptions. Heim (1982) argues that both indefinite and definite descriptions are interpreted as restricted free variables, the crucial difference being that definite descriptions have a referent that is familiar in the discourse. If we combine her theory with the line of thought just pursued, we derive the prediction that Sluicing should be possible even when the inner antecedent is a definite description.

Teasing out the extent to which this prediction is realized is a complicated matter. In some obvious cases, sluices are bad when the inner antecedent is familiar:

- (61) a.\*Joan said she talked to the students. Fred couldn't figure out who.  
 b.\*He announced he had eaten the asparagus. We didn't know what.

Sluices with a familiar inner antecedent are, however, impeccable when the displaced constituent is itself familiar (or discourse-linked in the sense of Pesetsky (1987)):

- (62) a. Joan said she talked to the students. Fred couldn't figure out which ones/which students.  
 b. He announced he had eaten the asparagus. We didn't know which asparagus.

Sluices of this type are also acceptable (though perhaps to a lesser degree) when the context makes clear that the reference of the inner antecedent is at issue:

- (63) a. She was reading the books under the table. Fred didn't know what books.  
 b. He announced he would marry the woman he loved most. None of his relatives could figure out who.

The grammaticality of (62) and (63) is predicted by our approach. This makes it attractive to suppose that sluices of type (61) are legal at LF, but

ruled out by a pragmatic conflict between the familiarity of the inner antecedent and the novelty requirement associated with the displaced constituent – a requirement which holds only under certain circumstances, notably when the Wh-phrase is not discourse-linked in Pesetsky's sense. Given merger, these contradictory requirements will be imposed on the same parameter, resulting in the kind of deviance we see in (61).

A similar phenomenon can be observed in cases of sprouting. Fillmore (1986) discusses various verbs whose implicit arguments are familiar ('zero-for-definite', in his terms). These include *win* (the contest, not the prize), *apply*, *arrive*, *insist*, *promise*, *try*, *accept*, *concur*, *approve*, *agree*, and *find out*. These verbs differ from verbs whose implicit arguments are novel, such as *eat*, *read*, *bake*, in that the speaker cannot felicitously use them and then deny knowledge of the implicit argument. Compare (64), in which the implicit arguments are familiar, with (65), in which they are novel:

- (64) a.\*She found out. I wonder what she found out.  
 b.\*They applied yesterday. I wonder what they applied for.  
 c.\*He has already contributed \$100. I wonder to what organization he has already contributed \$100.
- (65) a. She read until midnight. I wonder what she read.  
 b. They were eating. I wonder what they were eating.

The sluices corresponding to (64) are just as deviant as (64):

- (66) a.\*She found out. I wonder what.  
 b.\*They applied yesterday. I wonder what for.  
 c.\*He has already contributed \$100. I wonder to what organization.

This deviance is expected on our approach. When the antecedent IP is recycled, it must be extended to meet the interpretive needs of the structure it finds itself in. As we have already seen, the extension takes as its base the actual content (*qua* token) of the antecedent IP, including all the detail associated with the particular lexical choices made there. In the case of (66), this will involve inheritance of the presupposition of familiarity associated with the unrealized argument – a presupposition at odds with the presupposition of novelty associated with *what* in the sluice.

But when we embed both the sluice and its antecedent IP in material designed to neutralize the speaker's assumptions as much as possible, the results are better:

- (67) a.?? She intimated that she had found out, but she refused to say what exactly.

- b. ? They claimed to us that they had applied, but they refused to say for which jobs.
- c. ? He revealed that he had already contributed \$100, but he would not reveal to what organization.

Our analysis makes it natural to account for (61)–(63) in the same way as for (66) and (67). The sprouted constituents corresponding to implicit arguments are available as inner antecedents, regardless of whether they must be interpreted as novel or familiar. These cases would be very surprising to any account which tried to restrict inner antecedents to a more traditional notion of “indefinites.”

The ability of definite descriptions to serve as inner antecedents falls out reasonably well from our approach. More challenging are examples like the following:<sup>7</sup>

- (68) a. John is working on *War and Peace* but I don't know *which chapter*.
- b. She talked to *John or Mary* but I don't know *which (one)*.
- c. She read *one of the books* but I don't know *whose*.
- d. She talked to *several students* but I don't know *(exactly) how many*.
- e. She talked to *Harry*, but I don't know *who else*.
- f. I will see *them*, but I don't know *how many of them*.

In each case, the inner antecedent and the displaced constituent with which it must merge are italicized.

In (68a), the surprise is that the referential term *War and Peace* can serve as an inner antecedent. But when we consider the displaced constituent, we see a ready strategy by which the two can be combined: the inner antecedent can serve as complement to the displaced constituent, yielding the interpretation shown in (69):

- (69) . . . but I don't know which chapter *(of) War and Peace*.

Since the presence of the preposition *of* would be motivated only by Case considerations, there is no need to sprout it in the derivation of this interpretable LF.

Example (68b) raises the question of how disjoined terms such as *John or Mary* are interpreted. As a generalized quantifier, this expression would denote the join of the interpretations of the two disjuncts. Interpreted as an entity-level expression, however, it could be interpreted as a kind of

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<sup>7</sup> We are grateful to Armin Mester for the first example and to Mary Dalrymple for the fifth.

indefinite: a variable restricted to have one of the two individuals as its interpretation. If the last approach is plausible, then this example is not problematic at all. In support of the general idea, one can point to the apparent availability of donkey anaphora based on disjoined terms.<sup>8</sup>

(70) Everyone who knows either Susan or Laura likes her.

In (68c), the displaced constituent is a Wh-possessive and the interpretation of the sluice seems clear: *I don't know whose (one) book she read*. This does not strike us as any different from *I know she talked to a teacher but I don't know whose*, where *whose teacher* merges with the inner antecedent *a teacher* and the result is a question about the individual related to the teacher, not about the inner antecedent itself.

In (68a–c), the displaced constituent contributes its content to further restrict the inner antecedent. The antecedent IP provides a presupposed background for the interpretation of the sluice. The fact that the inner antecedent is not novel is consistent with its contribution, which is to help ground the referential parameter introduced by the displaced constituent.

(68d) is an instance of what we call 'Specifier Sluicing.' The displaced constituent *how many* is not an indefinite ranging over individuals, but rather an indefinite specifier, suggesting that the inner antecedent is not the entire DP *several students* but merely the determiner *several*. As expected, to the extent that the determiner itself is specific, merger fails:

- (71) a. \*She said she talked to three students but I don't know how many.  
 b. \*She said she talked to those students but I don't know how many.  
 c.?? She said she talked to the students but I don't know how many.  
 d. \*She said she talked to few students, but I don't know how many.

Example (68e) makes an important point: The crucial issue is not whether sufficient structure can be built out of the inner antecedent and the displaced constituent to enable them to be interpreted, but rather whether these elements, when coindexed, have a semantic interpretation. In this case there

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<sup>8</sup> Alternatively, pursuing a strategy similar to that taken for (68a) would yield a structure interpretable by whatever principles allow the interpretation of *Which of John or Mary would you choose?*.

(i) . . . but I don't know which (one) (of) John or Mary he talked to.

There is the interesting further problem of why the conjunction is not good even though the corresponding partitive-like NP's *which of John and Mary*, *one of John and Mary* are well-formed. It may be that in this case the *or* represents exclusive disjunction because of the singularity of the DP. In that case it would be parallel to *either of John or Mary* (versus ??*either of John and Mary*).

is an obvious complement structure for *who else* which could supply the desired interpretation: *who else but/other than Harry*. In order for *who else* to be interpreted, there must be a familiar grounding for the parameter introduced by *else*. The role played by the inner antecedent is precisely to ground that parameter.

Example (68f) shows that it is possible for the displaced constituent to contain a pronoun which merges with the pronoun of the inner antecedent. Note we can show roofing effects by binding the pronoun within the antecedent IP:

- (72) \*Everyone said they would come but I don't know how many of them.

The ungrammaticality of (72) confirms that (68f) involves merger, albeit a more refined version of this operation than we discussed in Section 5.

Overall, we choose to view these examples as evidence leading to a more refined understanding of merger, rather than as counterexamples to the interpretative approach to ellipsis.

## 8. THE LARGER THEORETICAL CONTEXT

Finally, we would like to consider the larger theoretical ramifications of the LF operations we have appealed to.

Let us begin with sprouting, which serves to add a new category to the syntactic structure. This operation provides the syntactic means by which the displaced constituent is integrated into the interpretation of the sluice. It is crucial in cases like (73):

- (73) He shouted again, but I don't know who to.

In such cases, the syntactically bound position in the LF of the sluice has no obvious correspondent within the antecedent IP.

Viewed from the perspective of 'classical' Government-Binding Theory, sprouting is anomalous in several respects. As a structure-building operation which applies between s-structure and the level of Logical Form, it violates at least the spirit of the Projection Principle. As a formal operation it is also anomalous, since it applies in the course of the derivation of LF representations, but is neither a movement nor a deletion.

It is important, then, to think carefully about the considerations that led us to propose this operation. Essentially, we are committed to the existence of sprouting by our decision to construct a Logical Form for Sluicing via reuse of the content of an IP. In some cases, the recycled IP simply lacks a crucial position and must therefore be extended, in ways



licensed by the idiosyncratic properties of the lexical items out of which it is constructed.

We adopt this position because we see no way to make the available alternatives work. Ross (1969) originally proposed that Sluicing results from a transformation which operates on the output of interrogative Wh-movement, deleting all but the displaced constituent under identity with other linguistic material. Analyses very similar in spirit to Ross's have been pursued by Fiengo and May (1994) for VP Ellipsis, and by Chomsky (1993) in a programmatic way for ellipsis in general (though not for Sluicing in particular).

However, well-known difficulties stand in the way of applying a deletion analysis to Sluicing, many of them pointed out by Ross himself (and by Rosen (1976)).

First, it is unclear whether the required notion of *identity* can be coherently defined. Consider the pairs of examples in (74)–(76):

- (74) a. She was dancing, but I don't know who with.  
       b. She was dancing with somebody, but I don't know who with.
- (75) a. Several firefighters were injured, but it's not known how seriously/in which area/when/in what way/why.  
       b. Several firefighters were injured, but it's not known  
           {how many }  
           {which ones }.
- (76) a. Charles was criticized, but I can't remember who by.  
       b. Charles was criticized by some students, but I can't remember which ones.

In (74a), the procedure which establishes identity must ignore the presence of the PP trace in the IP targeted for deletion, since this trace has no correspondent in the antecedent IP. In (74b), however, the presence of the PP-trace is evidently crucial in establishing identity, since it corresponds to the PP *with somebody* in the antecedent IP. Similar questions arise with respect to (75) and (76). In (75), identical IP's serve as antecedents of Sluicing: namely, *several firefighters were injured*. In (75a), the procedure for establishing identity must determine that this string is identical to an IP containing an adjunct trace. But in (75b), it is crucial that the string be identical to an IP which does not contain such a trace. It may be possible to define the identity relation in a way flexible enough to cover both kinds of cases, but it is at least unclear how this might be done.

Second, the restrictions on the inner antecedent of Sluicing pose serious difficulties for a deletion approach. The burden of our discussion so far

has been that it is crucial that the inner antecedent merge with the displaced constituent. This is responsible for the contrast between (77a) and (77b), which on a deletion analysis will have the sources (78a–b):

- (77) a. Meg is attracted to *somebody*, but they don't know who.  
 b. \*Meg is attracted to *Harry*, but they don't know who.
- (78) a. Meg is attracted to *somebody*, but they don't know who she (Meg) is attracted to.  
 b. Meg is attracted to *Harry*, but they don't know who she (Meg) is attracted to.

To account for the contrast, the deletion rule will have to be sensitive to the difference between these potential inner antecedents. (78b) is grammatical and meaningful and must therefore be assigned an interpretation at LF. Crucially, though, it must not be allowed to serve as a source for (77b). Thus, an identity relation will have to be defined between the first and second IP's in (78a), but not in (78b). The relevant difference is, however, fundamentally semantic, distinguishing between phrases which are interpreted as referential parameters and those which are not. If the deletion rule is one that applies in the derivation of Phonological Form (Chomsky 1993, 35), then it surely should not have access to such information.

There are even more compelling considerations. Ross (1969) observed that the sluice may violate almost all the standard conditions on movement. We will see shortly that the situation is more complicated, but for the moment consider examples like (79).

- (79) a. Sandy was trying to work out which students would be able to solve a certain problem, but she wouldn't tell us which one.  
 b. That certain countries would vote against the resolution has been widely reported, but I'm not sure which ones.  
 c. The administration has issued a statement that it is willing to meet with one of the student groups, but I'm not sure which one.

All the examples in (79) permit interpretations which correspond to ungrammatical s-structures (they also of course permit irrelevant readings in which only the lower IP of the antecedent clause is copied):

- (80) a. ?\*Sandy was trying to work out which students would be able to solve a certain problem, but she wouldn't tell us which one [she was trying to work out which students would be able to solve].  
 b. \*That certain countries would vote against the resolution has been widely reported, but I'm not sure which ones [that *t* would vote against the resolution has been widely reported].

- c.?<sup>\*</sup>The administration has issued a statement that it is willing to meet with one of the student groups, but I'm not sure which one [it has issued a statement that it is willing to meet with].

The availability of these readings illustrates what has been known for a long time: the relation between the displaced constituent of a sluice and its putative origin site does not exhibit island effects.

Pied piping also works differently in Sluicing than it does in overt questions. It is well known that pied piping is obligatory under certain circumstances:

- (81) a.\*What circumstances will we use force under?  
b.\*What sense is this theory right in?

In Sluicing, however, this otherwise forbidden pattern becomes grammatical, as was first observed by Rosen (1976):

- (82) a. We are willing to use force under certain circumstances, but we will not say in advance which ones.  
b. This theory is surely right in some sense; it's just not clear which (what) exactly.

In current theory, of course, the effects in (80)–(81) fall under the rubric of Subjacency.

Ross further demonstrated that sluices show apparent violations of the Coordinate Structure Constraint. Consider the following examples:

- (83) a.?<sup>\*</sup>Irv and someone were dancing together, but I don't know who.  
(Ross 1969, 276)  
b.?<sup>\*</sup>They persuaded Kennedy and some other senator to jointly sponsor the legislation, but I can't remember which one.

As Ross points out, (83a) is not perfect, but it is immeasurably better than its putative source on a deletion analysis, namely, (84a). Similarly for (83b) and (84b).

- (84) a.\*Irv and someone were dancing together, but I don't know who Irv and *t* were dancing together.  
b.\*They persuaded Kennedy and some other senator to jointly sponsor the legislation, but I can't remember which one they persuaded Kennedy and *t* to jointly sponsor the legislation.

Finally, we can observe that even ECP effects are unattested in sluices. This is illustrated for subject ECP effects below:

- (85) It has been determined that somebody will be appointed; it's just not clear yet who.

- (86) a. Sally asked if somebody was going to fail Syntax One, but I can't remember who.  
 b. The TA's have been arguing about whether some student or other should pass, but I can't now remember which one.

On a deletion analysis, the relevant readings of (85)–(86) would have (87)–(88) as their sources:

- (87) ?\*It has been determined that somebody will be appointed; it's just not clear yet who [<sub>IP</sub> it has been determined that *t* will be appointed].  
 (88) a.\*Sally asked if somebody was going to fail Syntax One, but I can't remember who [<sub>IP</sub> Sally asked if *t* was going to fail Syntax One].  
 b.\*The TA's have been arguing about whether some student or other should pass, but I can't now remember which one [<sub>IP</sub> the TA's have been arguing about whether *t* should pass].

The same holds true for adjunct ECP effects:

- (89) a. Sandy is very anxious to see if the students will be able to solve the homework problem in a particular way, but she won't tell us (in) which (way).  
 b. Clinton is anxious to find out which budget dilemmas Panetta would be willing to tackle in a certain way, but he won't say in which (way).  
 c. Sandy is wondering whether there will be students who have to drop the class for a certain reason, but she won't reveal what (reason).

Again, while the examples in (89) may not be perfect (for reasons to which we return), they are clearly not as ungrammatical as those in (90):

- (90) a.\*In which way is Sandy very anxious to see if the students will be able to solve the homework problem *t*?  
 b.\*In which way is Clinton anxious to find out which budget dilemmas Panetta would be willing to solve *t*?  
 c.\*Why is Sandy wondering whether there will be students who have to drop the class *t*?

This cluster of observations poses a serious problem for the view that sluices are derived via routine application of Wh-movement, followed by deletion of everything but the moved Wh-phrase. It remains mysterious why deletion of IP should expunge or ameliorate violations of Subjacency, the ECP, or the Coordinate Structure Constraint.

Crucially, Sluicing contrasts with VP Ellipsis in just this respect. In VP Ellipsis the elided VP may contain the trace of Wh-movement:

- (91) I know how many homeworks I've graded, but I don't know how many Bill has.

When the Wh-trace is contained within an island, however, we do not find the kind of amelioration we observed in Sluicing:

- (92) \*We left before they started playing party games. What did you leave before they did?

The source for (92) is the ungrammatical (93):

- (93) ?\*What did you leave before they (did) [<sub>VP</sub> start(ed) playing *t*]?

VP Ellipsis does not improve (93). If anything, (92) is palpably worse than (93). This is the pattern one would expect if VP Ellipsis were properly analyzed as a deletion. The principal motivation for deletion analyses of ellipsis is that the syntactic and interpretive properties of ellipsis structures exactly parallel those of their unelided counterparts (Chomsky 1993, 35), Fiengo and May 1994, 120–130). Given this, it may make sense to treat VP Ellipsis as resulting from a deletion rule which applies on the way to Phonological Form (though see Kennedy (1994) for a different view). Deletion should in principle be blind to issues of interpretation, and incapable of rescuing violations of syntactic constraints (especially those plausibly due to LF constraints, such as the ECP).

Sluicing, however, does not show these properties – at least in inner antecedent cases like those in (4). For this reason, and because we are committed to a unified analysis of the phenomenon, we claim that no subtypes of sluicing involve deletion. Rather, we take Sluicing to involve recycling of the linguistic material necessary to insure interpretation at LF.

The phenomena which are mysterious under a deletion analysis are entirely expected under our approach. Our analysis makes no appeal to Wh-movement in the licensing of a sluice.<sup>9</sup> Nor, at least for merger, does it appeal to the formation of an  $\bar{A}$ -Chain of any standard sort. Therefore, to the extent that Subjacency effects, ECP effects, and the Coordinate

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<sup>9</sup> Part of the theory of Wh-movement broadly construed is assumed by our analysis. We must assume that the displaced constituents in the s-structures of sluices are subject to the (perhaps language-particular) characterization of a displaceable Wh-constituent. However, this can be defined independently of movement, and the discussion of examples (81–82) suggests that this characterization is not relevant sentence-by-sentence. This point is made by Levin (1982, 607).

Structure Constraint are associated with movement, we expect that they should not be associated with Sluicing. This expectation is largely realized.

Ross (1969) did not, in fact, claim that sluices are completely immune from the conditions on syntactic movement. Rather, he claimed (1969, 276) that sluices are 'less deviant' than the corresponding complete questions. Our analysis lets us make sense of this observation.

Consider again the Subjacency violations in (79), repeated here:

- (94) a. Sandy was trying to work out which students would be able to solve a certain problem, but she wouldn't tell us which one.  
 b. That certain countries would vote against the resolution has been widely reported, but I'm not sure which ones.  
 c. The administration has issued a statement that it is willing to meet with one of the student groups, but I'm not sure which one.

Such violations should be acceptable to the extent that the inner antecedent introduces an unbound variable. Only if the variable is not bound or roofed within its containing CP can it supply the necessary target for binding. The empirical claim is, then, that such examples will be interpretable to the extent that the inner antecedent can have wide scope. More specifically, we predict an exact correlation between the availability of a wide scope reading for the indefinites in (95) and the grammaticality of the corresponding sluices in (94):

- (95) a. Sandy was trying to work out which students would be able to solve a certain problem.  
 b. That certain countries would vote against the resolution has been widely reported.  
 c. The administration has issued a statement that it is willing to meet with one of the student groups.

This prediction seem to be correct. It explains why sluices involving 'Subjacency violations' are best when the inner antecedent is an indefinite, like *a certain N*, which favors a wide-scope reading. When the inner antecedent is an indefinite which does not show the same propensity for wide scope, then it becomes correspondingly more difficult to judge the sluice as grammatical. Compare:

- (96) a. Sandy was trying to work out which students would be able to solve a problem.  
 b. The administration has issued a statement that it is willing to meet a student group.

- (97) a. Sandy was trying to work out which students would be able to solve a problem, but she wouldn't tell us which one.  
 b. The administration has issued a statement that it is willing to meet a student group, but I'm not sure which one.

Exactly analogous remarks hold for configurations relevant to the ECP. Above we cited (98) as an example in which the sluice seems to violate the ECP:

- (98) Clinton is anxious to find out which budget dilemmas Panetta would be willing to tackle in a certain way, but he won't say in which (way).

On our view, (98) should be well-formed exactly to the extent that it is possible to assign the wide scope reading to *a certain way* in (99):

- (99) Clinton is anxious to find out which budget dilemmas Panetta would be willing to tackle in a certain way.

The correlation seems to hold.

In short, our analysis of sluicing accounts for two facts:

- (i) Sluicing neutralizes what would otherwise have been violations of Subjacency or the ECP;  
 (ii) The examples illustrating this point are slightly marginal. For us, the marginality is a consequence of the marginality associated with structures in which indefinites take scope outside the islands containing them (see Fodor and Sag 1982).

This result lends credence to our overall approach and consequently to the Kamp/Heim theory of indefinites.

But if this is right, then sprouting is also crucial. If sluices do not in general result from deletion, but rather from IP-recycling, then the example in (73) must involve an operation like sprouting.

It is significant, then, that sprouting does not seem so anomalous in the context of Chomsky (1993). In that framework, structure-building operations of just the kind we have appealed to are used to construct phrase structure trees in the course of a syntactic derivation. These generalized transformations may draw freely from the lexicon. At a designated point in the derivation, the trees created enter the PF component, which maps the phrase marker to a phonetic representation. The derivational process "on the other side" continues to LF, with the sole constraint that operations that apply after the derivation branches have no further access to the lexicon. It follows from this general conception that d-structure and the Projection Principle must be abandoned.

Sprouting is a structure-building operation of exactly the kind whose

existence and properties are crucial to the Minimalist Program. There is, in fact, a natural interpretation of our proposal within that general program.

Let us now be more specific about what kind of operation sprouting is. Sprouting is a repair strategy which applies to remedy an interpretive defect in the copied IP – the absence of a syntactic position for the displaced constituent to bind. Its effect is to add a category to the tree – in a way that respects recoverability considerations and is licensed by preexisting structure in the recycled IP.

We assume that sprouted adjuncts are adjoined to a maximal projection; sprouted arguments are added as argument positions within VP. This, in essence, is Chomsky's (1993, 15) 'Form Chain' algorithm – an operation which, in a single derivational step, forms an  $\bar{A}$ -Chain terminating in an empty category, each of whose links must meet crucial locality requirements.<sup>10</sup> The empty category corresponding to the syntactic variable (i.e., the Case-marked trace) and the intermediate traces needed to link it with the Wh-phrase in the specifier of CP are introduced simultaneously. The single innovation required in order to construe sprouting in these terms is to allow the head of the chain so formed (the Wh-phrase in this case) to be already present in the structure. Conceiving our analysis in these terms has an important consequence, which we now explore.

The identification of sprouting with Form Chain bifurcates the class of sluices into those which depend on Form Chain and those which do not. Chain formation is, of course, subject to the standard conditions on movement – Subjacency and the ECP in particular. This observation leads to the expectation that sluices interpreted through sprouting should show sensitivity to these conditions; other sluices should not.

The standard wisdom since Ross (1969) has been that sluices seem not to be sensitive to the standard array of conditions on movement. However, all the examples used to make this point (above and in earlier works) are interpreted only by merger. We owe to Chris Albert the important observation that sluices which involve sprouting contrast with those involving merger precisely in being sensitive to the standard conditions on  $\bar{A}$ -Chain formation.

To see this, let us first observe that sprouting may result in structures which involve syntactic coindexing across an apparent distance:

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<sup>10</sup> In particular, these include antecedent government, perhaps reconstrued in terms of the 'Shortest Step' condition. This use of the structure building operations violates the 'extension requirement' of Chomsky (1993, 22–23), since sprouting does not extend the phrase marker to which it applies, but rather targets a proper subpart of the phrase marker to which it applies. Chomsky (1993, 24) proposes, however, that the extension requirement holds only for substitution in overt syntax.



- (100) I think Agnes said that Bill would speak, but I don't remember what about.

(100), for instance, can have the construal represented in (101):

- (101) . . . but I don't remember [<sub>CP</sub> what about [<sub>IP</sub> Agnes said [<sub>CP</sub> (t) that [<sub>IP</sub> Bill would speak t]]]]

With this established, we can proceed to the crucial data in (102)–(103) below. The examples in (102) show that sluices involving sprouting are subject to the standard array of island effects: the Wh-Island Constraint (102a–b), the Subject Condition (102c), and the Complex NP Constraint (102e–f).<sup>11</sup>

- (102) a.\*Sandy was trying to work out which students would speak, but she refused to say who to/to who(m).  
 b.\*Agnes wondered how John could eat but it's not clear what.  
 c.\*That Tom will win is likely, but it's not clear which race.  
 d. It's likely that Tom will win, but it's not clear which race.  
 e.\*Bob found a plumber to fix the sink but it's not clear what with.  
 f.\*Tony sent Mo a picture that he painted, but it's not clear with what.

Sluices interpreted by sprouting likewise exhibit adjunct ECP effects:

- (103) a.\*Sandy is very anxious to see which students will be able to solve the homework problem, but she won't say how.  
 b.\*Clinton is anxious to find out which budget dilemmas Panetta would be willing to tackle, but he won't say how.

This important asymmetry between the classes of sluices (which has not, to our knowledge, been observed before) is a natural consequence of our analysis.<sup>12</sup>

<sup>11</sup> Notice that the deviance of these examples is quite pronounced – more so than that of the corresponding overt examples. Earlier we observed the same kind of worsening for VP Ellipsis (see (90)–(92) above). It is because of the observations summarized in (102) that we do not assume that implicit arguments are a kind of indefinite in the syntax.

<sup>12</sup> We have so far assumed that the sprouted category is empty (and in this way similar to the trace of movement). But if we take seriously the idea that sprouting is actually a special case of Form Chain, then we see that this is not a crucial assumption. In fact, pursuing the view that the trace of movement is actually a copy of the moved category as far as LF interpretation is concerned reveals a parallel between the result of Form Chain and the inner antecedent structures we have assumed.

For concreteness, assume that the (initial) LF representation of (i) is (ii):

- (i) We don't know with who(m) she's been dancing.  
 (ii) We don't know [<sub>CP</sub> with who(m) [<sub>IP</sub> she's been dancing [*with who(m)*]]]

Our analysis assimilates the interpretation of Sluicing to the interpretation of unreduced questions with a minimum of assumptions. The fact that this analysis severs important properties of the construction is welcome in several respects. Sluicing is a very widely observed phenomenon. At present, we know of no language which does not have Sluicing in something like its English form.<sup>13</sup> The analysis we have constructed makes no appeal to any language-specific or Sluicing-specific devices. Its generality is thus expected.<sup>14</sup>

## 9. CONCLUSION

Many mysteries remain, and many questions remain open. Nevertheless, the analysis we have outlined here seems to us to go farther than previous analyses of Sluicing, both in terms of empirical coverage and in terms of integration into a larger theoretical structure.

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If we identify sprouting as an instance of Form Chain in this sense, then the sluice in (iii) will also have the LF structure of the embedded CP in (ii).

- (iii) She's been dancing but we don't know with who(m).

Hence the structure presented for interpretation by Sluicing is indistinguishable from that presented by a non-elliptical question. This view of Form Chain has the added advantage that (ii) is also parallel to (v), which interprets (iv) via IP recycling without sprouting:

- (iv) She's been dancing with someone but we don't know with who(m).

- (v) . . . we don't know [<sub>CP</sub> with who(m)] [<sub>IP</sub> she's been dancing with someone]]

Though we are not able here to pursue this point, in a sense the theory of indefinites allows us to see the tasks posed for interpretation in these three cases as parallel, and the semantic issues associated with merger may arise uniformly.

<sup>13</sup> This is one of the important differences between Sluicing and VP Ellipsis. Given the proposals of Lobeck (1992, 1992), it might follow from the crosslinguistic generality of Spec-Head agreement within the CP-projection, since on her account, an agreeing head is crucial for licensing ellipsis sites.

<sup>14</sup> The merger analysis of inner antecedent cases raises the question of what rules out the obviously ungrammatical (i).

- (i) \*Who did they see someone?

Given our general framework of assumptions, (i) must be ungrammatical because it violates some condition which holds of overt syntactic representations but not of LF representations. What might this condition be?

It seems to be true that well-formed  $\bar{A}$ -Chains in overt syntax always terminate either in an empty category or in a so-called 'resumptive' pronoun which is morphologically definite. Such chains never, as far as we know, terminate in a morphologically indefinite pronoun (such as *one* or *someone* in English). It therefore seems reasonable to conclude that the ill-formedness of (i) is due to a general requirement on the terminations of  $\bar{A}$ -Chains in overt syntax, rather than to any LF well-formedness conditions, such as those we have been concerned with here.

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