Definite Inner Antecedents and Wh-Correlates in Sluices

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1. Introduction

A **sluice** is an interrogative in which all but the questioned element is missing. For example, the complement of *remember* in (1) is a sluice, the **antecedent IP** is *John saw someone,* the **inner antecedent** is *someone* and the **Wh-correlate** is *who*:

(1)   John saw **someone**, but I can't remember **who**

One question we're interested in is whether a definite description can serve as an inner antecedent. Here is a relevant example, which is not good:

(2)   #John saw **the detective**, but I can't remember **who**.

Chung, Ladusaw and McCloskey (1995) say that definites can be inner antecedents. We agree, but with reservations. We first describe a confounding factor, which is not directly associated with sluicing, but which arises because a sluice necessarily involves a question that is embedded in a discourse taken to be coherent. Chung, Ladusaw and McCloskey also say that definite inner antecedents introduce special restrictions on the choice of the wh phrase used as correlate. Here we will disagree. We claim that the wh-correlate choices they discuss are not unique to definite inner antecedents but are also observed with indefinite inner antecedents.

A **pre-sluice** is a piece of discourse that has all the ingredients of a discourse with a sluice, but in the pre-sluice the ellipsis has not been done. The pre-sluice corresponding to our initial example in (1) is:

(3)   John saw someone, but I can't remember who he saw.

Extending the terminology, we'll call *someone* the inner antecedent in the pre-sluice in (3) and *John saw someone* the antecedent IP of the pre-sluice and *who* the wh correlate in the pre-sluice.

Our main claims are:

(a)   Sluices with definite inner antecedents are often bad because the corresponding pre-sluice is bad. The infelicity has to do with a clash between presumed knowledge, signaled by the use of a definite with a uniqueness presupposition, and an implication of ignorance of those very presuppositions, an implication stemming from the question embedding. The sluices in which definite inner antecedents are acceptable have additional features that serve to override the potential for this clash.

(b)   Various wh-phrases can potentially serve as Wh-correlates. The choice of the wh correlate is, in general, not affected by the definiteness of the inner antecedent but rather by the presence or absence of a head in the inner antecedent. The choice is governed by sluice particular factors and appear to follow from a semantic approach to sluicing that requires an entailment relation to hold between the sluiced clause and the antecedent IP.

2.   Pre-Sluices

Consider the following infelicitous discourse:

(4)   # Jack bought some books and magazines and went
          outside. He took one of the books out of the bag and
          began to read. When the wind came up, he used the book
          to hold his papers down, but I don't know which book he
          used.

The difficulty arises because the speaker claims not to know
which book Jack used to hold his papers down, when in fact he
does know. It was the book Jack was reading. The speaker
contradicts himself, making the discourse incoherent. There are a
number of aspects to this example that should be highlighted.
First, *the book that Jack was reading* constitutes a good answer
to the question, *which book did Jack use to hold his papers
down?*, the question embedded under *know*. Second, the fact that
the speaker has 'access' to that answer is betrayed by the use of
the definite description in *he used **the book** to hold his papers
down*. Together, these two factors give rise to a sense of
contradiction. We will probe these and other aspects of this
example, to fill out the range of pre-sluices that are rejected for
incoherence.[1]
          The use of *which book* normally presupposes an
antecedent set of books from which to choose. We've been
careful to explicitly include in (4) both the antecedent for *which
book*, namely, *books he bought*, as well as the antecedent for the
definite description *the book*, namely *one of the books*. These
antecedents are usually accommodated when an informant is
presented with examples where they are not explicit. Therefore,
post-accommodation, the explanation for the infelicity of (5)
below runs just like for (4):

(5)   #He talked to the detective. I don't know which detective
          he talked to.

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[1]Our analysis is in the spirit of the discussion in Ginzburg and Sag (2000).
They address the specific question of definite inner antecedents in a footnote
(pg.323, fn 31).

The explanation for the unacceptability of (4) relied on the fact that the interrogative was embedded under *don't know* with a first person subject. These ingredients are less crucial than might at first seem. If we change *don't know* to *know*, it still sounds funny. The reason is that the speaker is unnecessarily stating what has already been stated or implied. Similarly, changing *know* to *remember*, *forget* or *ask* doesn't change matters much. They just involve an extra step in the explanation having to do with how knowledge relates to remembering, forgetting or conditions on asking.

What if we change the attitude holder from first person? In principle, this should matter, but it often doesn't. Here's an example:

(6)   # The President invited an astronaut and a doctor to attend the ceremony. He decided that the astronaut would light the first candle. The newspaper didn't say which astronaut would light the first candle.

In making sense of this bit of discourse, it is natural to assume that the newspaper is the source of the information in the first part. Once that assumption is made, the infelicity is like in (4). A contradiction arises in the last sentence, given that *the astronaut that the President invited* is a good answer to the question *which astronaut will light the first candle?*. A similar kind of thing happens if we change the attitude holder at the end of (4):

(7)   # Jack bought some books and magazines and went outside. He took one of the books out of the bag and began to read. When the wind came up, he used the book to hold his papers down, but Jill couldn't remember which book he used.

To gain coherence, we seem inclined to assume that Jill is privy to the first part of the story. Once that is the case, the final clause is contradictory, as in (4).

Recall now that (4) and the other examples relied on having a definite in them whose presupposition insures that it will be a good answer to the embedded question. We now look at

some examples where that parameter is adjusted. To see how that will matter, let's first look at an example with an indefinite inner antecedent. Replacing the definite inner antecedent in (5) with an indefinite we get:

(8)   He talked to a detective. I don't know which detective he talked to.

In this example, the speaker claims not to know the answer to the question, *which detective did he talk to?* and there is no contradiction here, because nothing prior to that says he does. A skeptic might raise the following objection: the speaker does have an answer to the question *which detective did he talk to?*, namely: *the detective that he talked to*. This may be an answer in a technical sense, but it's certainly not a **good** answer. It's not a good answer because the predicate used to pick out the individual is too close, in fact identical, to the predicate in the question. A similar type of thing can happen with a definite antecedent as well, when its presupposition is so weak that it doesn't constitute a good answer. Here's an example:

(9)   Fred and Susan were invited to Jane's birthday party on Sunday. On Saturday, they went to Borders and bought a bunch of books. When they got home, Susan took one of the books, wrapped it and put it in Fred's bag. When they got to the party, Fred took the book out and gave it to Jane, but he still doesn't know which book he gave her.

Fred does have an answer to the question *which book did he give to Jane?*, namely, *the book that was gift wrapped*, but apparently that's not a good answer. It's too close to *the book that he gave Jane*, so contradiction does not ensue and the discourse is acceptable.

Another way to have a felicitous definite inner antecedent is to use an expression that is definite in form, but that doesn't carry a uniqueness presupposition. Any of the following fit this description:

(10)   John is going to take the train, but he doesn't know yet which train he is going to take.

(11)   I know it's on the side of the house, I just don't know which side it's on.

(12)   The vet will put a device in the horse's ear. It doesn't matter which ear they put it in.

(13)   He's already seen the doctor about it. I just don't know which doctor he's seen.

(14)   They took him to the hospital. She wouldn't tell us which hospital they took him to.

Take example (11). You can use the expression *the side of the house* without having a particular side in mind and hence without having an answer to a question about which side. There is no contradiction, hence the example is felicitous.[2]

Going back now to our infelicitous examples, beginning with (4), recall that the contradiction depends on a clash between the presupposition connected with the definite and the implication or assertion of ignorance stemming from the question embedding. This story extends to examples like (6) and (7) where the attitude holder is not the speaker, because of an effect whereby the attitude holder is understood to be in a position to use the definite. It is exactly this understanding that is questioned in cases of communication breakdown such as the following. Joe is nervously describing to Ed an accident he just witnessed. There were two policemen at the scene and Joe's tale oscillates back and forth among the actions of the policemen. Eventually, Ed becomes confused:

(15)   Joe: At that point, the cop took my picture.
         Ed: Which cop?

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[2]As Daniel Altshuler pointed out to us, this explanation is confirmed by considering the result of replacing "the side of the house" with the demonstrative "that side of the house". In that case, the speaker must have a particular side in mind and, as expected, example (11) becomes infelicitous when this change is made.

Here Ed asks a question that he would have an answer to, if only he were in a position to felicitously use the definite that Joe used. This situation can be reported as:[3]

(16)   Joe said that the cop had taken his picture but Ed couldn't figure out which cop had taken Joe's picture.

This type of communication breakdown is also how we understand the following pre-sluice based on the example that Chung, Ladusaw and McCloskey used to show that definites can be inner antecedents:

(17)   He announced he had eaten the asparagus. We didn't know which asparagus he announced he had eaten.

        Summarizing now, we've looked at a range of examples in which a pre-sluice with a definite inner antecedent is odd. We claimed that the problem is a clash between the presupposition associated with the use of the definite and the implied ignorance associated with the embedded question. This seems a plausible description of what goes wrong and it also explains why examples with definite inner antecedents are acceptable, when the definite does not carry a uniqueness presupposition or where there is a presupposition but the questioner is not understood to be adopting it.
        Moving to our central issue, definite inner antecedents in sluices, the lesson is that in many cases they will not be good, having nothing to do with sluicing per se.[4] It follows that in assessing any claims about sluices, and especially those with definite inner antecedents, one needs to check the corresponding

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[3]Note that definites whose uniqueness presuppositions are uncontroversial cannot function in these contexts. In the following, for example, world knowledge insures that there will be exactly one Chief of Police so there is no room for communication breakdown: #*Ed reported the matter to the Chief of Police but Joe couldn't figure out which chief of police he reported the matter to.*

[4]Of course, this assumes that if the pre-sluice is bad, sluicing won't repair it. Ignoring cases where sluicing removes an island-violation, we believe that this is true for the most part. See Merchant (2001) and Fox and Lasnik (2003) for accounts in which even the repair of islands is only apparent, not real.

pre-sluice.[5] This task is not always straightforward, however. Consider the following pair in which a bad pre-sluice appears to be repaired by sluicing:

(18)   #The President invited an astronaut and a doctor to attend the ceremony. He decided that the astronaut would light the first candle. The newspapers didn't say which astronaut would light the first candle.

(19)   The President invited an astronaut and a doctor to attend the ceremony. He decided that the astronaut would light the first candle. The newspapers didn't say which astronaut.

The mistake here is to take the second sentence of (18) to be the pre-sluice for (19). In fact, the elided material in (19) corresponds to the previous two sentences or, perhaps, just the first sentence: *The newspapers didn't say which astronaut the President invited (and decided would light the first candle)*. In either case, the inner antecedent is indefinite.

3.   Wh Correlates

We now turn to the choice of the Wh-correlate, which is the second aspect of sluices that we are interested in. Chung, Ladusaw and McCloskey (1995:266) point to the contrast between (20) and (21):

(20)   He announced he had eaten the asparagus. We didn't know which asparagus.

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[5]The problem of not evaluating the pre-sluice also underlies claims about indefinites. Ginzburg & Sag (2000:314) claim that *who the hell* doesn't make for a good correlate in sluices. They offer the following example:

> A: A friend of mine came in.
> B: #Who the hell?

Since the corresponding pre-sluice *Who the hell came in*? is also odd, it is unclear that the difficulty in Ginzburg & Sag's example is a sluicing phenomenon. See Sprouse (2006) for recent discussion of *the hell* in sluices.

(21)   *He announced he had eaten the asparagus. We didn't know what.

They attribute the unacceptability of (21) to a conflict between the "familiarity" of the definite inner antecedent and the "novelty" of *what*. No such conflict arises in (20), they say, because *which asparagus* is "familiar".[6]

    While we agree that (21) suffers from a mismatch between the Wh-correlate and the inner antecedent, we don't think the relevant feature is "familiarity". The problem rather lies in the difference in head-content between the two. In the acceptable (20), the Wh-correlate and inner antecedent are both headed by the same noun, but this is not the case in the unacceptable (21). The clearest evidence for this alternative explanation is the presence of parallel facts in examples like the following with **indefinite** inner antecedents:

(22)   *Joan was eating a doughnut. Fred didn't know what.
(23)   Joan was eating a doughnut. Fred didn't know which doughnut.
(24)   Joan was eating something. Fred didn't know what.
(25)   *Joan was eating something. Fred didn't know which doughnut.

In the bad examples, the inner antecedent and the Wh-correlate disagree with respect to the presence of the head noun *doughnut*, in the good examples they agree. A focus on familiarity would lead to frustrated expectations in (22)-(23). Since *a doughnut* is "novel", it is expected to go with "novel" *what* rather than "familiar" *which*. Head-content appears to be the crucial property in these examples, as in the previous ones.

    We dub the empirical generalization that cuts across these examples "Antecedent-Correlate Harmony":

(26)   *Antecedent-Correlate Harmony*
        The Wh-correlate and inner antecedent agree on the presence/absence of a contentful head noun.

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[6]They take D-Linking, in the sense of Pesetsky (1987), to be the relevant notion of novelty and familiarity for Wh expressions.

In keeping with our methodological urgings in the previous section, we note that the unacceptable (22) has a felicitous pre-sluice:

(27)   Joan was eating a doughnut. Fred didn't know what she was eating.

We conclude that *Antecedent-Correlate Harmony* is a genuine sluice phenomenon.[7]

    Antecedent-Correlate Harmony can be seen with further examples of definite inner antecedents which have good pre-sluices. Here are some cases showing how they sluice with different Wh-correlates:[8]

(28)   John is going to take the train, but he doesn't know yet which train.
(29)   *John is going to take the train, but his mother doesn't know yet what.

The inner antecedents in these examples, while they are formally marked with the definite article, are in no way "familiar". Sentence (28) is fine when uttered in a discourse in which no particular train is salient. As in our earlier examples, the head of the inner antecedent is *train* and the head of the Wh-correlate must be too. These examples don't involve communication breakdown, as (20)-(21) do, but that difference has to do with how their pre-sluices come to be acceptable. Nevertheless, once the pre-sluices are acceptable, they can be sluiced as long as *Antecedent-Correlate Harmony* is preserved. In these examples, *Antecedent-Correlate Harmony* led to the requirement of a headed Wh-correlate, but that isn't always the case. Communication breakdown allows for definite inner antecedents that are not noun-headed to harmonize with unheaded Wh-

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[7]By contrast note that the unacceptable *I know he ate a doughnut but I don't know what* tells us nothing about sluicing, since the corresponding pre-sluice is bad for the kinds of reasons outlined earlier. The speaker cannot assert knowledge of what was eaten and then profess ignorance of that fact.

[8]We have changed the subject of the second clause in (29) since #*John is going to take the train, but he doesn't know yet what he is going to take* would be an unacceptable pre-sluice, at least under the most likely interpretation.

correlates. Imagine that two cars figure in Joe's nervous description of the accident he has just witnessed. Suppose that he oscillates back and forth between the cars and again, Ed becomes confused:

(30)   Joe: Eventually, they towed it away.
        Ed: What/which one?

The *Antecedent-Correlate Harmony* generalization is often overlooked or left unstated in the sluice literature, although the sum total of data presented in that literature tends to conform to it. Moreover it is not entirely inconsistent with current ideas of how sluicing works. Still there are some assumptions and claims that it calls into question. To show this, we will start with the semantic approaches to sluicing (Romero 1998, Merchant 2001, for example) and follow that with a discussion of syntactic approaches (Fox and Lasnik 2003). In section 4 we show, on the basis of data involving the use of *exactly* in sluices, that Antecedent-Correlate Harmony remains problematic for syntactic approaches but can be accommodated within semantic approaches to the phenomenon.

A key idea in the spirit of Merchant's theory is that sluicing is possible when the presupposition of the question in the pre-sluice is informationally equivalent to the antecedent IP.[9] To illustrate this idea we return to the examples in (22) and (23). The question in (23) presupposes that Joan was eating a doughnut, which is what the antecedent says. By contrast, the question in (22) presupposes that Joan was eating something, which includes some but not all the information in the antecedent.

(22)   *Joan was eating a doughnut. Fred didn't know what.

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[9]This is not how Merchant phrases things. Technically, what we are calling "the presupposition of the question" is the existential closure of the question's meaning understood to be a set of propositions. The closure is a single proposition and it plays a role in determining the placement of accent in a question in a particular discourse (Schwarzschild 1999). Also, an important aspect of Merchant's and Romero's theories that we are ignoring is the sensitivity of sluicing to the distribution of intonational prominences in the question and in the antecedent IP.

(23)   Joan was eating a doughnut. Fred didn't know which doughnut.

Similarly, in (28) above, the question presupposes that John is going to take a train and that is informationally equivalent to the antecedent IP, given the weak presupposition associated with the definite used there.

      If this much is correct, then the communication breakdown examples (20-21 and 15) in which the definites clearly have uniqueness implicatures now take on a special interest for the theory of presupposition projection. Ed's question in (15), repeated here, presupposes that some cop or other took Joe's picture.

(15)   Joe: At that point, the cop took my picture.
       Ed: Which cop?

Taken at face value, Joe's assertion says more than that, namely that there is a cop that is unique in some way. So there is a puzzle as to why the sluicing works. Two lines of explanation present themselves. One possibility is that Joe's presupposition is canceled in a way that matters to the sluice condition. It is not a part of the content of the antecedent IP. Another possibility that has some basis in intuition is that the antecedent for Joe's presupposition is somehow included in the sluiced part. It is as if Ed was asking:

(31)   Which cop is it that {you are thinking of} and that took your picture?

The antecedent for Ed's sluice would then be more than just the literal utterance recorded for Joe in (15). It would include the antecedent for Joe's presupposition (compare 18-19 above). The presupposition of the question would be *there is some cop that you/Joe have in mind who took your picture* which is informationally equivalent to the antecedent *the cop that I/Joe am thinking of took my picture*.

      The syntactic approach to sluicing has most recently been taken up by Fox and Lasnik (2003). Their attention is

primarily on sluices with indefinite inner antecedents and they argue that the indefinite is in-situ at LF without the indefinite article and that a copy of the restrictor of the question phrase is in situ at LF. Here's a sample LF (*f,g* are variables over choice functions):

(32)   a. Fred said that I talked to a girl but he didn't say
           which girl.

        b. ∃f [Fred said that I talked to f(girl)],
           but he didn't say which g <Fred said that I talked to
           g(girl)>.

Both the antecedent IP and the question in the LF for (23) will have an occurrence of *doughnut* following the verb. In this setting, sluicing is allowed just in case the antecedent IP and the IP of the question are formally identical at LF. *Antecedent-Correlate Harmony* now follows more or less straightforwardly for sluices with indefinite inner antecedents. And all that is needed to explain its application to examples with definite inner antecedents is the idea that the definite article also fails to appear at LF.

        Based on what we have seen so far, the Harmony generalization appears compatible with both the semantic and the syntactic approaches to sluices. But there are further considerations that can tilt the balance. A consideration that speaks in favor of the syntactic approach has to do with the possibility of covert restrictions alluded to above. Recall what the semantic account says about example (22), repeated here:

(22)   *Joan was eating a doughnut. Fred didn't know what.

Fred's question-presupposition is that Joan ate something, which is informationally insufficient to license the sluice. Notice, however, that the word *what* is a quantifier and as such it could be subject to quantifier domain restriction. Prima facie, this could be why I could say I know what you ate last night, when all I really know is what your main course was for dinner. If *what* can have its domain restricted, why doesn't this process

restrict *what* in (22) to doughnuts in the interest of making for a good sluice?

Chung, Ladusaw and McCloskey argue for precisely such a restriction and posit LF rules to ensure that *who/what* become equivalent to *which N*. Merchant does not address this issue directly but Romero explicitly argues for inheritance of content, though she does not derive it via syntactic copying as Chung, Ladusaw and McCloskey do. We have shown that the only way to account for the Harmony facts within a semantic account is to interpret *what/who* as ranging over a wider domain than *which N*, since reliance on formal features of definiteness such as "familiarity" are untenable. This is a puzzle for the semantic approach alone. Domain restriction would have no effect on sluicing in the syntactic approach. It only considers LF representations to determine whether a sluice would be possible:

(33)   a. $[what]_1$ <Joan was eating t_1>
         b. Joan was eating f(doughnut)

Since the LF's of the sluice and the inner IP don't match, the sluice will be correctly ruled out.

The syntactic approach faces a different problem. Up to now, we have avoided using sluices and pre-sluices with question words other than *what* and *which* but the picture changes when we look at the behavior of *who* as a wh correlate. One would expect *who* to work like *what* and, indeed, it often does. In the acceptable (34), the inner antecedent and Wh-correlate agree in head-content, in the unacceptable (35) they don't:[10]

(34)   We know that linguists attend those conferences, but we don't know which linguists.
(35)   *We know that linguists attend those conferences, but the police don't know who.

However, a *who*-correlate can often be used even with a headed inner antecedent:

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[10]The subjects of the *but* clauses were chosen so as to get good pre-sluices for both examples.

(36)   At the LSA, Joan was talking to a phonologist, but I
        don't know who (exactly).

The LFs for (36), being fully parallel to (33), incorrectly rules
out sluicing. The puzzle then is that Harmony effects are visible
clearly and strongly only with *what*, not with *who*. The Harmony
facts evident with *what* support the syntactic account but the
behavior of *who* tells against it. The semantic account might take
solace in the *who* facts, chalking them up to domain restriction,
but that doesn't seem the right way to go given the behavior of
what. As we show in the next section, the solution to the puzzle
posed by these data turns out to be consistent with the semantic
approach to sluice licensing rather than the syntactic approach.

4.   Levels of individuation: *who*, *what* and *exactly*

We would like to start by suggesting that *what* and *who* as wh
correlates do not differ with respect to domain restriction,
understood as a process whereby the domain is simply made
smaller. Rather, the difference lies in the possibility of *levels of
individuation* (Aloni 2005, Heller 2005). Domain restriction has
to do with narrowing the search space, while level of
individuation has to do with how you select or describe the
elements of the domain. One can increase the level of
individuation without affecting the size of the domain and one
can shrink the size of the domain without affecting the level of
individuation. To give a concrete example, the set of individuals
in a context could be individuated by profession or by name:

(37)   a. Who did you speak to?
        b. I spoke to a lawyer.
        c. I spoke to John.

The question can range over the same set of individuals and the
two answers may pick out the exact same individual. That is, it is
possible for (37b) and (37c) to be extensionally equivalent
answers to (37a). The cases of Harmony violations we are
interested in, cases where the inner antecedent is headed and the
wh correlate is not, are those where the wh correlate *who* is

accompanied either optionally or obligatorily with *exactly*. We therefore present the following observations about the contribution of *exactly* to the meaning of a question. The answer to *exactly Q* must be more precise than an answer already available in the discourse or an answer inferable from the context. (38)-(39) provide independent justification for this claim:[11]

(38)   A: I spoke to a lawyer.
        B: Tell me exactly who you spoke to/ Exactly who did
             you speak to?
        A: I spoke to Joe Smith.

(39)   A: I spoke to Joe Smith.
        B: #Exactly who did you speak to?

In some intuitive sense, the level of individuation signaled by profession is less precise than that signaled by name, as has been argued for in a different context by Aloni (2005) and Heller (2005). The follow-up question in (39) is infelicitous because a more precise answer to the one already available is not possible. Note that the discourse in (38) entails that Joe Smith is a lawyer because B's question does not reject A's statement as false. It accepts its truth but asks for more precision.

    In order to show the role such levels of individuation play in sluicing, we note that *what* and *who* have different sensitivities in this regard. It is generally not possible to answer a question like *what did you eat?* at two levels of individuation since doughnuts, pieces of bread and other such items are not individuated by name.[12] And, contrary to what we saw in (38), a question with *exactly* cannot function as a follow-up. (40b) can

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[11]Romero analyses *exactly* in terms of partial and complete answers but that distinction is not directly applicable to the contrast in (38)-(39) nor to the difference between *who* and *what* that we point out here.

[12]It is possible to have answers at two distinct levels of individuation with *books*. Still, there seems to be some resistance to follow-ups with *exactly: I bought a book. ?# Exactly what did you buy?* The partitive form *which book* is needed.

only express incredulity at the prior statement, it cannot be a request for a more precise answer:[13]

(40)   a.   I ate a doughnut.
         b.   # Exactly what did you eat?

We take *exactly* in questions to be an anaphor expression. The requirement of greater precision follows from the standard felicity conditions on questions that the information the question is after must not be already available. The only way to satisfy the anaphoric presuppositions of *exactly* and the felicity condition for questioning is for the question to be answered more precisely than the antecedent answer.

Let us take the example from the previous section, repeated below as a pre-sluice, and see how the contribution of *exactly* affects the entailment relations:

(41)   Joan was talking to a phonologist, but I don't know who
         (exactly) she was talking to.

Although the presupposition of the question *Joan was talking to someone* by itself does not entail the antecedent IP, it does so in combination with the presupposition of *exactly*: the less precise answer *Joan was talking to a phonologist*. There is no domain restriction of the quantifier *who*, but the effect is the same.

The distinction between direct domain restriction and restriction of possible answers via the presupposition of *exactly* can be demonstrated by looking at an example where *exactly* appears to be obligatory:

(42)   We know linguists attend those conferences but we don't
         know who *(exactly) attends those conferences.

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[13]It is possible to have *what kind (of doughnut) exactly* as the wh correlate in such cases, but then there is no violation of *Harmony* since the wh correlate is headed. Also, *I ate a doughnut* entails that *I ate a kind of doughnut* so the entailment relations between antecedent IP and the sluice hold.

Without *exactly*, contradiction creeps into the discourse, something that would not happen if the domain of *who* was restricted to linguists.[14]

Our explanation for the variation between *who* and *what* with respect to violations of Harmony follows from the fact that similar levels of individuation do not exist in the inanimate domain:

(43)   Joan was eating a doughnut but Fred doesn't know what (exactly) she was eating.

Coherence in the pre-sluice turns on Fred not being aware of Joan's eating a doughnut. That is, the presupposition of the question is *Joan is eating something*, which is insufficient to license a sluice. And there does not exist a level of individuation that would satisfy the presuppositions of *exactly,* meet the felicity requirement for questions and derive the conditions under which sluicing would go through.

To sum up, we note that the quantificational domain of *who/what* in pre-sluices is not restricted by the inner antecedent, for reasons that are not entirely clear to us. Harmony violations are predicted to be ungrammatical, given the informational equivalence required for sluicing. When levels of individuation in the quantificational domain allow for a more precise answer, as evidenced by the presence of *exactly*, informational equivalence becomes possible and sluicing is licensed. *Who* and *what* differ with respect to Harmony violations because they differ with respect to levels of individuation.

It may appear from what we have said so far that *exactly* is only possible when the domain can be individuated by name. In fact, *exactly* can call for precision along many other dimensions, some of which are relevant to sluicing: *Joan talked to several students but I don't know exactly how many*. Such cases have been discussed by Romero and would be amenable to the proposal here. Instead of pursuing that line of investigation,

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[14]We don't quite know why *exactly* is not always obligatory in Harmony violation cases. We speculate that it may be possible for *exactly* to occur separated from the wh correlate and be part of the ellipsis but we recognize that further investigation of this issue is needed.

however, we return to the issue of definite inner antecedents and examine whether Harmony violations are possible in those contexts.

Our general sense is that Harmony violations are not readily available with definite inner antecedents.[15] To see this, we start with the pre-sluice versions of example (18), repeated below:

(44)   a.   The President invited an astronaut and a doctor to attend the ceremony. He decided that the astronaut would light the first candle.

b.   #The newspapers didn't say who exactly would light the first candle.

c.   The newspapers didn't say who exactly was invited and asked to light the first candle.

This example is not particularly revealing since we already established that the felicity of the sluice depends on the ellipsis going back to the first sentence, that is, to a context in which there is no unique astronaut. So this example essentially tells us what we have already established, namely that Harmony violations are possible with indefinite antecedents.

More interesting are cases of communication breakdown:

(45)   a.   Joe: At that point, the cop took my picture.
               Ed: Who exactly took your picture?

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[15]The following is not a case of Harmony violation, but calls for some comment since the presupposition of *exactly* is satisfied by a statement with a definite:

(i)   There were some exposed wires on the back wall. Jack definitely touched the wires, but I couldn't tell you exactly which ones.

The antecedent IP involves pragmatic weakening of the kind studied by Brisson 1998, where touching some of the wires counts as touching the wires as a group entity. A more precise answer would identify the wires actually touched. It is worth noting that the example does not go through if the wh correlate is changed from *which N* to *what*.

b. Joe said that the cop had taken his picture but Ed couldn't figure out who exactly had taken his picture.

(45a) and (45b) both are acceptable but it is not clear in these cases whether Ed's knowledge includes the picture taker being a cop. There is, perhaps, a sense in which the question continues to be about *which person* rather than *which cop*, that is, with the presupposition of *exactly* being satisfied by *someone took Joe's picture* rather than *some cop took Joe's picture.*

The issue really bears on what the precision relation in *exactly* questions is. If the shift is from an existential statement to a statement with a name, precision can be defined in terms of an asymmetric entailment relation. But if a shift from a statement with a definite to a statement with a name is possible, then the relevant notion of precision would have to be based on identifying a unique individual by name. We leave this issue for further exploration, noting simply that there are relatively few examples of Harmony violations with definite antecedents and our own investigations has revealed some variation in judgment:

(46)   Joe: The cop took my picture/The police chief took my picture.
          Ed: #Who?

(47)   He announced he would marry the woman he loved. But none of us could figure out who (exactly).

In (46), once the uniqueness associated with the definite is accepted by Ed, he cannot use *who* as a way of inquiring about that individual's identity. In (47), based on an example from Chung, Ladusaw and McCloskey, there seems to be little problem in interpreting *who* as asking for the identity of the individual. The point that amelioration of Harmony violations makes clear is that identity of LF representations cannot be relied upon to explain the possibility of sluicing.

5.   Summary and Conclusion

Let us now return to the following question: can a definite serve as an inner antecedent for sluices? In this paper, we have provided a 'yes' answer, but only if:

a) its use is coherent in conjunction with the embedding of the sluiced question. In short, only if the corresponding pre-sluice is acceptable.

b) it agrees with the Wh-correlate on the presence/absence of a contentful head noun.

       Both of these points are nicely illustrated by studying an interesting set of examples from Chung, Ladusaw and McCloskey in which the role of inner antecedent is played by the implicit argument of a transitive absolute.[16] Here's one such example:

(48)   *She found out. I wonder what.   (= 66a.)

Chung, Ladusaw and McCloskey use this example as further evidence for the relationship a Wh-correlate must have to its inner antecedent in a sluice. This is surprising from our perspective, given that the Wh-correlate has no head and the implicit inner antecedent certainly doesn't either, so the relationship between the two that we argued for above is in fact met. This is the relationship given in (b) above. The surprise is mitigated, however, by the point made in (a). This example doesn't teach us anything about the required relationship between Wh-correlates and inner antecedents in sluices, because the corresponding pre-sluice is bad as well:

(49) *She found out. I wonder what she found out.   (= 64a)

Chung, Ladusaw and McCloskey compare (48) to an example with a verb whose implicit argument is not anaphoric and which forms a good pre-sluice:

(50)   She read until midnight. I wonder what she read. (= 65a)

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[16]This term is in Dowty (1981).

The source of the difference is clear. A felicitous use of absolutive *find out* in (48) entails the possession by the speaker of an answer to the question *what did she find out?* whereas a felicitous use of absolutive *read* in (50) does not entail the possession by the speaker of an answer to the question *what did she read till midnight?*. Furthermore, the sluice of (48) is ok, since neither the Wh nor the implicit inner antecedent includes a contentful head noun.

Finally, the requirement in (b) is the definite subcase of a broader generalization we've called *Antecedent-Correlate Harmony*. We assume that this generalization follows from the rules governing sluicing. There are various theories about what those rules are. We gave some reason to believe that semantic theories enjoy an advantage, based on exceptions to the Harmony generalization where *exactly*-modified Wh correlates are used.

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