Sluicing and Logical Form

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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, p. 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), for instance, 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 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 to 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 Sluicing. 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, 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 sluice's 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 on Sluicing which, as far as we know, have not been observed before, and which constitute our main empirical contribution to the study of this construction.

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 (1991) 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.

§2 presents Sluicing in a nutshell, classifying the basic facts which any adequate analysis will have to account for. §§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 §6, and then refined further in §7. Finally, §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 corre-
responds to nothing in the surrounding linguistic structure:

(3) a. He's writing, but you can't imagine where/why/how/how fast/with whom.  (Ross 1969, p. 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:\(^1\)

(4) a. He's going to give us one old problem for the test, but which problem isn't clear.  (Ross 1969, p. 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.

   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 of examples, 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.

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1 The displaced constituent in the sluice of (3)b is a PP. Note that P and its object may invert—a fact first noted by Ross (1969, pp. 265–266), who analyzed the inverted P as a stranded preposition. The viability of Ross's original analysis is questioned by Rosen (1976, pp. 208–209), who observes several disparities between the contexts in which P can be stranded and those in which an inverted P can occur. Rosen's observations suggest that inversion is considerably more restricted than a preposition stranding analysis would predict. Consequently, we claim that even in the inverted version of (3)b, the displaced constituent is the entire PP. We further analyze inversion as (idiosyncratically restricted) movement of P's complement to its specifier (as seen more productively in other Germanic languages). Such a claim enables us to maintain—contra Ross—that, even when inversion has occurred, the s-structure of the sluice contains 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.
Any adequate analysis must account for the fact that these are the principal classes of cases in which Sluicing is permitted. 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.

3. IP Recycling, Sprouting, and Merger

In constructing an analysis, let us begin by adopting the X-bar theory of Chomsky (1986), according to which the X-bar principles extend to functional heads 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 C₀ and IP subconstituents are null (see Lobeck 1991):

(6)

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        CP
          \   / \
          /   /
        C₁
          |   |
          \   /
          /   /
        C₀
          |   |
          \   /
          /   /
        [WH]
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The task of interpreting Sluicing then becomes the task of deriving 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 read off. 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 1979, 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 IP 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

Consider (7), which contains the embedded question shown in (8):

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

\[ \lambda p[(\exists x : \text{person}(x))[p \equiv \text{not}(\text{see}(\text{Joan}, x))]] \]

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

On the syntactic side, the displaced constituent must syntactically bind a position within the IP complement of C^0. On the semantic side, the displaced constituent must contain a WH-indefinite that is interpreted as a

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2 So far, we have not found any reason why this choice, over the 'partition' approach of Higginbotham and May (1981) or Groenendijk and Stokhof (1982), is crucial.

We will assume here that every embedded question contains an interrogative operator, which resides in C^0. The situation might well be more complicated, given the so-called Quantificational Variability Effect for complement questions (Berman 1991, Lahiri 1991), but in ways irrelevant, as far as we know, for our present concerns.
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 can be seen as tripartite quantification structures of the kind familiar since Heim (1982). 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(John, 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 mapping between these three pieces of structure and the information needed to compose the question meaning is straightforward. The empty complementizer is identified as a ‘Q-operator’, a variable-binding operator which targets the interrogative variable within the displaced constituent, on the one hand, and the open proposition which is the interpretation of the IP, on the other. Note that, in a simple case like this, the syntactic variable is translated as the interrogative variable.

The displaced constituent supplies the restrictive clause, which in this case restricts the Q-operator to persons. Had the displaced constituent instead been which dog, the Q-operator would have bound a variable restricted to (discourse-familiar) dogs, yielding the interpretation in (10).

\[
\lambda p([\exists x : dog(x))][p = \neg[see(John, x)]])
\]

(10) \[
\lambda p([\exists x : dog(x))][p = \neg[see(John, x)]])
\]

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 question operator. In the general case, however, any such identification is pernicious. The content of the displaced constituent and the interrogative variable diverge when material has been pied-piped, as in (11):

(11) They asked [CP in whose housei [IP John slept e_i]]

In such cases, the IP does not supply all of the information needed to formulate an open proposition to serve as the nuclear scope. The answer space

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3 The formula in (10) ignores the restriction to familiar dogs.
of this question contains not propositions about places where John slept, but rather propositions about individuals which are 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) (12):

(12) \[ CP \, \text{who}_j \, [IP \, \text{John slept in } e_j's \text{ house}] \]

This fundamental 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 (11) to the more straightforward interpretation of (12). This, for instance, is the effect of (WH-)reconstruction (see May 1985, p. 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:

(13) \[ [[\text{in whose}^x \, \text{house}]_i; \, e^x \, [\text{John slept } e_i]] \]

(14) \[ [[\text{who}^z]_i; \, e^z \, [\text{Joan saw } e_i]] \]

On this view, syntactic movement prepares for the semantics by insuring that an occurrence of a semantic variable which is bound by the Q-operator is located in the specifier of CP.

3.2. IP Recycling

What does this view of constituent questions tell us about the interpretation of Slicing? Consider the slice in (15):

(15) 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 (15) 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

We saw earlier that 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 (16) in the following way.

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

\[ \text{Joan ate dinner but I don't know with whom.} \]

Once this LF is copied into the IP of the sluice, there is still no appropriate syntactic position for the displaced constituent to bind, as can be seen in (17):

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4 It is possible that this operation should be thought of only as an indication that the displaced constituent must be incorporated into the IP. That incorporation could well be part of the WH-reconstruction process. We will discuss the nature of this operation and its position in larger theoretical perspective in §4 and in §8 below.
The defect is remedied by sprouting an extra PP-position, as shown in (18).

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 in the clause, 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, an operation like 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 (18)). 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 §6.2). This is illustrated, for instance, by the sluices in (19) and (20), both of which are uninterpretable:

(19) *John ate dinner but I don't know who(m).
(20) *She mailed John a letter, but I don't know to whom.

In (19), 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 (20), 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, in particular, be sensitive to details of the particular use of the verb within the antecedent IP. A particularly instructive case is provided by the ditransitive verb serve, which has two different argument structures, given in (21) in the style of Levin and Rappaport (1988):

(21) a. server < meal (diner) >
    b. server < diner (meal) >

The argument structures in (21)a and (21)b license the examples in (22)a and (22)b, respectively:

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

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5 And in the absence of a binding relation, an “extra” category is presumably in violation of the principle of Full Interpretation.
Consider now the Sluicing examples in (23). Of particular interest is the fact that the displaced bare DP who in (23)b is uninterpretable, but the displaced what in (23)c is fine:

(23) 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 (23)a-b is licensed by the argument structure in (21)a. 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 (21)a, which comes to be bound by the displaced constituent to whom in (23)a. In order for the anomalous (23)b 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 (21)a rather than (21)b, this extension is not licensed. (23)c works differently. In this case, the use of serve found in the antecedent IP is licensed by the argument structure (21)b, 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 when an IP is recycled, 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 (24), observed by Levin (1982):

(24) a. She was reading, but I couldn’t make out what.
   b. *She was bathing, but I couldn’t make out who.

(24)a is straightforward. The verb read has an optional second argument, unrealized in the antecedent IP of (24)a. 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 (24)b is expected.

Adjuncts, we claim, must also be licensed. The examples in (25) are ungrammatical because inappropriate adjuncts have been used:

(25) 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 (26) 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 (26)a, for instance—is not licensed by the content of the recycled IP.

(26) 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.

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 (27) represent the second subtype of Sluicing cases:

(27) 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

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6 We discuss the relation between sprouting and implicit arguments below.
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 (27). The result of simply recycling the antecedent IP into the sluice is the structure shown in (28).

(28)

How can such a structure be interpreted?

Under the theory of indefinites developed by Heim and Kamp, 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, they 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 (forthcoming) and ultimately Chomsky 1963) that WH-pronouns and all weak DP's can be interpreted in this way. That being so, the IP of (28) can be interpreted as a propositional function, open on the variable associated with the indefinite. This means in turn that the LF in (28) is not different in essential respects from the tripartite quantification
associated with any question (see §3.1 above and also §8 for an extended discussion of the possible 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 (27). We have already seen that the displaced constituent of a question must be interpreted as if it occupied that position. Therefore, the task of providing an interpretation for (28) and the task of providing an interpretation for the corresponding full question are fundamentally alike.

We will use the term merger for the process whereby the restriction on the semantic variable bound by the Q-operator comes to be defined by the content of two phrases, the WH-indefinite and (the relevant subportion of) the inner antecedent.

Under what circumstances can merger succeed? (28) 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 (28) can be recorded by co-superscripting the two indefinites, as shown in (29) on the following page.

As a result of coindexation, the displaced constituent is now linked with a syntactic position within IP, one which subsumes a free variable. Consequently, the IP can contribute to the scope of the Q-operator as one of its two sources of content, the other source being content inherited from the displaced constituent. The result, we claim, is an interpretable Logical Form, as long as the merger of the two contents results in a single coherent content. In the case of (29), the final result is the interpretation in (30), exactly what would result from the interpretation of the corresponding full question.

(30) \( \lambda p((\exists z : \text{person}(z)) [p = \text{\{eat(Joan, dinner, with \ z\)}]]) \)

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

These predictions center on the availability or not of the crucial free variable within the antecedent IP. The structure in (29) is interpretable exactly
(29)

because the copied IP subsumes a referential parameter around which the propositional function \([Joan ate dinner with z]\) of (30) 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 clearly 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:

(31) 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 are well-formed reveals that there is nothing wrong with the interpretation ultimately intended for (31)a–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:

(32) 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:

(33) 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 un-
bound variable), and, when recycled, cannot function as the nuclear scope
of the interrogative quantification structure.7

Pronouns also provide no variable which might end up functioning as
the semantic variable for the sluice. This is so even though it might be
thought that pronouns are interpreted as ‘free variables’:

(34) *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 indefi-
nites 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 ref-
erence, whereas indefinites describe restrictions on reference. Expressions
for which reference is specified do not provide a variable for merger. That

7 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 merger fails in the
case of pronouns, on which see below.
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:

(35) *There were they/them on the fence.

Summarizing, the analysis developed so far predicts the range of contrasts seen in (36):

(36) Joan ate dinner with \[ \begin{cases} \text{s} & \text{someone} \\ \text{several students in her class} \\ \text{a woman from San Josè} \\ \text{*them} \\ \text{*most first year students} \\ \text{*every student in her class} \\ \text{*John} \\ \text{*nobody} \end{cases} \] 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 theory of indefinites developed by Heim and Kamp, 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 (37), which is ambiguous:

(37) She didn't talk to one student.

On the theory we are assuming here, the ambiguity of (37) 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 (37), 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 reused to fill out the interpretation of the sluice, 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). Put differently, an expression which is already quantificationally closed cannot supply the free variable needed to provide a nuclear scope for the Q-operator of the sluicing. 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. (38), for instance, is grammatical only if the antecedent IP is interpreted so that the indefinite has ‘wider scope than’ negation:

(38) She didn’t talk to one student; I wonder who.

Significantly, such an interpretation is unavailable in (39), because the indefinite is a negative polarity item and therefore necessarily roofed by the negation. As expected, Sluicing is ungrammatical:

(39) 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.

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

(40) 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 (40)a, 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 (40).

This effect follows from our account. In (40)a, 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):

(41) [what \( \varepsilon \) c \( \varepsilon \) [always \( \varepsilon \) she reads something \( \varepsilon \) at dinner]]

Assuming that a given bound variable is bound by exactly one operator, the result will be an ill-formed Logical Form.
The discussion can be taken a step further. Certain ambiguities which arise under Sluicing can be explicated under the assumption that the discourse may supply more than one potential antecedent IP for recycling. (42) is such an example:

(42) [IP The Times has reported [CP that [IP they are about to appoint someone]]], but I can't remember who.

(42) is ambiguous; the sluice can be interpreted as (43)a or as (43)b:

(43) a. ... but I can't remember [CP who [IP the Times has reported that they are about to appoint]].

b. ... but I can't remember [CP who [IP they are about to appoint]].

Clearly, copying of either the matrix or the embedded IP in (42) is legal, because the indefinite someone is free in both. But consider a case like (44), which is ambiguous:

(44) [IP Most columnists claim [CP that [IP a senior White House official has been briefing them]]].

On one interpretation of (44) (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:

(45) [IP Most columnists claim [CP that [IP a senior White House official has been briefing them]]], and the Times today reveals which one.

Consider now the other reading of (44), 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 (44) is suitable to remedy the defects of the LF, and Sluicing based on the lower IP alone should be acceptable. It is:

(46) [IP Most columnists claim [CP that [IP 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 the generalized quantifier most columnists rooks 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 (47):

(47) \[ \text{Most columnists claim} \quad [\text{IP that} \quad [\text{IP a senior White House official has been briefing them}]אס, \quad \text{but none will reveal which one has been briefing them.}] \]

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

The account extends to cases of merger like (48):

(48) 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 that our expectation is that Sluicing will succeed to the extent that it is possible to recycle an IP containing a semantic variable available for binding by the Q-operator of the sluice. Such variables are typically supplied by unroofed indefinites in the antecedent IP. Recall further our assumption that WH-phrases are themselves indefinites, which contribute to the interpretation of the question as though they were located in the position of the WII-trace (see §3.1 above and §8 below for further discussion). We can therefore represent the LF of the complement CP of (48)b crudely as in (49):

(49) \[ \text{IP how many papers} \quad [\text{IP Sandy had read} \quad [\text{how many papers}]] \]

Can the IP of (49) 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 (46)). The acceptability of (48), then, is not unexpected.\(^8\)

The final instance of merger we discuss here, brought to our attention by Donka Farkas, involves a subtler aspect of the interaction between Sluicing and the facts of quantifier scope. The crucial examples are of the type in (50):

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

\(^8\) These examples raise interesting issues regarding different modes of underspecification in indefinites. Our proposal provides for a natural discussion of these differences, but space limitations prevent us from including that discussion here.
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 1983, and Chierchia 1992). Engdahl (1988) argues that a question like (51) is three ways ambiguous:

(51) Which book did each author recommend?

The ambiguity emerges in the three kinds of answers that may be given to (51), illustrated below:

(52) 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 (52)a and (52)b 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 (52)b; narrow scope for the universal determines what Engdahl calls the 'individual' answer in (52)a (for discussion of this line of analysis, see May 1985, 1988, Williams 1988, Jones 1990, Sloan 1990, Chierchia 1992). (52)c 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 (50), we claim, has the relational interpretation.

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9 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.
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 the case of (51), 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 individuals (variables of type \(<e,e>\)). The denotation of the question in (51) 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 un-roofed variable of the appropriate (higher order) type. In general, then, a relational interpretation should be possible for a slice 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 (53) (Engdahl 1988, p. 68):

(53) 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 (p.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 (50) that provides the basis for the relational interpretation of the sluice.

Engdahl observes that relational interpretations are extremely marginal for declaratives such as (53). If we combine her view of such interpretations with the analysis of Sluicing developed here, we predict that relational interpretations of sluices should be available; but we also expect that they should be marginal—the marginality of the relational interpretation of declaratives should be reflected in an exactly equivalent marginality associated with the relational interpretation of sluices. The issue is difficult to judge, but it seems to us that these twin expectations are borne out, at least to a first approximation.

5.2. Inheritance of Content

There is a final prediction of our approach which needs to be discussed. In postulating that Sluicing can involve merger of an inner antecedent with the displaced constituent, we diverge from analyses (such as that of Levin 1982) which remove the inner antecedent from the antecedent IP as part of the process of supplying an interpretation for the sluice. Our analysis also diverges from accounts (such as that proposed originally by Ross) according to which the LF of a sluice will resemble routine WH-questions in that only the content of the WH-phrase of the sluice is available to restrict the variable bound by the Q-operator.

An important difference between such accounts and ours is that we predict that the semantic variable of the sluice is subject to restrictions which derive 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.

(54) 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. We will meet (sometime) on Sunday, but they didn’t say when.

d. We should put them (somewhere) in the dining 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 (54)a, for instance, the question presupposes that the individuals spoken to were students. (54)b 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 (54)c and (54)d.

This inheritance of the content of the antecedent into the interpretation of the sluice follows from our approach. After copying of the antecedent IP, 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, according to which the sluices in (54) would have only the LF representations seen in (55)b–(58)b. These are to be contrasted with (55)a–(58)a, which are the representations the examples in (54) receive on our proposal.

(55) a. I don’t know [who [she talked to some students]]
    b. I don’t know [who [she talked to e]]
(56) a. I don’t know [which ones [John read three of the books]]
    b. I don’t know [which ones [John read e]]
(57) a. they didn’t say [when [we will meet (sometime) on Sunday]]
    b. they didn’t say [when [we will meet e]]
(58) a. it’s not clear [where [we should put them (somewhere) in the dining room]]
    b. it’s not clear [where [we should put them e]]

6. Alternatives

At this point, we have outlined the basic elements of our analysis of Sluicing. Our approach makes use of four LF operations: copying of the content of IP, sprouting of empty categories, coin dexation, 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 §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, p. 635). She proposes that the displaced constituent is coindexed with the inner antecedent and the content of the inner antecedent is then excised. Identifying the relation between the inner antecedent and the WH-phrase of the sluice as one of ‘coreference’ (p. 636) does not explain why not all DP’s may function as inner antecedents (see the discussion of §5.1). Nor does her proposal account for the inheritance effects discussed in §5.2 (given the proposal that the content of the inner antecedent is excised when it is integrated into the sluice) or the roofing effects discussed in §5.1.

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 violated. 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 difference emerges clearly when we consider the serve examples discussed earlier in §4:

(59) 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 \textit{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 \(59b\) follows immediately. Each of \(59a\) and \(59c\) licenses the antecedent IP via a different argument structure for \textit{serve}. In each case, the sluice must be licensed by an extension of the particular argument structure used in the antecedent IP. \(59b\) attempts to change argument structures between the antecedent IP and the interpretation of the sluice, and hence is ill-formed.\(^{10}\)

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.

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 \(59\), the process must be constrained by additional conditions, which must be stipulated.\(^{11}\)

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

\(^{10}\)Crucial to this result is the assumption that the ditransitive argument structure of \textit{serve} does not allow the direct object—the position associated with the goal argument—to be optional. The evidence of \(59\) confirms the correctness of this assumption, but we do not offer any independent motivation here.

\(^{11}\)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 \textit{eat} and \textit{bathe} involve an alternation between a transitive lexical form and an intransitive lexical form in which the second argument is existentially quantified over (for \textit{eat}) or bound by the subject argument (for \textit{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 \textit{bathe} would also count as a monotonic extension of the argument structure. Our analysis of these cases is considered in \(\S4\) above.
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, p. 253) and illustrated by the German example in (60):

\[(60) \quad \text{Er will jemandem schmeicheln,}\]
\[
\quad \text{he wants someone [DAT] flatter}\]
\[
\quad \text{aber sie wissen nicht wen/ *wen.}\]
\[
\quad \text{but they know not who [DAT]/ who [ACC]}\]
\[
\quad \text{"He wants to flatter someone but they don’t know who."}\]

In (60), the displaced constituent must be dative, because that is the case required by the verb schmeicheln. The observation strongly suggests that 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 (1992) 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 (§4.2.7) three 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, p. 301–302). On his view, recycling would provide the second conjunct of (61)a with the Logical Form (61)b. But, he observes, a better paraphrase would be (61)c:

\[(61) \quad \begin{align*}
\text{a. John likes some students, but I don’t know who.} \\
\text{b. I don’t know who John likes.} \\
\text{c. I don’t know who the students John likes are.} 
\end{align*}\]
We agree that (61)c is better than (61)b as a paraphrase of (61)a. The observation, though, follows directly from our analysis, which involves merger of the displaced constituent with the inner antecedent:

(62) John likes some students, but I don’t know \([\text{CP who}^\circ [\text{IP John likes [some students]]}]\).

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 (63):

(63) \([x: \text{student } (x) \ [\text{like} (\text{John}, (x))]]\)

It is not clear that more than this needs to be said to do semantic justice to (61)a.\(^{12}\)

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

(64) 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?

On Ginzburg’s view, the fact that the examples in (64) have an interpretation argues that Sluicing is not, as Hankamer and Sag (1976) claimed, a type of ‘surface anaphora’. Furthermore, 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

\(^{12}\) The final step is presumably to note that constituent questions carry existential presuppositions or implicatures. The interpretation schematized in (63) will then be backed by an assumption that there are students whom John likes. What (61)a finally conveys, then, is (i) the backgrounded assumption that there are students whom John likes and (ii) the foregrounded claim of inability to provide an exhaustive listing of the true propositions of the form \([x \text{ is a student and John likes } x]\).
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 (64) 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 (64) 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:

(65) a. Taxi driver to colleague: *She never said where to.
    a. 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 SF 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 are 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:

(66) 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):

(67) 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:

(68) 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 (67) and (68) is predicted by our approach. This makes it attractive to suppose that sluices of type (66) 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 discourse referent, resulting in the kind of deviance we see in (66).

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 (69), in which the implicit arguments are familiar, with (70), in which they are novel:

(69) 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.

(70) a. She read until midnight. I wonder what she read.
   b. They were eating. I wonder what they were eating.

The sluices corresponding to (69) are just as deviant as (69):

(71) a. *She found out. I wonder what.
   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 (71), 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:

(72) 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.
The relative acceptability of (72) argues that sprouted categories are available in principle for binding by the displaced constituent, whether the implicit arguments that license them are novel or familiar. Examples so derived will be deviant or acceptable depending on how the pragmatic context is manipulated. That being so, it is natural to extend the approach to cases in which definite descriptions serve as inner antecedents, accounting for (66)–(68) in the same way as (71) and (72). Significantly, such an extension would not be possible if the antecedent of Sluicing, whether overt or unexpressed, was required merely to be an indefinite.

The ability of definite descriptions to serve as inner antecedents falls out reasonably well from our approach. More challenging are Sluicing examples like the following:13

(73) 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 DP which serves as the inner antecedent is italicized; the displaced constituent with which it must merge is set off in bold face.

In (73)a above, 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 (74):

(74) ... 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 (73)b raises the question of how disjoined terms such as John or Mary are interpreted. As a generalized quantifier, this expression would

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13 We are grateful to Armin Mester for the first example and to Mary Dalrymple for the fifth.
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 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:\footnote{Alternatively, pursuing a strategy similar to that taken for (73)a 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).}

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

In (73)c, 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 (73)a–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.

(73)d 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:

(76) 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 (73)e 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 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 (73)f 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:

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

The ungrammaticality of (77) confirms that (73)f involves merger, albeit a more refined version of this operation than we originally discussed in §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 some of the LF operations we have appealed to.

Let us begin with sprouting, which serves to add a new category to the syntactic structure—either an adjunct or an argument. 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 (78):

(78) 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. In his pioneering work on the topic, Ross (1969) proposed that Sluicing results from a deletion transformation which operates on the output of interrogative WH-movement, deleting all but the displaced constituent under identity with some other string in the linguistic material. Analyses very similar in spirit to Ross's have been pursued by Fiengo and May (1991) 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 such a line of 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 (79)–(81):

(79) a. She was dancing, but I don’t know who with.
   b. She was dancing with somebody, but I don’t know who with.

(80) 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 \}.

(81) 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 (79)a, 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 (79)b, 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 (80) and (81). In (80), identical IP’s serve as antecedents of Sluicing: namely, Several firefighters were injured. In (80)a, the procedure for establishing identity must determine that this string is identical to an IP containing an adjunct trace. But in (80)b, 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, in the core cases, it is crucial that the inner antecedent contain an indefinite. Thus, on our account, (82)a is good because the antecedent IP contains such an indefinite, whereas (82)b is bad because no such indefinite can be located:

(82) a. Meg is attracted to somebody, but they don't know who.

b. *Meg is attracted to Harry, but they don't know who.

On a deletion analysis, the sources for these examples will be (83)a–b:

(83) 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 between (82)a and (82)b, the deletion rule will have to be sensitive to the difference between these potential inner antecedents. (83)b 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 (82)b. Thus, an identity relation will have to be defined between the first and second IP's in (83)a, but not (83)b. 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, p. 35), then it surely should not have access to such information.

There are even more compelling considerations. Ross (1969) observed that Sluicing 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 (84).

(84) 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.

These examples illustrate 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. All the examples in (84) permit interpretations which correspond to ungrammatical $s$-structures:

(85) 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. *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.]

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:

(86) 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):

(87) 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 (85)–(86) both fall under the rubric of Subjacency.)

Ross further demonstrated that Sluicing shows at least limited immunity to the Coordinate Structure Constraint. Consider the following examples:

(88) a. *Irv and someone were dancing together, but I don’t know who. (Ross 1969, p. 276)

b. *They persuaded Kennedy and some other Senator to jointly sponsor the legislation, but I can’t remember which one.

As Ross points out, (88)a is not perfect, but it is immeasurably better than its putative source on a deletion analysis, namely, (89)a. Similarly for (88)b
and (89)b.

(89) 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 Sluicing. This is illustrated for subject ECP effects below:

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

(91) 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, (90)-(91) would have (92)-(93) as their sources:

(92) ?*It has been determined that somebody will be appointed; it’s just not clear yet who [IP it has been determined that t will be appointed.]

(93) a. *Sally asked if somebody was going to fail Syntax One, but I can’t remember who [IP 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 [IP the TA’s have been arguing about whether t should pass.]

The same holds true for adjunct ECP effects:

(94) 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 (94) may not be perfect (for reasons to which we return), they are clearly not as ungrammatical as those in (95):

(95) 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 Sluicing is 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:

(96) \[
\text{I know how many homeworks I've graded, but I don't know how many Bill has.}
\]

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

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

The source for (97) is the ungrammatical (98):

(98) ?*What did you leave before they (did) [vp start(ed) playing t]?

Notice that application of VP Ellipsis does not improve (98). If anything, (97) is palpably worse than (98). This is the pattern one would expect if VP Ellipsis were properly analyzed as a literal deletion (Chomsky 1993, Fiengo and May 1991). 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, p. 35, Fiengo and May 1991, p. 136). Given this, it makes sense to treat VP Ellipsis as resulting from a deletion rule which applies on the way to Phonological Form. Such a deletion should in principle be blind to issues of interpretation, and incapable of eliminating ungrammaticalities which have accrued through misapplication of syntactic movement (especially those plausibly due to LF constraints, such as the ECP).
Sluicing, however, does not show these properties. For this reason, we do not analyze it as involving deletion (or non-pronunciation) on the phonological side of the derivation. Rather, we take it to involve recycling of the linguistic material necessary to ensure interpretation at LF.

The phenomena we have been discussing are entirely expected under our approach. Our analysis makes no appeal to WH-movement in the licensing of a sluice.\textsuperscript{15} Nor, at least for merger, does it appeal to the formation of an Ā-Chain of any standard sort. Therefore, to the extent that Subjacency effects, ECP effects, and the Coordinate Structure Constraint are associated with movement, our expectation is that they should not be associated with Sluicing. This expectation is largely realized.

The analysis can be taken a little further. Ross (1969) did not claim that Sluicing structures are completely immune from the conditions on syntactic movement. Rather, he claimed that Sluicing leads to 'less deviant' (Ross 1969, p. 276) results than would have been produced by WH-movement alone. Our analysis lets us make sense of this observation.

Consider again some typical Subjacency violations under Sluicing:

\begin{enumerate}
\item[(99)] 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.
\item b. That certain countries would vote against the resolution has been widely reported, but I'm not sure which ones.
\item 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.
\end{enumerate}

Given our analysis, such violations should be acceptable to the extent that the inner antecedent within the antecedent IP 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 be interpreted as 'having wide scope'.\textsuperscript{16} More specifically, we

\textsuperscript{15} 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 (86–87) suggests that this characterization is not relevant sentence-by-sentence. This point is made by Levin (1982, p. 607).

\textsuperscript{16} We include the scare quotes here since it is controversial whether standard scope-assignment mechanisms such as QR are implicated in the relevant readings of (99); see Fodor and Sag (1982), Heim (1982) for relevant discussion. Resolution of this question is not crucial for our concerns here.
predict an exact correlation between the availability of a wide scope reading for the indefinites in (100) and the grammaticality of the corresponding sluices in (99):

(100)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 seems to be correct. It explains, for instance, why sluices involving 'Subjacency violations' are best when the inner antecedent is an indefinite like a certain $N$. It is well-known that such indefinites favor wide-scope readings and thereby improve the chances that a sluice based on them will be grammatical. 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:

(101)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.

(102)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 (103) as an example in which Sluicing gives rise to a grammatical ECP 'violation':

(103) 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, (103) should be well-formed exactly to the extent that it is possible to assign the wide scope reading to a certain way in (104):

(104) 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 the overall approach we have been developing and consequently to the Heim/Kamp theory of indefinites, on which it crucially relies.

But if this is right, then sprouting is also crucial. If sluices do not in general result from deletion, but rather from recycling of an IP, then the example in (78) must involve an operation like sprouting, for exactly the reasons given earlier.

It is significant, then, that sprouting does not seem so anomalous in the context of some proposals made recently by Chomsky. In the framework of Chomsky (1993), structure-building operations of just the kind we have appealed to (formalized as Generalized Transformations) are used to construct phrase structure trees in the course of a syntactic derivation. These operations apply in parallel and may draw freely from the lexicon. At a designated point in the derivation, the trees created are transferred to 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. (This requirement is necessary to preserve recoverability.) It follows from this general conception that d-structure, and as a consequence 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 very 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 kind of 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 pre-existing structure in the recycled IP.

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17 Discussions with Maggie Browning were very helpful in clarifying the issues considered in this section.
We assume that sprouted adjunct categories are adjoined to a maximal projection; sprouted argument categories are added as argument positions within VP. This, in essence, is Chomsky's (1993, p. 15) 'Form Chain' algorithm—an operation which, in a single derivational step, forms an Ā-chain terminating in an empty category, each of whose links must meet crucial locality requirements. 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 to be 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 principal difference between the two subtypes of Sluicing, on the view developed here, is that sprouting depends on the Form Chain algorithm, while inner antecedent merger cases 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 the two subtypes of Sluicing should differ exactly in whether or not they show sensitivity to these conditions. Cases involving sprouting should; cases which do not involve sprouting should not.

The standard wisdom since Ross (1969) has been that sluicing structures 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 licensed only by merger. We owe to Chris Albert the important observation that Sluicing cases which involve sprouting contrast with those involving merger precisely in being sensitive to the standard conditions on Ā-Chain formation.

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

(105) I think Agnes said that Bill would speak, but I don’t remember what about.

(105), for instance, can have the construal represented in (106):

(106) ... but I don’t remember [CP what about [IP Agnes said [CP (t) that [IP Bill would speak t ]]]]

18 In particular, antecedent government, perhaps reconstructed in terms of the “Shortest Step” condition. This use of the structure building operations violates the ‘extension requirement’ of Chomsky (1993, pp. 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 proposes, however, (p. 24) that the extension requirement holds only for substitution in overt syntax.
With this established, we can proceed to the crucial data in (107)-(108). The examples in (107) show that Sluicing licensed by sprouting is subject to the standard array of island-effects: the WH Island Constraint ((107)a–b), the Subject Condition ((107)c), and the Complex NP Constraint ((107)e–f).\(^{19}\)

(107)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.

Sluicing licensed by sprouting likewise exhibits adjunct ECP effects:

(108)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 two subtypes of Sluicing (which has not, to our knowledge, been observed before) is a natural consequence of the analysis we have developed here.\(^{20}\)

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\(^{19}\) Notice that the deviance of these examples is quite pronounced—more so than in the corresponding overt examples. Earlier we observed the same kind of worsening for VP Ellipsis (see (97)-(98) above). Both presumably deserve the same explanation, whatever that may be.

These observations considerably weaken the argument against a deletion analysis for the cases we have grouped under the rubric of sprouting, and raise the possibility of a mixed analysis—recycling for cases of merger, deletion for cases of sprouting. Most of the conclusions we are primarily concerned with here will continue to hold under this conception. We pursue here, however, the goal of constructing a unified analysis and examining its implications.

It is because of the observations summarized in (107) that we do not assume that implicit arguments are a kind of indefinite in the syntax. On such a view, the distinction between the two species of Sluicing we have documented would be less distinct than they are on our analysis.

\(^{20}\) In our discussion up to this point, we have assumed that the sprouted category is empty (and in this way similar to the traditional notion of the trace of movement). But if we take seriously the idea that ‘sprouting’ is actually a special case of ‘Form
The view that we have developed here assimilates the interpretation of Sluicing to the interpretation of unreduced questions with a minimum of assumptions. The fact that this analysis revealed 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.\textsuperscript{21} The analysis we have constructed makes no appeal to any language-specific or Sluicing-specific devices. Its generality is thus expected.\textsuperscript{22}

\begin{itemize}
  \item Chain' within the general framework of Chomsky (1993), 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 whom she danced.
  (ii) We don't know [CP with whom [IP she danced [with whom]]].
  
  If we identify sprouting as an instance of 'Form Chain' in this sense, then (ii) will likewise be the LF structure on which the interpretation of the sluice in (iii) will be based.
  
  (iii) She's been dancing but we don't know with whom.

  Hence the structure presented for interpretation by Sluicing is indistinguishable from that presented by a non-elliptical question. But this interpretation of 'Form Chain' has the added advantage that these structures are parallel, given the theory of indefinites, to the structure suggested by (v), which arises from IP recycling without sprouting in inner antecedent cases such as (iv):
  
  (iv) She's been dancing with someone but we don't know with whom.
  (v) She's been dancing with someone but we don't know with whom 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. If this is correct, then our earlier speculation (note 4) that the problem of sprouting reduces to the more general problem of WH-reconstruction is given analytic flesh.

\textsuperscript{21} This is one of the important differences between Sluicing and VP-Ellipsis. Given the proposals of Lobeck (1991, 1992), it might follow from the cross-linguistic generality of SPEC-HEAD agreement within the CP-projection, since on her account, an agreeing head is crucial for licensing ellipsis-sites.

  Sluicing also differs crucially from VP-Ellipsis in its interaction with constraints on movement (see the discussion of §8), and in not permitting antecedent-contained ellipsis.

\textsuperscript{22} 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, the example in (i) must be ungrammatical because it violates some condition which holds of overt syntactic representations
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.

References


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but not of LF representations. What might this condition be? It seems to be true that well-formed A-Chains in overt syntax always terminate either in an empty category or 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 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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