Ellipsis and the Structure of Discourse

Daniel Hardt
Copenhagen Business School

Maribel Romero
University of Pennsylvania

Abstract.
It is generally assumed that ellipsis requires parallelism between the clause containing the ellipsis and some antecedent clause. We argue that the parallelism requirement generated by ellipsis must be applied in accordance with discourse structure: a matching antecedent clause must be found that locally c-commands the clause containing the ellipsis in the discourse tree. We show that this claim makes several correct predictions concerning the interpretation of ellipsis, both in terms of the selection of the antecedent (in Sluicing and Verb Phrase Ellipsis), and in terms of the possible readings assuming a particular antecedent (in the "many-clause" puzzle and in Antecedent-Contained Deletion).

1. Introduction

Many authors have suggested that ellipsis and other processes of reduction require a certain similarity or parallelism between the reduced clause and some antecedent clause in discourse. It has also frequently been proposed that discourse structure is relevant to interpretation of ellipsis and related constructions. In this paper, we combine these two claims, and propose that the parallelism requirement is strongly constrained by discourse structure. We assume the following two background claims:

(1) **Matching Condition on Ellipsis Resolution:** Ellipsis resolution requires that a *matching* relation holds between a clause E containing the ellipsis site e and some clause A containing the antecedent a to which the ellipsis is resolved. (Dalrymple et al., 1991; Rooth, 1992a; Tancredi, 1992; Fiengo and May, 1994; Schwarzschild, 1999)

(2) **Discourse Structure:** Clauses in a discourse are structured according to discourse relations; ellipsis resolution (and other anaphora resolution) occurs as a side-effect of establishing discourse relations. (Hobbs, 1979; Asher, 1993; Prust et al., 1994; Kehler, 2000; Asher et al., 2001; Webber et al., 2003)

The central claim of this paper is the following:

(3) **Discourse Condition on Ellipsis Resolution:** The A-clause and E-clause satisfying the Matching Condition must be in a particular discourse configuration: the A-clause must locally c-command the E-clause in the discourse tree.

We assume the following (standard) definition of c-command: A c-commands E iff every node that dominates A also dominates E. We define local c-command as follows:

(4) **Local c-command:** A locally c-commands E iff A c-commands E and there is no C c-commanding E that appears between A and E.[1]

In what follows, we show that this claim makes a variety of correct predictions concerning the interpretation of ellipsis, both in terms of the selection of the antecedent a, and in terms of the possible readings assuming a particular antecedent. The paper is organized as follows. In section 2, we present our background claims concerning ellipsis resolution and discourse structure in more detail. Section 3 concerns antecedent selection: using both sluicing and VP-ellipsis (VPE), we show how the proposed Discourse Condition uses discourse structure to rule out antecedents that would otherwise be incorrectly permitted. We also show that, while the Discourse Condition does impose much stronger constraints than previous approaches, it is not quite as restrictive as one might think, since matching may often be performed at different levels and it is sensitive to implicit material and to contextual inferencing. In sections 4 and 5, we examine the issue of possible readings for ellipsis assuming a particular antecedent, focusing on two versions of the "many-clause" puzzle for VPE in section 4 and on scope readings for Antecedent-Contained Deletion (ACD) in section 5. We show that our claim rules out (section 4) or ranks lower (section 5) readings that are incorrectly permitted by theories that do not refer to discourse structure. Section 6 concludes.

[1] In most cases, the locally c-commanding A-clause is also sister to E. In fact, in this paper, it is only the "many-clause" puzzle (example (77)) for which we require local c-command instead of sisterhood. In future work, we will investigate the question of whether the local c-command requirement can be replaced with a sisterhood requirement. For the purposes of the present paper, we will use the expressions "A locally c-commands E" and "A is the sister of E" to indicate that the Discourse Condition is satisfied.

2. Background

2.1. Ellipsis Resolution as Matching

(Rooth, 1992a) argues that ellipsis involves a matching relation that is not necessarily restricted to the minimal clause containing the ellipsis site e. (See also (Dalrymple et al., 1991; Tancredi, 1992; Fiengo and May, 1994; Schwarzschild, 1999) among many others). In this paper, we will assume Rooth's (1992a) formalization of this idea, which he applies to ellipsis (complete phonological reduction) as well as to deaccenting (a milder form of phonological reduction).[2]

(Rooth, 1985) defines the focus value of an expression α as the set of denotations constructed following the recursive definition in (5), where D_σ is the set of objects of type σ:

(5) Definition of focus semantic value of α, $F(\alpha)$:

a. If α is a non-focused lexical item, then $F(\alpha) = \{\alpha\}$.

b. If α is a focused lexical item, then $F(\alpha) = D_\sigma$, where σ is the type of α.

c. If the node α has the daughters β and γ (order irrelevant), and there are types σ and τ such that $<\sigma,\tau>$ is the type of β and σ is the type of γ, then $F(\alpha) = \{x \in D_\tau : \exists y, z[\ y \in F(\beta) \ \wedge\ z \in F(\gamma) \ \wedge\ x = y(z)\ ]\ \}$

Following this procedure, the focus value of a clause S is the set of propositions p that result from replacing the denotation of every focused element n in S with some object x of the same semantic type as n's denotation. For example, take the sentence in (6), with focus on its subject *KAREN*. The focus semantic value of (6) –or set of focus alternatives– is the set of propositions with the shape "x arrived late last night", for any x of the same semantic type as $[\![KAREN]\!]$ (type e), as exemplified in (7):

(6) KAREN arrived late last night.

(7) F (KAREN arrived late last night) =
$\{\ p \mid \exists x \in D_e[p = x$ arrived late last night$]\ \} =$
{ "Karen arrived late last night", "Paul arrived late last night", "Susan arrived late last night", ... }

Applying the above definition of focus semantic value to ellipsis phenomena, Rooth (1992a:18) states the following Matching Condition:

[2] We follow Rooth in assuming that our account applies to deaccenting the same way as it does to ellipsis, although in this paper we will concentrate on ellipsis.

(8) **Matching Condition:**
Take an ellipsis site e with an ellipsis antecedent a in the discourse. Ellipsis requires that there be some phrase E containing the ellipsis e and some phrase A containing the ellipsis antecedent a such that $[\![A]\!]$ is or contextually implies a member of $\mathrm{F}(E)$.

Consider the following example:

(9) [Susan arrived late last night]$_{S1}$, and [KAREN did]$_{S2}$, too.

The ellipsis site e is the VP in S_2, and the ellipsis antecedent a to which e is resolved is the VP *[arrive late last night]* in S_1. We can find constituents E and A containing e and a respectively that will fulfill Rooth's Matching Condition. For example, if we take A to be S_1 and E to be S_2, we see that the proposition denoted by *[Susan arrived late last night]*$_{S1}$ is a member of the focus semantic value of *[KAREN arrived late last night]*$_{S2}$ computed in (7). This is indicated in (10):

(10) $[\![$ [Susan arrived late last night]$_{S1}$ $]\!]$ $\in$ F ([KAREN did arrive late last night]$_{S2}$)

Hence, the small discourse in (9) fulfills Rooth's Matching Condition and the ellipsis is licensed in Rooth's system.[3]

2.2. Sloppy Identity as Matching

Rooth's matching condition is stated independently of the issue of sloppy identity, which is illustrated by the following example:[4]

(13) John$_1$ revised his$_1$ paper. Bill$_2$ did too (revised his$_2$ paper)

[3] As a special case, ellipsis across question and answer is governed by the subset matching condition which, independently of ellipsis, (Rooth, 1992b) proposes for Question/Answer pairs. This condition is given in (11) and illustrated below:

(11) **Matching Condition for Q/A pairs:**
Given a question answer sequence Q A, $[\![Q]\!]$ must be a subset of F(A).

(12) Q: [Which student called?]$_{S1}$
A: [JOHN (called)]$_{S2}$.
$[\![$ [Which student called?]$_{S1}$ $]\!]$ = { p | $\exists x[student(x) \wedge p = x$ called] }
$[\![$ [Which student called?]$_{S1}$ $]\!]$ $\subseteq$ F([JOHN (called)]$_{S2}$) = { p | $\exists x \in D_e[p = x$ called] }.

[4] Throughout the paper, material in parentheses in the examples indicates the intended ellipsis resolution.

There are many well-known mechanisms to permit sloppy readings, many of which are consistent with Rooth's condition. Perhaps the simplest is to assume that NPs in general can raise, leaving a co-indexed trace and using the index of movement as a lambda abstractor over the XP they adjoin to, as follows (see e.g. (Heim and Kratzer, 1998)):

(14) [NP 1 [... t_1 ...]]

(15) If α is a syntactic constituent of the form [$_\alpha$ i β], for any index i,
then $[\![\alpha]\!]^g = \lambda x.\ [\![\beta]\!]^{gx/i}$

A pronoun can then be coindexed with the variable bound by the lambda operator. Thus, if we raise *Bill* in (13) and coindex the pronoun *his* with the lambda bound variable, the sloppy reading is permitted.

(16) John$_1$ revised his$_1$ paper. [BILL $\lambda x.x$ revised x's paper]

Now the focus value of the ellipsis clause E is
$\{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$
This set is the set of all propositions in which some individual is substituted for x in "x revised x's paper". The denotation of the antecedent clause A *[John$_1$ revised his$_1$ paper]* is clearly a member of this set.

2.3. Matching and Inference

(Rooth, 1992a) notes that ellipsis sometimes is licensed where $[\![A]\!]$ is not directly an element of the focus value of E. He suggests that inferences can sometimes apply.[5] Note that the Matching Condition in (8) above states that $[\![A]\!]$ is *or contextually implies* a member of F(E). Example (17) illustrates this, where deaccented material appears in italics. The A-clause S_1 does not match the E-clause S_2 directly, as shown in (18), but the A-clause contextually implies a proposition that is a member of F(E), as in (19):

(17) [People convinced John to play the lottery]$_{S1}$, and then [SUE *decided to*]$_{S2}$ as well.

(18) [People convinced John to play the lottery]$_{S1}$ $\notin$ F ([SUE *decided to* (play the lottery)]$_{S2}$)

(19) [People convinced John to play the lottery]$_{S1}$ implies the proposition "John decided to play the lottery".

[5] (Webber, 1978) also claims that ellipsis resolution sometimes relies on inference.

"John decided to play the lottery" $\in$ F ([SUE *decided to* (play the lottery)]$_{S2}$) [6]

It is clearly necessary to constrain inference in the licensing of ellipsis. Although we do not have a complete solution to this rather open question, we will consider some constraints in section 3.5. For the time being, we merely note that inference sometimes allows ellipsis that otherwise would violate the matching condition.

Finally, we point out that Rooth and other authors propose that an extra identity condition applies to ellipsis but not to deaccenting: the elided constituent e itself has to find an ellipsis antecedent a in the discourse to which it is identical in some particular sense: syntactically identical, as in (Rooth, 1992a; Fiengo and May, 1994), or semantically identical, as in (Jacobson, 1992; Hardt, 1993; Merchant, 2001). We will not address this extra condition in the present paper.

2.4. Discourse Relations

There is an extensive literature concerning the structure arising from clausal discourse relations (Hobbs, 1979; Mann and Thompson, 1986; Asher, 1993; Marcu, 2000; Webber et al., 2003). While there is still controversy concerning the proper inventory of discourse relations, and the class of possible resulting structures, much progress has been made, and there is substantial agreement concerning standard relations such as the following:

- **Temporal:** A **before/after** B
- **Cause-Effect/Subordination:** A **because** B
- **Concessive:** A **although** B
- **Parallel:** A **and** B **too**

[6] A reviewer provides the variant of (17) in (20), where the A-clause *[John couldn't be convinced to play the lottery]*$_{S1}$ does not imply "John decided to play the lottery". Crucially, note that here the verb *deCIded* must bear focal stress in (20) and cannot be deaccented. Matching is satisfied between the A-clause and the E-clause directly, without any inferencing, as shown in (21):

(20) [John couldn't be convinced to play the lottery]$_{S1}$, but [SUE deCIded to]$_{S2}$.

(21) $[\![$ [John couldn't be convinced to play the lottery]$_{S1}$ $]\!]$ $\in$
F ([SUE deCIded to (play the lottery)]$_{S2}$), which equals
$\{ p \mid \exists x \in D_e \; \exists P \in D_{<<st>,<e,<st>>>}$ [p= x P to play the lottery] $\}$

- **Contrast:** A **but not** B
- **Consequence:** A **so** B; A **thus** B
- **Question/Answer:** A? B
- **Constructions: if** A **then** B; **forall** A B; **most** A B, etc.

We will restrict ourselves to relatively uncontroversial structures where clausal relations such as the ones above are explicitly signalled with discourse particles, or arise in constructions such as conditionals.[7] We will also follow the fairly standard view that discourse relations (both explicit and implicit) give rise to a tree structure (Asher, 1993; Prust et al., 1994) (but see (Webber et al., 2003) for a critical examination of the tree structure assumption).

3. Selection of Antecedent

The Discourse Condition makes clear predictions concerning the selection of an antecedent a in resolving an ellipsis site e. The goal of this section is to examine these predictions. We begin with simple examples of sluicing, in 3.1, followed by simple examples of VP ellipsis in 3.2. In both cases, we show that the Discourse Condition plays an essential role in correctly accounting for the facts. In the three subsequent subsections, we examine more complex examples where independently motivated aspects of semantic interpretation and focus matching need to be invoked. Subsection 3.3 concentrates on examples of VP ellipsis where matching and the Discourse Condition apply at a higher level, between *non-minimal* A and E clauses containing the antecedent VP a and the elided VP e. This flexibility is already present in Rooth's original matching proposal. Subsection 3.4 tackles cases which involve implicit material independently required for the interpretation of modal operators. Finally, in subsection 3.5, we examine cases where some simple inferences are required to produce the correct matching. The appeal

[7] An anonymous reviewer points out that it is not standard to invoke discourse relations in constructions such as **forall** A B. However, it is not uncommon to associate a conditional with a discourse relation. For example, the *Consequence* relation is invoked in (Lascarides and Asher, ress) for conditionals. It is also widely accepted that conditionals and quantified structures receive a uniform analysis in terms of *tripartite structures* (Heim, 1982) or *duplex conditions* (Kamp and Reyle, 1993). Thus, we uniformly invoke discourse relations for all such structures. The account of ACD structures given in section 5 requires the positing of a discourse relation in a **forall** structure, and thus may be seen as providing empirical support for this claim.

to inference and contextual implication is part of Rooth's matching approach, as we saw in section 2.3, independently of the new Discourse Condition.

3.1. Sluicing

Ross (1969) coined the term "Sluicing" to refer to the ellipsis of IP in an interrogative clause, as exemplified in (22)-(23). (Chung et al., 1995) noted that the expression in the antecedent clause A corresponding to the sluiced *wh*-phrase is often an indefinite, explicit in (22) and implicit in (23). Let us call this corresponding expression the "correlate".

(22) John called somebody. I wonder who.

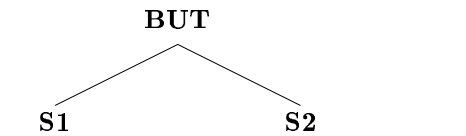
(23) John ate. But it's unclear what.

(Romero, 1998) gives a Matching Condition account of the relation between a sluiced *wh*-phrase and the shape of its correlate. She exploits the fact that sluiced *wh*-phrases -like remnants of ellipsis in general– bear focus stress, and she defines a set of alternatives of a focused *wh*-Determiner that includes an existential option. For example, the sluiced interrogative clause *[WHAT John ate]* in (23) has the following focus semantic value:

(24) F (WHAT John ate) =
{ "what x: John ate x", "how much x: John ate x", "whether ∃x: John ate x" }

Furthermore, (Romero, 1998) argues that uttering a sentence like *John ate* implies that the speaker has some propositional attitude towards the proposition expressed. That is, uttering *John ate* implies the proposition "I believe / I know / It is clear that John ate". The proposition "It is clear that John ate" in turn implies the proposition "It is clear whether John ate (something)". Once this is taken into account, matching obtains in example (25) between S_1 and S_2, that is, between two direct sisters in the discourse tree, as indicated in (26):

(25) [John ate]$_{S1}$. But [it's unCLEar WHAT (he ate)]$_{S2}$.



Example (25)

(26) Uttering [John ate]$_{S1}$ implies the proposition "It is clear whether ∃x: John ate x", and
"It is clear whether ∃x: John ate x" ∈ F ([It is unCLEar WHAT x: he ate x]$_{S2}$)

Let us now turn to the following example, which (Chung et al., 1995) observe is ill-formed:

(27) *[Agnes arrived after [John ate] $_{S3}$]$_{S1}$, but [it's unclear what]$_{S2}$.

(Chung et al., 1995) tacitly assume the discourse structure indicated in (27) –where *[Agnes arrived after John ate]*$_{S1}$ is in the contrast relation with *[it's unclear what]*$_{S2}$– and claim that unacceptability results from an island violation in (28), as happens in the overt counterpart (29):

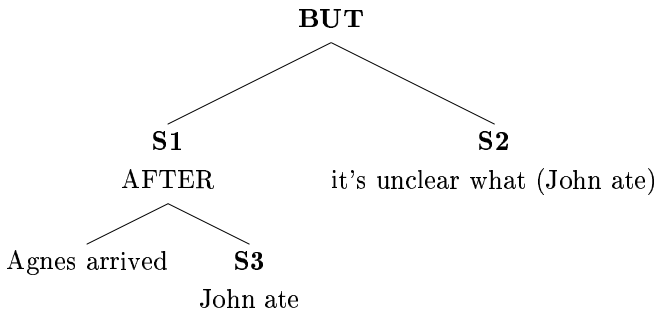
(28) *[Agnes arrived after [John ate] $_{S3}$]$_{S1}$, but [it's unclear what (Agnes arrived after John ate t)]$_{S2}$.

(29) *It's unclear **what** Agnes arrived after John ate **t**.

However, (Chung et al., 1995) do not consider the possibility of resolving the elided IP in (27) to *John ate t*, as in (30), whose overt (non-deaccented) counterpart (31) has no island violation and is perfectly fine:

(30) *[Agnes arrived after [John ate] $_{S3}$]$_{S1}$, but [it's unclear what (John ate t)]$_{S2}$.

(31) Agnes arrived after John ate, but it's unclear what John ate.



Example (30)

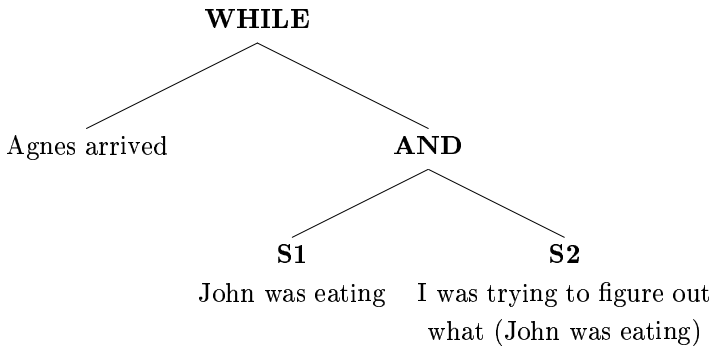
Nothing in (Chung et al., 1995)'s theory (or other theories of ellipsis) rules out representation (30). In the present account, (30) is unacceptable because no matching A-clause is found that is in the right discourse relation with the E-clause S_2, since:

i. S_3 matches the E-clause S_2, but S_3 does not c-command S_2 in the discourse tree, and

ii. S_1 c-commands the E-clause S_2 in the discourse tree, but S_1 and S_2 do not match. That is, $[\![$ [Agnes arrived after John ate]$_{S1}$ $]\!]$ implies the proposition "it is clear whether ∃x: Agnes arrived after John ate x", but this proposition $\notin$ F ([it is unCLEar WHAT x: John ate x]$_{S2}$).

If we change the discourse structure, as in (32), the example becomes acceptable:

(32) Agnes arrived while [[John was eating]$_{S1}$ and [I was trying to figure out what]$_{S2}$].



Example (32)

The sentence is acceptable because the Matching Condition and the Discourse Condition are now both met. S_1 matches S_2 in (32), as sketched in (33). And, given that S_1 is sister to S_2, S_1 is permitted as the A-clause to the E-clause S_2 by the Discourse Condition.

(33) Uttering [John was eating]$_{S1}$ in (32) implies the proposition "I knew whether ∃x: John was eating x", and "I knew whether ∃x: John was eating x" $\in$ F ([I [was trying to FIgure out]$_F$ WHAT x: he was eating x]$_{S2}$) .

3.2. VP Ellipsis

We have seen that discourse structure correctly rules out potential antecedents a for a sluicing site e. In this section, we will see that the same is true of VP ellipsis. Take, for example, (34). Here, the ellipsis

site can be resolved to the VP *arrive after John ate*, but not to the embedded VP *ate*. In other words, the matrix VP *arrive after John ate* in S_1 can be taken as the antecedent a of the ellipsis site, but the embedded VP *eat* in S_3 cannot.

(34) [Agnes arrived after [John ate]$_{S3}$]$_{S1}$. (But) [Bill didn't *(eat)/ (arrive after John ate)]$_{S2}$.

As in the case of Sluicing, some potential antecedents a for the ellipsis site are ruled out because no containing A-clause can be found that matches and locally c-commands the E-clause. According to our analysis, in (34) the E-clause S_2 cannot take S_3 as its matching A-clause because S_3 does not c-command S_2, as shown in the discourse tree below. Hence, the ellipsis site cannot be resolved to the VP of S_3. Instead, S_2 is allowed to match its discourse sister S_1, and thus the ellipsis is resolved to S_1's VP *arrive after John ate*.[8]

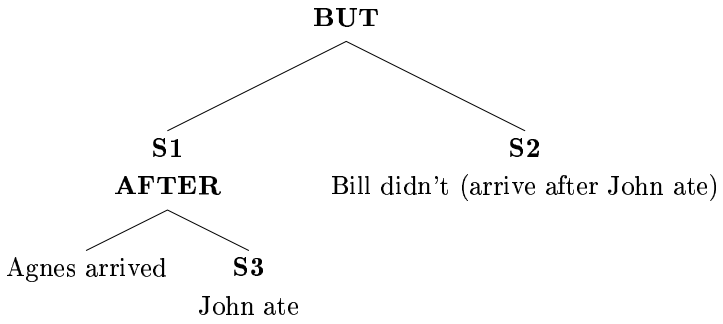


Figure 1. Example (34)

The same discourse configuration obtains if, instead of being juxtaposed, the larger clauses S_1 and S_2 are placed in an *if-then* discourse

[8] Note that ellipsis resolution to *eat* in this configuration is impossible even though the overt (non-deaccented) counterpart would be fine. This is shown by the contrast between the unfelicitous response with ellipsis (35S) and the alternative acceptable response in full (35S'):

(35) Context: S works at a day care with three babies, John, Bill and Jesse, each of which has some problem. John only has a good digestion when Agnes feeds him. Bill sometimes refuses to eat. Jesse is a loud crier.
A: How was your day at work?
S: A nightmare!!! Lots of things went wrong. Agnes arrived after John ate. # Bill didn't (eat). Jesse cried for three hours...
S': A nightmare!!! Lots of things went wrong. Agnes arrived after John ate. Bill didn't eat. Jesse cried for three hours...

structure. Given the resulting discourse tree under (36), only S_1 is a possible A-clause for the E-clause S_2 according to the Discourse Condition.[9]

(36) If [Agnes arrived after [John ate] $_{S3}]_{S1}$ then [Bill didn't *(eat)/ (arrive after John ate) $]_{S2}$.

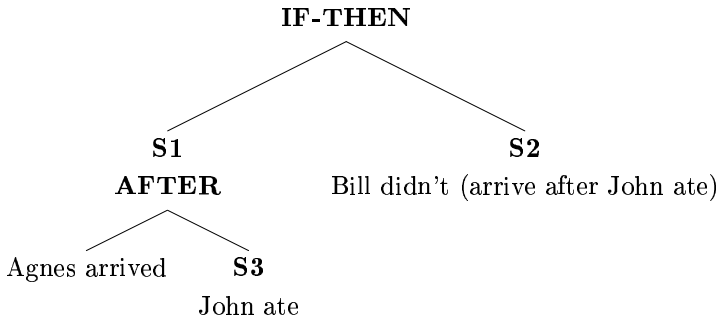


Figure 2. Example (36)

We analyze Antecedent Contained Deletion (ACD) sentences like (37) in a similar fashion. That is, even though relative clauses -like *if*-clauses– are syntactically embedded within the matrix CP projected by S_2, the discourse relation is established between the relative clause IP and a matrix IP node excluding the relative clause. The resulting discourse tree is given below. Again, local c-command determines that the ellipsis should be resolved to *arrive after John ate.*[10]

(37) Everyone who [t could have arrived after John ate]$_{S1}$ [t did *(ate) / (arrive after J ate) $]_{S2}$

3.3. Matching at Different Levels

The Discourse Condition sharply limits possible interpretations for ellipsis, in a way that might at first glance appear excessively restrictive. For example, one might think that an embedded antecedent *a* is never possible, since its clause cannot c-command the clause with the ellipsis. It is important to realize, however, that the matching can often take place at many levels. Recall that Rooth's Matching Condition

[9] See subsection 6 for an elaboration on (36) involving symmetric focus.

[10] Note that the ellipsis can be *arrive after John ate*, excluding *could (have)*. See section 5 on ACD on this issue.

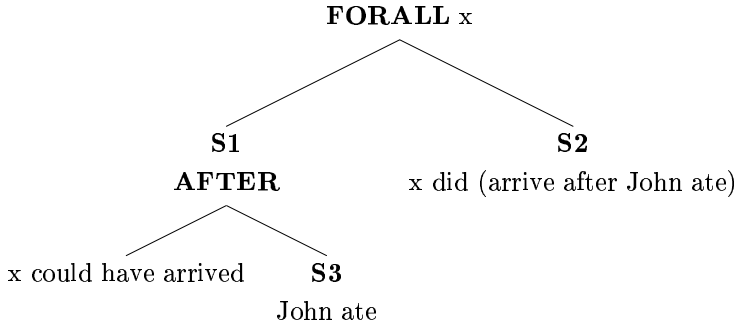


Figure 3. Example (37)

simply requires matching between *some* constituent A containing the antecedent a and *some* constituent E containing the ellipsis e; in particular, Rooth's condition does not require that the *minimal* containing clauses match. We will see that, in all of the following cases, apparent matching between clauses without local c-command is due to matching clauses at a higher level that are in the appropriate c-command relation.

We begin with examples (38) and (39). (38) is like the examples from the section 3.2. The relative clause S_1 and the main clause S_2 are discourse sisters in a **forall** structure. Hence matching can apply between them and the ellipsis is resolved to the VP of S_1.

(38) Everyone who [t wanted to leave before he ate salmon]$_{S1}$ [t did *(eat salmon) / (leave before he ate salmon)]$_{S2}$

But what about (39)? Despite the fact that the two embedded clauses S_3 and S_4 in (39) are not discourse sisters, ellipsis resolution can select the embedded VP in S_3.

(39) [The man who [t ate salmon]$_{S3}$ left this evening]$_{S1}$. [The man who [t didn't (eat salmon)]$_{S4}$ left this afternoon.]$_{S2}$

We propose that matching in (39) is performed not between S_3 and S_4, but between the two matrix clauses S_1 and S_2, which are discourse sisters. In other words, even though the ellipsis antecedent a and the ellipsis site e are further embedded, Rooth's Matching Condition allows us to choose the higher clause S_1 as the A-clause containing a and the higher clause S_2 as the E-clause containing e. Matching succeeds between these discourse sisters, as shown in (40), and thus the ellipsis is licensed.

(40) $[\![$[The man who ate salmon left this evening]$_{S1}$ $]\!]$ $\in$
F ([The man who DIDn't (eat salmon) left this AFTERNOON]$_{S2}$),

which equals
{"The man who ate salmon left this evening", "The man who ate salmon left this afternoon", "The man who didn't eat salmon left this evening", "The man who didn't eat salmon left this afternoon", ... }

Note that matching at higher levels does not automatically solve any problem that would potentially arise with matching at lower levels. Higher level matching allows us to satisfy the local c-command condition when lower matching would not. But, in exchange, higher matching demands parallelism between larger constituents, and hence the parallelism required by higher matching may not succeed in examples where the parallelism required by lower matching would. This can be seen by comparing (39) with (41). (41) shows that, if we change the second matrix sentence so that the higher S_1 and S_2 do not match, the embedded VP *eat salmon* is not an available antecedent *a* anymore. This means that both (39) and (41) require higher level matching in order to comply with local c-command –with complete parallelism between S_1 and S_2 – and that they cannot be licensed through lower level matching without c-command. If lower matching without c-command was allowed, we would wrongly predict the resolution of *e* to *eat salmon* to be perfectly acceptable in both examples.

(41) [The man who [t ate salmon]$_{S3}$ left this evening]$_{S1}$, and [John did too (leave this evening)/*(eat salmon).]$_{S2}$

A second type of example, which involves questions, is given in (42). Here the local c-commander S_2 does not provide the antecedent for the VP ellipsis site. But, again, our c-command constraint is not violated, since matching can be done between the question S_1 and the entire sentence S_4, which stand in the Question/Answer discourse relation with S_1:

(42) Q: [Did the students answer the survey?]$_{S1}$
A: [Everyone who [t received the forms]$_{S2}$ [t did]$_{S3}$ (answer the survey)]$_{S4}$

In this sense, matching in (42) obtains exactly at the same level as in (43), where the A-clause is a question and the E-clause is its sister answer.

(43) Q: [Did the students answer the survey?]$_{S1}$
A: Yes, [they did (answer the survey)]$_{S4}$

The only difference is that, while (43) provides a complete answer, (42) only gives a partial one. Following Groenendijk-Stokhof (1984), a partial answer eliminates some equivalence class in the partition (of possible exhaustive answers) induced by the question, but it does not eliminate all but one. Or, in terms of (Büring, 1997), S_4 in (42A) answers some subquestion of the relevant question, but leaves some other subquestions unanswered.[11]

3.4. Implicit Material

Consider example (47). Here, S_1 seems to match S_2 and resolve the VPE with it, despite the lack of local c-command between them:

(47) [If it rains, [John will come home]$_{S1}$]$_{S0}$. [Peter might (come home)]$_{S2}$, too.

However, note that modals always carry some restrictor set C of possible worlds. This set is at least partly determined contextually, and it can be further restricted with an explicit *if*-clause (Kratzer, 1979; von Fintel, 1994). In (47), the restrictor set is specified by the *if*-clause for S_0 and contextually determined for S_2. But note that the restrictor of *might* in S_2 is understood as being $\{w' : \textit{it rains in } w'\}$. This means that, semantically, the higher clauses S_0 and S_2 match. And, since S_0 is the local c-commander of S_2, matching occurs between the A-clause

[11] That matching succeeds between the discourse sisters S_1 and S_4 in (43) is shown in (44) (see also footnote 3). For (42), we need Büring's (1997) analysis of Topic accent, building on Rooth's framework. The relevant Topic matching condition is stated in (45) and applied to our example in (46):

(44) $[\![$[Did the students answer the survey?]$_{S1}]\!] \subseteq$ F([they DID (answer the survey)]$_{S4}$) = {they answered the survey, they didn't answer the survey}

(45) Given a question answer sequence Q A, $[\![Q]\!]$ must be an element of T(A), where T(A) is the set of the focus values F(A) resulting from substituting the Topic-accented element with some other element of the same type.

(46) $[\![$[Did the students answer the survey?]$_{S1}]\!] \in$
T([[Everyone who received the FORMS]$_{Topic}$ DID (answer the survey)]$_{S4}$), which equals
{ {The students answered the survey, the students didn't answer the survey}, {the students in my class answered the survey, the students in my class didn't answer the survey}, {the students that received the forms answered the survey, the students that received the forms didn't answer the survey}, ...}

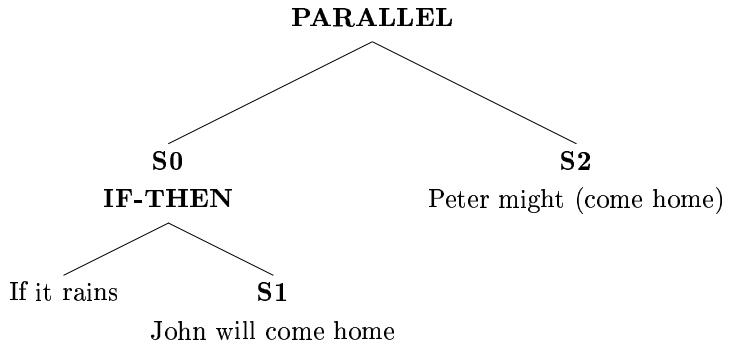


Figure 4. Example (47)

S_0 and the E-clause S_2 with the appropriate discourse relation. This is indicated in (52):[12]

(51) [If it rains, [John will come home]$_{S1}$]$_{S0}$. [If C$_{\{w'\text{: } it\ rains\ in\ w'\}}$, [Peter might (come home)]$_{S3}$]$_{S2}$, too.

(52) $[\![$ [If it rains, John will come home]$_{S0}$ $]\!]$ $\in$
F ([If C$_{\{w'\text{: } it\ rains\ in\ w'\}}$, PEter MIGHT (come home)]$_{S2}$)

Matching is also done at the top level in the following variant, where not only the subjects and modals but also the content of the restrictor sets contrast with each other:

(53) [If it rains, [John might come home]$_{S1}$]$_{S0}$. [[Peter will (come home)]$_{S3}$ no matter what]$_{S2}$.

[12] Example (47) is reminiscent of cases of Modal Subordination like (48) ((Roberts, 1986), (Roberts, 1996)). As in (47), the modal *might* in (48) is contextually restricted to a set of worlds at least partially determined by the previous clause, namely $\{w' : you\ buy\ a\ lottery\ ticket\ in\ w'\}$. One difference, though, is that example (47) draws this set from the *restrictor* of the implicit modal in the previous clause (i.e., from *if it rains*), whereas examples of Modal Subordination typically use material in the *nuclear scope* of the previous operator (e.g., *you buy a lottery ticket* is within the nuclear scope of *should*). Beyond this difference, both cases pattern alike in that this type of silent contextual restriction is more felicitous than explicit mention of it, as the two examples are preferable over their versions (49) and (50). We thank a reviewer for pointing out this judgment for (49).

(48) You should buy a lottery ticket and put it in a safe place. It might be worth a million dollars.

(49) If it rains, John will come home. If it rains, Peter might (come home), too.

(50) You should buy a lottery ticket and put it in a safe place. If you bought a lottery ticket, it might be worth a million dollars.

(54) $[\![$ [If it rains, John might come home]$_{S0}$ $]\!]$ $\in$
F ([PEter WILL (come home) [no matter WHAT]$_F$]$_{S2}$), which equals
{"In all w$\in$ $\{w'$: w' *is a possible world*$\}$ Peter comes",
"In all w$\in$ $\{w'$: w' *is a possible world*$\}$ John comes",
"In some w$\in$ $\{w'$: w' *is a possible world*$\}$ Peter comes",
"In some w$\in$ $\{w'$: w' *is a possible world*$\}$ John comes",
"In all w$\in$ $\{w'$: *it rains in* $w'\}$ Peter comes",
"In all w$\in$ $\{w'$: *it rains in* $w'\}$ John comes",
"In some w$\in$ $\{w'$: *it rains in* $w'\}$ Peter comes",
"In some w$\in$ $\{w'$: *it rains in* $w'\}$ John comes", ... $\}$[13]

3.5. Constrained Inferencing

As Rooth notes in his original exposition of the Matching Condition, repeated in (56), matching sometimes has access to inferred antecedent propositions. That is, his condition, repeated below, allows for the antecedent clause A to denote *or to contextually imply* a member of F(E):

(56) **Matching Condition:**
Take an ellipsis site e with an ellipsis antecedent a in the discourse. Ellipsis requires that there be some phrase E containing the ellipsis e and some phrase A containing the ellipsis antecedent a such that $[\![A]\!]$ is or contextually implies a member of F(E).

It is clear that the appeal to inference must be constrained – allowing unconstrained inference would seriously weaken the empirical content of the Matching Condition of ellipsis, since otherwise inference might often be able to save a structure that the Matching Condition is intended to rule out. Furthermore, constraining inference would relieve the hearer of what might otherwise be an intolerable burden, since the hearer would have to check all possible inferable alternatives to the antecedent clause, before arriving at an interpretation. This is a problem that arises for any theory of ellipsis, and is not specific to our proposal.

[13] Example (55), provided by a reviewer, is parallel to (53): the modal cluster *should be able to* contrasts with *can't* and the temporal adjunct *this time* contrasts with the entire temporal clause *when there is a blizzard.* No implicit material (nor inferencing) is involved here.

(55) Although [usually when there is a blizzard, John can't get to Chicago]$_{S1}$, [this time he should be able to]$_{S2}$.

However, it is perhaps particularly acute with respect to our proposal, since we claim that the Discourse Condition places strong limitations on possible antecedents a for an ellipsis e. Thus it is important to show that inference can be sharply constrained, so that it does not undermine the restrictions imposed by our Discourse Condition.

The proper characterization of constraints on inference in the theory of ellipsis and related phenomena is an important area, which has in our view received insufficient attention. While we cannot hope to present a complete solution to this problem here, we would like to describe one concrete proposal in this regard, due to (Fox, 2000), to illustrate that the Matching Condition and the proposed Discourse Condition can successfully incorporate inference in a highly constrained way.

Our goal in this section, then, is to show two things: on the one hand, we will show that inference is blocked in cases where our Discourse Condition properly rules out a particular reading; on the other hand, we will show that we can successfully appeal to this type of constrained inference in cases where it is in fact required by our account. We first summarize Fox's account, and briefly present his arguments. Next, we re-examine the inferences required in our account of sluicing, and we show that, while these inferences are consistent with Fox's constraints, inferencing does not undermine the effect of the Discourse Condition in ruling out embedded antecedents a. Finally, we consider an example in which further inference is required for our account, and we show that this inferencing is permitted.

3.5.1. *Fox's Account of Accommodation-Seeking Material*

(Fox, 2000) argues that contextual inferencing from A must be *minimal* and that it is possible when triggered by *accommodation-seeking material*. Accommodation-seeking material is defined as non-focused (or non-Focus-marked) overt material in E that is absent from A. This can be thought of as a heuristic strategy on the part of the hearer; accommodation-seeking material is an easily identifiable sign that inference may well be required, and furthermore gives an indication of what the required inference might be.

Fox's proposal is illustrated in the deaccenting examples (57) and (60). Take the A clause to be S_1 and the E clause to be S_2 in both examples. In (57), there is some overt accommodation-seeking material in E –namely *came to believe*– that is non-focused and that is absent from A. This triggers the inferencing from the phrase *you convinced Mary* in the A clause to the implied phrase *Mary came to believe*; once we have inferred the proposition "that Mary came to believe that I was bad-mouthing her", Matching obtains, as indicated in (58):

(57) [First you convinced Mary$_1$ that I was bad-mouthing her$_1$]$_{S1}$, and then [FRED$_2$ *came to believe that I was bad-mouthing him$_2$*]$_{S2}$

(58) a. The accommodation-seeking material *came to believe* in E triggers the inferencing from the A-clause [First you convinced Mary$_1$ that I was bad-mouthing her$_1$]$_{S1}$ to the proposition "that Mary came to believe that I was bad-mouthing her".

b. The inferred proposition "that Mary came to believe that I was bad-mouthing her" $\in$ F ([FRED$_2$ *came to believe that I was bad-mouthing him$_2$*]$_{S2}$).

However, Fox notes that, if we replace the accommodation-seeking material *came to believe* with the focused verb *DENIED*, as in (60), there is no non-focused accommodation-seeking material in E, no inferencing is triggered, and the A-clause must match the E-clause directly. As $[\![A]\!] \notin$ F(E), the Matching Condition is violated and the sentence is ill-formed:[14]

(60) * [First you convinced Mary$_1$ that I was bad-mouthing her$_1$]$_{S1}$, and then [FRED$_2$ DENIED *that I was bad-mouthing him$_2$*]$_{S2}$

(61) a. There is no accommodation-seeking material to trigger inferencing.

b. $[\![$[First you convinced Mary$_1$ that I was bad-mouthing her$_1$]$_{S1}]\!] \notin$ F ([FRED$_2$ DENIED *that I was bad-mouthing him$_2$*]$_{S2}$)

3.5.2. *Inferencing and the Discourse Condition*
In our account of sluicing, we appealed to inferences of the following form:

[14] If the binders of the pronouns *her$_1$* and *him$_2$* are in parallel syntactic positions, as in Fox' variant of (60) in (59), the focused verb *DENIED* matches the previous attitude *came to believe* directly and there is no need for inferencing. (See also footnote 6 for a similar example without need for inferencing.) Inferencing is needed in (60) in the text becasue the A-clause must denote or contextually imply a member of $\{\ p \mid \exists x \in D_e[\ p = x$ R that I was bad-mouthing $x\ ]\ \}$, where the binder of the pronoun is the subject of the attitude verb.

(59) [Sue$_1$ came to believe that I was bad-mouthing her$_1$]$_{S1}$. However, [FRED$_2$ DENIED *that I was bad-mouthing him$_2$*]$_{S2}$

John ate ⇒ *I know / It is clear whether John ate.*

Consider the VP-ellipsis example (62), which involves this sort of inferencing as well. Two pieces of inference are needed in (62) for the discourse sisters S_1 and S_2 to match, and both are triggered by accommodation-seeking material. First, the presence of the subject *I* as the holder of an epistemic attitude in the E-clause S_2 triggers inferencing of *I* as a holder of an attitude in the A-clause S_1 as well. That is, it triggers the inferencing from *[The man who climbed Mount Aneto left this evening]*$_{S1}$ to the proposition "*I know* that the man who climbed Mount Aneto left this evening". Second, since the material embedded under *wonder* in S_2 is an interrogative construction and no such construction is found in S_1, further inferencing is triggered from the proposition "I know that the man who climbed Mount Aneto left this evening" to the proposition "I know *whether* the man who climbed Mount Aneto left this evening". This inferred proposition matches the E-clause S_2, as indicated in (63):

(62) [The man who climbed Mount Aneto left this evening]$_{S1}$. [I wonder whether Mary did too (left this evening).]$_{S2}$

(63)
a. The holder of the attitude *I* and the interrogative construction in E trigger the inferencing from the A clause *[The man who climbed Mount Aneto left this evening]*$_{S1}$ to the proposition "I know whether the man who climbed Mount Aneto left this evening".
b. The inferred proposition "I know whether the man who climbed Mount Aneto left this evening" ∈ F ([I WONder whether MAry did (left this evening)]$_{S2}$).

Interestingly, note that the A-clause *[The man who climbed Mount Aneto left this evening]*$_{S1}$ also implies the proposition "I know whether a man climbed Mount Aneto". Can this implied proposition be used to satisfy Matching while resolving the ellipsis to the embedded VP *climb Mount Aneto* in (64)? No. There is no further overt accommodation-seeking material in E (nor anywhere else) that could trigger inferencing from the A-clause S_1 to this proposition. In the absence of a trigger, this inferencing does not occur and that proposition cannot be used to fulfill Matching in (64):

(64) * [The man who climbed Mount Aneto left this evening]$_{S1}$. [I wonder whether Mary did too (climb Mount Aneto).]$_{S2}$

(65)

a. The proposition "I know whether a man climbed Mount Aneto" $\in$ F ([I WONder whether MAry did (climb Mount Aneto)]$_{S2}$).

b. However, no overt accommodation-seeking material in E triggers the inferencing from the A clause *[The man who climbed Mount Aneto left this evening]*$_{S1}$ to the proposition "I know whether a man climbed Mount Aneto".

This last piece of reasoning can be applied to examples (30) and (41) above, where we invoked the Discourse Condition to rule out some antecedents a. Take (30), repeated here as (66):

(66) *[Agnes arrived after [John ate] $_{S3}$]$_{S1}$, but [it's unclear what (John ate)]$_{S2}$.

Our claim was that the Discourse Condition correctly ruled out ellipsis resolution to the embedded IP *John eat t* because it requires the A-clause to be the sister clause S_1. If inference is not constrained, then it would undermine this claim, since the sister clause *[Agnes arrived after John ate]*$_{S1}$ implies the proposition "I know whether $\exists x$: John ate x", and this would match *[It is unCLEar WHAT (John ate)]*$_{S2}$. However, this inference is not triggered by accommodation-seeking material in the E-clause (nor elsewhere in the sentences), and therefore it is blocked. The case of (41), repeated below, is similar:

(67) [The man who [t ate salmon]$_{S3}$ left this evening]$_{S1}$, and [John did too (leave this evening)/*(eat salmon).]$_{S2}$

Again, we claimed that the Discourse Condition rules out the embedded antecedent VP *eat salmon*, but the top-level clause *[The man who ate salmon left this evening]*$_{S1}$ entails the proposition "A man ate salmon", which would match *[JOHN (ate salmon)]*$_{S2}$. If permitted, this inference would undermine the restriction imposed by the Discourse Condition. Again, the E-clause lacks accommodation-seeking material, and the inference is blocked, as desired.

We have seen that, in the examples where our account needed inference, inferencing is granted by the presence of accommodation-seeking material; and that, in the examples where our Discourse Condition correctly ruled out a particular antecedent a, inferencing is blocked from saving the interpretation, because there is no accommodation-seeking material to trigger inference.

3.5.3. *A More Complex Example*

Finally, we examine a case where our account requires further inference, and we will show that inference in this case is triggered by the presence

of accommodation-seeking material. Consider example (68) (due to an anonymous reviewer):

(68) [Agnes said [she would come]$_{S1}$ after [John left]$_{S2}$]$_{S0}$.
But [[he hasn't]$_{S3}$, so [she must not be here yet]$_{S4}$]$_{S5}$.

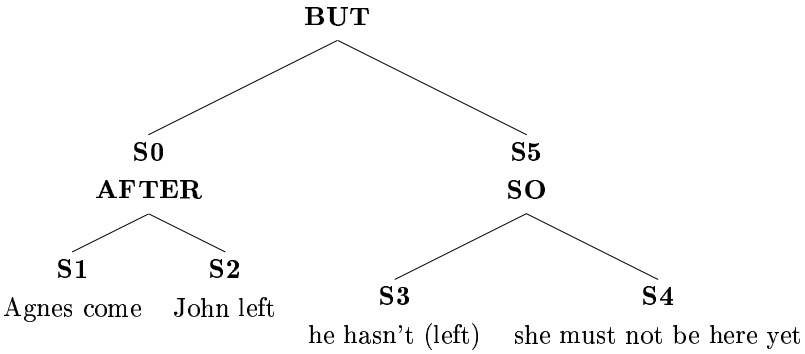


Figure 5. Example (68)

We see that the ellipsis site in S_3 can be resolved to the VP in S_2. The Discourse Condition does not allow for S_2 to be taken as the matching A-clause of S_3 directly, since local c-command does not obtain between the two. But we can perform matching at a higher level between the sisters S_0 and S_5 by using two pieces of triggered inferencing. First, the connective *so* in the E clause S_5 is accommodation-seeking material; it expresses a consequence relation absent in the A clause S_0. This triggers inferencing from the temporal relation in *[Agnes said she would come after John left]*$_{S0}$ to the (conditional-)consequence relation in the proposition "If John hasn't left, Agnes must (according to Agnes's forecast) not have come". Second, the accommodation-seeking material *not be here yet* in the E clause S_5 forces further inferencing from "not have come" to "not be here yet". These two inference steps are summarized in (69):

(69)
a. The accommodation-seeking material *so* in E triggers inferencing from the A clause *[Agnes said she would come after John left]*$_{S0}$ to the proposition "if John hasn't left, Agnes must (according to Agnes's forecast) not have come".
b. The accommodation-seeking material *not be here yet* in E triggers further inferencing from the proposition "if John hasn't left, Agnes must (according to Agnes's forecast) not

have come" to the proposition "if John hasn't left, Agnes must (according to Agnes's forecast) not be here yet".

Once these two triggers have motivated inferencing, the inferred proposition "if John hasn't left, Agnes must (according to Agnes's forecast) not be here yet" matches S_5. To see this, take a discourse where this proposition is directly expressed, as in (72). It is clear that the higher sentences S_0 and S_5 express the consequence relation between the two same propositions "John hasn't left" and "Agnes is not here yet". The only difference is that S_0 merely states this consequence relation (using *if-then*), whereas S_5 expresses this consequence relation (using *so*) and furthermore emphasizes the truth of the proposition "John hasn't left" in the actual world by focusing *HASN'T*.[15] In sum, S_0 matches S_5.

(72) [If [John hasn't left]$_{S1}$, [Agnes must not be here yet]$_{S2}$]$_{S0}$.
[[He hasn't]$_{S3}$, so [she must not be here yet]$_{S4}$]$_{S5}$.

In conclusion, by incorporating Fox's proposal, we have shown that inference can be combined with our Discourse Condition in a constrained way. On the one hand, the Discourse Condition successfully rules out embedded antecedents a, because in these cases inference is blocked. On the other hand, in cases where it appears that an embedded antecedent a is made available in violation of the Discourse Condition, we can successfully appeal to inference that is consistent with Fox's constraint.[16]

[15] This is a use of auxiliary stress not as polarity Focus but as so-called VERUM Focus. See section 5.2 for discussion of this distinction. Roughly, S_0 in (72) conveys the proposition in (70), S_5 conveys the proposition in (71), and focal stress on *HASN'T* indicates contrast between the epistemic certainty conveyed in S_5 and the epistemic possibility conveyed in S_0:

(70) "There is a consequence relation between John not leaving and Agnes not being here. It is (epistemically) **possible** that John has not left."

(71) "There is a consequence relation between John not leaving and Agnes not being here. It is (epistemically) **certain** that John has not left."

[16] In our view, the crucial point of Fox's account is the that inference is only permitted in matching if it is triggered. It is not clear whether Fox intends that accommodation-seeking material in the E-clause is the *only* possible trigger, or whether accommodation-seeking material placed somewhere else may trigger inferencing as well. The following example, due to Satoshi Tomioka, (p.c.), may suggest that a trigger outside the E-clause is also possible.

(73) When [[Bill got healthy]$_{S1}$ after [he quit smoking]$_{S2}$]$_{S0}$, [his brother did (quit smoking / got healthy after he quit smoking) as well]$_{S3}$.

3.6. Summary of section 3

To sum up section 3, we have shown that the selection of an antecedent clause A for a clause E containing an ellipsis site is subject to discourse constraints. The data presented here can be captured if the Discourse Condition requires that the matching A-clause locally c-command the E-clause in the discourse tree. This condition leaves open the possibility that the E-clause be the minimal clause containing the ellipsis e or that it be a higher one. The proposal also takes into account implicit material independently motivated for the interpretation of modals. Finally, the proposed analysis inherits the resource to contextual inferencing –constrained in important ways– from Rooth's proposal.

In the following sections, we will see that, for a given antecedent a to an ellipsis site e, the proposed Discourse Condition also has an effect on possible readings of pronouns (section 4) and on preferred scope readings (section 5).

We direct our attention to the reading "his brother did (quit smoking)", judged quite acceptable. Note that, under this reading, the elided VP gives rise to the interpretation "his brother quit smoking *in order to get healthy*". We propose that an inference is triggered from the temporal relation in the A-clause S_0 *[Bill got healthy after he quit smoking]*$_{S0}$ to the cause-effect relation in the proposition "Bill quit smoking in order to get healthy". What triggers this inference? We believe that the presence of *when*, which is interpreted as a causal link between the event described in S_0 and the event described in S_2, is responsible for the inference. In effect, Bill's health at a time t cannot produce his brother's health at a time t', but Bill's (successful) attempt at getting healthy by quitting smoking can cause his brother's attempt at getting healthy by quitting smoking. Through this trigerred inference, the discourse sisters S_0 and S_3 match, as sketched in (74):

(74) *[Bill got healthy after he quit smoking]*$_{S0}$ contextually implies the proposition "Bill quit smoking in order to get healthy", and this proposition
∈
F ([his BROther did (quit smoking in order to get healthy)]$_{S3}$).

That *when* is the inference trigger despite it being outside the E-clause is suggested by the variant in (75). Here, *when* is replaced with the neutral connective *and*, the cause-effect inference in not triggered, and the ellipsis site must be resolved to *get healthy after he quit smoking* and cannot be resolved to *quit smoking (in order to get healthy)*:

(75) [Bill got healthy after he quit smoking]$_{S0}$, and [his brother did (* quit smoking / get healthy after he quit smoking) as well]$_{S3}$.

4. Possible Readings: The Many-Clause Puzzle

4.1. The Standard Many-Clause Puzzle

We turn now to a well-known type of example, dubbed the "many-clause puzzle" by (Fiengo and May, 1994), and originally due to (Dahl, 1974).

(76) John revised his paper, and Bill did too, although the teacher didn't.

(77) [John revised his paper]$_{S0}$, and
[[Bill did (revise his paper)]$_{S2}$ too, although
[the teacher didn't (revise his paper)]$_{S3}$]$_{S1}$.

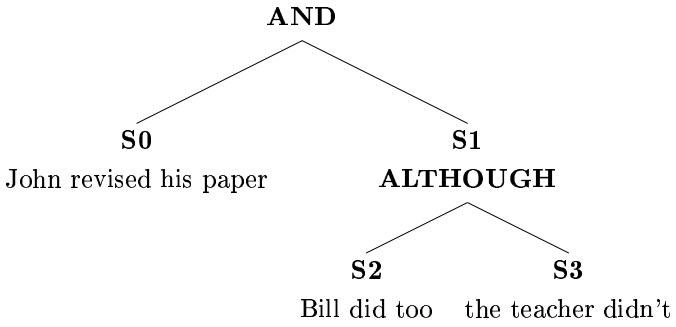


Figure 6. Example (76)

Note that there are two clauses containing an ellipsis site, S_2 and S_3. As observed by Dahl, there are three possible readings. First, there is the across the board strict reading, where John, Bill but not the teacher revised John's paper. Second, there is the across the board sloppy reading, where John, Bill but not the teacher revised their own paper. Third, there is a mixed reading, in which Bill revised Bill's paper (sloppy), although the teacher did not revise Bill's paper (strict). Other mixed readings are not possible. Thus of five potential readings, displayed below, only 1-3 are permitted.

Readings: 1. JJJ 2. JBT 3. JBB 4. *JJT 5. *JBJ

Note that S_0 is the locally c-commanding A-clause for S_2, and that S_2 is the locally c-commanding A-clause for S_3. Below, we show how readings 1-3 are correctly permitted by our Discourse Condition, whereas readings 4-5 are ruled out. As discussed in Section 2.2, we assume that a sloppy reading involves NP raising of the "controller" or antecedent for the sloppy pronoun in the E-clause.

1. (JJJ) All strict: $[\![S_0]\!] \in F(S_2)$, $[\![S_2]\!] \in F(S_3)$.
   $\mathrm{F}(\mathrm{S}_2) = \mathrm{F}(\mathrm{S}_3) = \{\ p \mid \exists x \in D_e[\ p = x$ revised John's paper $]\ \}$

2. (JBT) All sloppy: $[\![S_0]\!] \in F(S_2)$, $[\![S_2]\!] \in F(S_3)$.
   $\mathrm{F}(\mathrm{S}_2) = \mathrm{F}(\mathrm{S}_3) = \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$

3. (JBB) Sloppy/Strict:
   $[\![$ [John revised John's paper]$_{S0}]\!] \in$ F(BILL $\lambda x.x$ revised x's paper]$_{S2}$)
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$
   $[\![$ [Bill revised Bill's paper]$_{S2}]\!] \in$ F[the TEACHER revised Bill's paper]$_{S3}$
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised Bill's paper $]\ \}$

4. *(JJT)
   $[\![$ [John revised John's paper]$_{S0}]\!] \in$ F([BILL revised John's paper]$_{S2}$)
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised John's paper $]\ \}$
   $[\![$[Bill revised John's paper]$_{S2}]\!] \notin$ F([the TEACHER $\lambda x.x$ revised x's paper]$_{S3}$)
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$

5. *(JBJ)
   $[\![$[John revised John's paper]$_{S0}]\!] \in$ F([BILL $\lambda x.x$ revised x's paper]$_{S2}$)
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$
   $[\![$[Bill revised Bill's paper]$_{S2}]\!] \notin$ F([the TEACHER revised John's paper]$_{S3}$)
   $= \{\ p \mid \exists x \in D_e[\ p = x$ revised John's paper $]\ \}$

It is pointed out by (Fiengo and May, 1994) that Reading 5 (JBJ) is incorrectly permitted by the approach of (Dalrymple et al., 1991), since it allows matching to relate the clause S_3 with clause S_0. The same criticism applies to Rooth's matching approach if deployed without the Discourse Condition. As we see below, the A-clause for S_3 would be allowed to be S_0, and then matching would succeeds for reading 5 (JBJ):

(78) $[\![$[John revised John's paper]$_{S0}]\!] \in$ F([BILL λx.x revised x's paper]$_{S2}$)
$= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$
$[\![$ [John revised John's paper]$_{S0}]\!] \in$ F([the TEACHER revised John's paper]$_{S3}$)
$= \{\ p \mid \exists x \in D_e[\ p = x$ revised John's paper $]\ \}$

This shows clearly that discourse relations play a crucial role in constraining available readings. Here, we don't allow for S_0 to match S_3, because S_0 does not locally c-command S_3, since a closer c-commander of S_3 – namely, S_2 – appears between S_0 and S_3.[17]

4.2. A Variant of the Many-Clause Puzzle

We turn now to a variant of the Many-Clause Puzzle, which further illustrates the interaction of discourse structure with the selection of available readings.

(79) John revised his paper BEFORE Bill did, but AFTER the teacher did.

(80) [[John revised his paper]$_{S1}$ BEFORE
[Bill did (revise his paper)]$_{S2}$]$_{S0}$, but [AFTER
[the teacher did (revise his paper)]$_{S3}$]$_{S4}$.

Note that here, clause S_1 and S_2 are related by BEFORE, and S_1 and S_3 are related by AFTER, as shown in Figure 7. Furthermore, there is symmetrical focus on BEFORE and AFTER. This requires matching in both directions between the higher clauses S_0 and S_4, independently of ellipsis.

Because of the differences in discourse and focus structure, only Readings 1 and 2 are possible here:
Readings: 1. JJJ 2. JBT 3. *JBB 4. *JJT 5. *JBJ

We examine each reading in turn. The strict-strict reading JJJ is possible because both ellipsis sites can find a containing E-clause that matches its discourse sister: S_1 and S_2 match, and S_1 and S_3 match.

[17] An anonymous reviewer notes that our account here relies on a constraint that the closest of two VP antecedents is selected, and the reviewer suggests that this is similar to syntactic accounts in which there is a preference for closest binders. One well-known proposal of this sort is Rule H, discussed in (Fox, 2000), in which a bound pronoun must have the closest possible binder, in cases where two different potential binders would give the same semantic interpretation. This is described by Fox as a kind of optimality condition, couched in the Minimalist framework. Apart from the preference for locality, our proposal is of a rather different character, since it does not compare different structures which have the same interpretation, but rather imposes a constraint that Matching must respect discourse structure, and thus indirectly imposes a locality constraint on ellipsis resolution. We are aware of no proposals to extend a proposal like Fox's to cases other than that of bound pronouns, although this might be an interesting possibility to pursue.

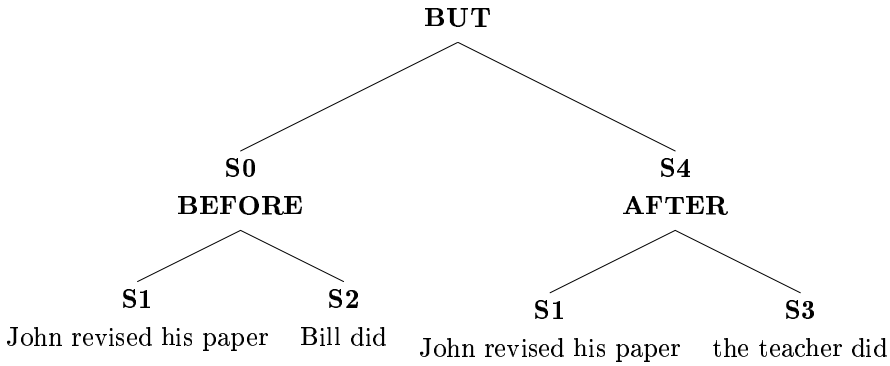


Figure 7. Example (79)

1. (JJJ) All strict:
   $[\![$ [John$_1$ revised his$_1$ paper]$_{S1}]\!]$ $\in$ F([BILL$_2$ revised his$_1$ paper]$_{S2}$).
   $[\![$ [John$_1$ revised his$_1$ paper]$_{S1}]\!]$ $\in$ F([the TEACHER$_3$ revised his$_1$ paper]$_{S3}$)

For the sloppy-sloppy reading JBT, the subjects *Bill* and *the teacher* are raised, and the pronouns are lambda-bound variables. Just as in reading 1, we can see that both ellipsis sites can find a containing E-clause that matches its discourse sister: S_1 and S_2 match, and S_1 and S_3 match.

2 (JBT) All sloppy:
$[\![$ [John$_1$ λ x.x revised x's paper]$_{S1}]\!]$ $\in$ F([Bill$_2$ did ($\lambda x.x$ revise x's paper)]$_{S2}$)
$= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$
$[\![$ [John$_1$ λ x.x revised x's paper]$_{S1}]\!]$ $\in$ F([the TEACHER$_3$ λx.x revised x's paper]$_{S3}$)
$= \{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$

We turn now to the sloppy-strict reading JBB, which is now ruled out, while it was permitted with example (77). For the first ellipsis site, the Discourse Condition is fulfilled, since the sisters S_1 and S_2 match, as shown below. The Discourse Condition is also met for the second ellipsis site if we choose matching at higher levels: if we take the E-clause to be S_4, then its sister S_0's denotation belongs to F(S_4) and the Discourse Condition is satisfied, as indicated below. However, the reading is ruled out as the result of two factors. First, S_2 must involve lambda binding of the pronoun *his*, so that it represents the alternative set $\{\ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$. Otherwise, the first clause S_1, "John revised John's paper" would not match S_2. Second, given

that we have symmetrical focus on BEFORE and AFTER, the clause S_4 must be an element of the focus value of S_0 as well, to license the focus on BEFORE. But this fails, because the S_4 contains the clause S_3 ("the teacher revised Bill's paper"), and this clause cannot match with S_2, whose alternative set we saw is $\{ p \mid \exists x \in D_e[\ p = x$ revised x's paper $]\ \}$.

3 *(JBB):

$[\![\mathrm{S}_1]\!] \in \mathrm{F}(\mathrm{S}_2)$:
$[\![[\mathrm{John}_1$ revised his_1 paper$]_{S1}]\!] \in \mathrm{F}([\mathrm{Bill}_2$ did $(\lambda x.x$ revise x's paper$)]_{S2})$.

$[\![\mathrm{S}_0]\!] \in \mathrm{F}(\mathrm{S4})$:
$[\![[\mathrm{John}_1$ revised his_1 paper before Bill_2 did $(\lambda x.x$ revise x's paper$)]_{S0}]\!]$
$\in$
$\mathrm{F}([\mathrm{John}_1$ revised his_1 paper AFTER the $\mathrm{TEACHER}_3$ did (revise his_2 paper$)]_{S4}) =$
$\{ p \mid \exists x \in D_e[\ p =$ John revised John's paper R x revised Bill's paper $]\ \}$

But $[\![\mathrm{S4}]\!] \notin \mathrm{F}(S_0)$, since:
$[\![[\mathrm{John}_1$ revised his_1 paper after the $\mathrm{teacher}_3$ did (revise his_2 paper$)]_{S4}]\!]$
$\notin$
$\mathrm{F}([\mathrm{John}_1$ revised his_1 paper BEFORE BILL_2 did $(\lambda x.x$ revise x's paper$)]_{S0}) =$
$\{ p \mid \exists x \in D_e[\ p =$ John revised John's paper R x revised x's paper $]\ \}$

Finally, the impossible readings JJT and JBJ are ruled out, independently of ellipsis itself, because the focus on AFTER requires that $[\![\mathrm{S}_0]\!]$ belong to $\mathrm{F}(\mathrm{S}_4)$, but this matching does not succeed:

4 *(JJT): $S_0 \notin \mathrm{F}(S_4)$, since:
$[\![\ [\mathrm{John}_1$ revised his_1 paper before Bill_2 did (revise his_1 paper$)]_{S0}]\!]$
$\notin$
$\mathrm{F}([\mathrm{John}_1$ revised his_1 paper AFTER the $\mathrm{TEACHER}_3$ $\lambda x.x$ revised x's paper$]_{S4}) =$
$\{ p \mid \exists x \in D_e[\ p =$ John revised John's paper R x revised x's paper $]\ \}$

5 *(JBJ):
$S_0 \notin \mathrm{F}(S_4)$, since:
$[\![\ [\mathrm{John}_1$ revise his_1 paper before Bill_2 $(\lambda x.x$ revise x's paper$)]_{S0}]\!] \notin$
$\mathrm{F}([\mathrm{John}_1$ revised his_1 paper AFTER the $\mathrm{TEACHER}_3$ revised his_1 paper$]_{S4}) =$
$\{ p \mid \exists x \in D_e[\ p =$ John revised John's paper R x revised John's paper $]\ \}$

In sum, discourse structure constrains the application of the Matching Condition and hence the availability of pronominal readings in ellipsis. Changing the discourse structure results in changes in the possible readings, in the way predicted by the Discourse Condition.

5. Possible Readings: Scope and Ellipsis Size in Antecedent-Contained Deletion

5.1. Preferences in ACD

Consider the following example of Antecedent-Contained Deletion (ACD) (Sag, 1976):

(81) The teacher wanted Mary to read everything Sue didn't.

The quantified NP headed by *everything* can in principle take scope over or under *wanted*, and the ellipsis site can be resolved to *read* (small ellipsis) or to *wanted Mary to read* (large ellipsis). This gives the following four logical possibilities:

(82) **Reading a**: Wide scope of *every*, large ellipsis.
For every x: if Sue didn't want Mary to read x, the teacher wanted Mary to read x.
Scenario: The teacher and Sue happened to have completely different desires: for every particular x that Sue didn't want Mary to read, the teacher wanted Mary to read x.

(83) **Reading b**: Narrow scope of *every*, small ellipsis.
The teacher wanted this: that, for every x, if Sue didn't read x, then Mary reads x.
Scenario: The teacher didn't know what Sue read or didn't read. The teacher simply wanted all the material to be read by one of the two. That is, the teacher just wanted for Mary to read whatever Sue didn't read.

(84) % **Reading c**: Wide scope of *every*, small ellipsis.[18]
For every x: if Sue didn't read x, the teacher wanted Mary to read x.
Scenario: Unbeknownst to the teacher, Sue didn't read *Sinn und Bedeutung*, *Tractatus* and *PTQ*. It turns out that, for each of those x, the teacher coincidentally wanted Mary to read x.

[18] We use % to indicate that an sentence has intermediate status – not fully acceptable, but not as bad as *.

(85) * **Reading d**: Narrow scope of *every*, large ellipsis.
The teacher wanted this: that, for every x, if Sue didn't want Mary to read x, then Mary reads x.

As first observed in (Sag, 1976), reading (d) gives rise to an impossible structure, and it is in fact ruled out by many well-known accounts (see (Fiengo and May, 1994) for discussion and references). The remaining readings (a), (b) and (c) result in well-formed syntactic representations and are expected to be available. We note, however, that there is a preference for readings (a)-(b) over reading (c): while the readings (a)-(b) of (81) are easily available, reading (c) is hard to obtain in most contexts. Example (86) illustrates the contrast between readings (a)-(b) and reading (c) as well, perhaps more sharply:

(86) Pat refused to read everything John did.

(87) **Reading a**: Wide scope of *every*, large ellipsis.
For every x: if John refused to read x, Pat refused to read x.

(88) **Reading b**: Narrow scope of *every*, small ellipsis.
Pat refused to do this: to read every x that John read.

(89) % **Reading c**: Wide scope of *every*, small ellipsis.
For every x: if John read x, Pat refused to read x.

We claim that reading (c) is degraded compared to (a) and (b), and that it is only available if the context primes for it, as in (90). Here, the opening of the discourse *Pat won't get her wish* seems to make salient the contrast between Pat's desires and the actual facts. This makes reading (c) easily available.[19]

(90) Pat won't get her wish... She wants you to like everybody you won't (like).
Reading c: Wide scope of *everybody*, small ellipsis:
For every x: if you won't (like x), then she wants you to like x.

The goal of this section is to show that reading (c) is dispreferred because of the Discourse Condition, together with an independently motivated economy factor that we call Focus Economy. We will show that focused auxiliaries can give rise to simple polarity-based alternative sets, but that they can also give rise to more complex VERUM-based alternative sets. Our Focus Economy principle dictates that there is

[19] We will come back to the effect of the context in (90) in subsection 5.3, once our analysis is presented.

a preference for the simpler polarity-based alternative sets. Together with Focus Economy, the Discourse Condition provides an account of the above preference for (a)-(b) over (c).

5.2. Auxiliaries and Alternative Sets

For most examples of focused auxiliaries, the focus set of alternatives specified in (91) is generally assumed. In other words, the stress on *DID* or *DIDn't* is usually taken to focus the plain positive or negative polarity: e.g., *DID p* means roughly p as opposed to $\neg p$. This is the default set of alternatives for a focused auxiliary, and it is enough to fulfill the matching condition in simple sentences like (92).

(91) $\mathrm{F}(\mathrm{DID}_{Pol}\ p) = \mathrm{F}(\mathrm{DIDn't}_{Pol}\ p) = \{\ p, \neg p\ \}$

(92) John won a race, but CHRIS DIDn't.

But this is not the only use of focal accent on auxiliaries. Independently of ellipsis, (Höhle, 1992) and (Romero and Han, 2002) (among others) describe a use of auxiliary focus where stress emphasizes (or contrasts) not the polarity itself, but a predicate or operator VERUM meaning roughly "it is true that" or "it is for sure true that".[20] This use of auxiliary focus is illustrated in the examples (94), (95) and (96).[21] It is clear that, in (94), focus on *DID* does not signal contrast with the polarity of the previous embedded clause *[she finished her work on time]*, since the polarity of this clause and the stressed polarity of *DID* are both positive. Instead, auxiliary stress here marks contrast between the operator VERUM (="it is for sure true that") and the attitude expressed in the preceding clause by *I hope* ("it is hoped that"). In a similar fashion, in (95), the clause *[she made the silly claim that p]* (="it is doubted that p") contrasts with VERUM p (="it is for sure true that p"). Finally, in (96), VERUM ("it is for sure true that") contrasts with the denotation of the modal *may* ("it is possible that").

(94) A: I hope she finished her work on time.
S: She DID finish it on time.
LF: [VERUM_F [she finished it on time]]

[20] (Romero and Han, 2002) define VERUM as the conversational epistemic operator in (93), where $Epi_x(w)$ is the set of worlds that conform to x's knowledge in w, $Conv_x(w')$ is the set of worlds where all the conversational goals of x in w' are fulfilled, and $CG_{w''}$ is the Common Ground or set of propositions that the speakers assume in w'' to be true:

(93) $[\![VERUM_i]\!]^{g^{x/i}} =$
$\lambda p_{<s,t>} \lambda w. \forall w' \in \mathrm{Epi}_x(w)[\forall w'' \in \mathrm{Conv}_x(w')[p \in \mathrm{CG}_{w''}]]$

[21] Example (95) is the English version of (Höhle, 1992)'s example (2).

(95) A: I asked Hanna what Karl was doing, and she made the silly claim that he is writing a script.
S: (It's true.) He IS writing a script.
LF: [VERUM$_F$ [he is writing a script]]

(96) A: Sophia may be asleep.
S: She IS asleep.
LF: [VERUM$_F$ [she is asleep]]

The focus set of alternatives of this modal-like operator VERUM is sketched in (97):[22]

(97) F(DID$_{Verum}$ p) = F(DIDn't$_{Verum}$ p) =
{ it is for sure true that p, it is possible that p, it is hoped that p, it is doubted that p, it is wanted that p, it is expected that p, ..., John expects that p, John hopes that p, Sam expects that p, ...it is for sure true that $\neg p$, it is possible that $\neg p$, it is hoped that $\neg p$, it is doubted that $\neg p$, it is wanted that $\neg p$, it is expected that $\neg p$, ..., John expects that $\neg p$, John hopes that $\neg p$, Sam expects that $\neg p$, ...}

This VERUM-set of alternatives is also operative in ellipsis. Take the examples (98)-(99). Matching is performed between the discourse sisters S_0 and S_2, following the Discourse Condition. In both sentences, the denotation of S_0 belongs to the VERUM set of alternatives of S_2. Matching is, hence, satisfied in accordance with the Discourse Condition:

(98) [Sue expected John to win]$_{S0}$, and [he DID]$_{S2}$.
$[\![$ [Sue expected John to win]$_{S0}$$]\!]$ $\in$ F([he DID win]) =
{it is for sure true that John won, it is possible that John won, ...Sue wanted that John won, Sue expected that John won, ...}

(99) [John wanted [to go to Rome]$_{S0}$, but [he DIDN'T]$_{S2}$.
$[\![$ [John wanted to go to Rome]$_{S0}$$]\!]$ $\in$ F([he DIDN'T go to Rome]) =
{it is for sure true that John did not go to Rome, it is for sure true that John went to Rome,... , John wanted that John goes to Rome, John wanted that John doesn't go to Rome,...}

[22] (Romero and Han, 2002), building on (Höhle, 1992), discuss a scope ambiguity between negation and VERUM in focused negative auxiliaries: *DIDn't p* is ambiguous between the LF *[*VERUM *not p]* and the LF *[not* VERUM *p]*. To be faithful to this ambiguity, we would need two sets of alternatives for a focused negative auxiliary. For simplicity, we only give one set of alternatives in the text, sufficient for the examples at hand.

Both the polarity-based alternative set and the VERUM-based set follow Rooth's requirement that the Focus alternatives be of the same semantic type (see (5b) above). Our proposal is also consistent with the proposal from (Heim, 1997)[210] that alternative sets be restricted to *natural* alternatives. In our view, polarity functions like $\lambda p \lambda w.p(w) = 1$ and $\lambda p \lambda w.p(w) = 0$ form a natural class and modal functions introducing quantification over possible worlds form another.

Once these two alternative sets are generated for focused *DID* and *DIDn't*, the question arises whether they are equally available. We propose that the simpler polarity-based set is the default one and that the VERUM-based set, which involves positing a lexically unrealized operator and a more complicated alternative set, is dispreferred in neutral scenarios where no contextual cues prime it. This can be seen in (103) and (104). Take (103), for example. We have in principle the following two options: (i) *PAT* contrasts with *Sue*, *DIDn't* is plain polarity focus and the ellipsis is resolved to *want to attend the meeting*; or (ii) *PAT* contrasts with *Sue*, *DIDN'T* is VERUM focus and the ellipsis resolves to *attend the meeting*. In the absence of any cues priming the latter VERUM option, the former polarity option is preferred. In the same fashion, in (104), the ellipsis resolution to *expect to like it* is preferred over the resolution to *like it* because the former uses the polarity-based alternative set and the latter necessitates the VERUM-based set.[23]

(103) Guess what! I found out two things concerning yesterday's meeting: that Sue wanted to attend the meeting and that PAT DIDn't (want to attend the meeting / ??attend the meeting)

(104) A: Did you hear any gossip concerning the exhibit?
B: Only this: Amy expects to like it and SUE DOESn't (expect to like it / ??like it).

We state the asymmetrical status of the two alternative sets in the following Focus Economy condition:

[23] Although we restrict ourselves to non-modal auxiliaries like *DID* and *DIDn't* in the text, focal stress on *modal* auxiliaries can also be understood in two ways: as focusing the bare polarity, as in (100), or as focusing the modal itself, as in (101). In a way similar to *DID / DIDn't*, the polarity-base alternative set is preferred over the modal-based set in examples like (102):

(100) John should go to the gathering, but BILL SHOULDn't.

(101) John doesn't want to go to the gathering, but he SHOULD.

(102) John shouldn't want to go to the gathering. BILL SHOULD (want to go to the gathering / ??go to the gathering).

(105) Focus Economy (for auxiliary stress):
The interpretation of auxiliary stress as polarity focus is more economical than its VERUM interpretation. That is, *ceteris paribus* and in the absence of contextual bias, polarity focus is preferred over VERUM focus when an auxiliary is stressed.[24]

With these two sets of alternatives for *DID/DIDn't* and with the Focus Economy principle delimiting their distribution, we are ready to return to ACD and its readings.[25]

[24] Perhaps Focus Economy may follow from a general constraint barring contextually untriggered accommodation, along the lines sketched in subsection 3.5. The intuition is that, to obtain the VERUM-based focus set from *DID* or *DIDn't*, the speakers need to accommodate the meaning of an operator VERUM that is not overtly realized in the structure. To contrast the modal-based set of *SHOULD* with *shouldn't want to* in (102) in footnote 23, the function $f_{<<st>,<e,st>>}$ denoted by *shouldn't want to* needs to be accommodated as a natural alternative to more typically modal functions.

[25] The examples seen in this section contained phonological stress on the auxiliary at issue. However, a problem remains in examples like (106), where the subject of the E-clause is pronounced with focal stress but the auxiliary does not seem to bear stress. For matching to obtain between S_0 and S_2, we would need to invoke the VERUM set of alternatives of *did* even though *did* is not phonologically focused. This is a topic that merits further investigation. One possibility is that there is an additional accent on *did*, which is somewhat difficult to perceive. Another possibility is that VP ellipsis creates a tendency for semantic focus to fall on the auxiliary verb. In any case, this question arises independently of the Discourse Condition and the VERUM alternatives proposed in this paper: even if we dropped our Discourse Condition, neither matching between S_1 and S_2 nor matching between S_0 and S_2 succeeds in (107) unless the unstressed auxiliary *should* is somehow understood as semantically focused, as shown below:

(106) [Sue expected [John to win]$_{S1}$]$_{S0}$, but [BILL did]$_{S2}$.
⟦ [Sue expected John to win]$_{S0}$⟧ $\notin$ F([BILL did (win)])
⟦ [Sue expected John to win]$_{S0}$⟧ $\in$ F([BILL DID$_{Verum}$ (win)])

(107) [Mary wants [John to pick up the students this time]$_{S1}$]$_{S0}$, though [BILL should (pick up the students this time)]$_{S2}$
⟦ [John to pick up the students]$_{S1}$⟧ $\notin$ F([BILL should (pick up the students)]$_{S2}$)
⟦ [John to pick up the students]$_{S1}$⟧ $\in$ F([BILL SHOULD (pick up the students)]$_{S2}$)
⟦ [Mary wants John to pick up the students]$_{S0}$⟧ $\notin$ F([BILL should (pick up the students)]$_{S2}$
⟦ [Mary wants John to pick up the students]$_{S0}$⟧ $\in$ F([BILL SHOULD (pick up the students)]$_{S2}$

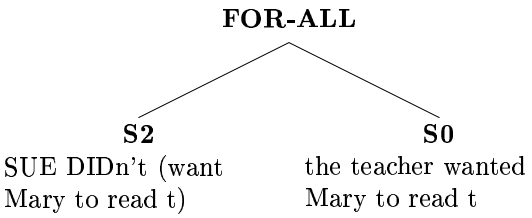
5.3. Antecedent-Contained Deletion

We can now show why reading (c) is degraded, as compared with readings (a) and (b). We repeat our ACD example (81) here as (108):

(108) The teacher wanted Mary to read everything Sue didn't.

Reading (a) is derived as in (109). Wide scope of *every* determines that the discourse sister of the ellipsis clause S_2 is S_0, as shown in the tree below. S_0 matches S_2 without having to use the VERUM-based set of alternatives, since the basic polarity-based suffices, as stated in (110). Thus, reading (a) is easily available.

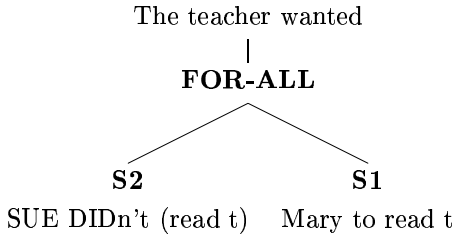
(109) Reading a: Wide scope of *every*, large ellipsis.
LF: Everything that [SUE DIDn't (want Mary to read t) $]_{S2}$ [the teacher wanted [Mary to read t$]_{S1}$ $]_{S0}$



(110) $[\![$[the teacher wanted Mary to read t $]_{S0}]\!] \in$ F([SUE DIDn't$_{Pol}$ (want Mary to read t)$]_{S2}$)

In reading (b), the ellipsis is resolved to *read t* and the narrow scope of *every* yields the discourse tree under (111). Hence, this time the matching A-clause for the E-clause S_2 has to be S_1. This matching can be satisfied by using the polarity-based set of alternatives, as in (112), and hence this reading is easily available:

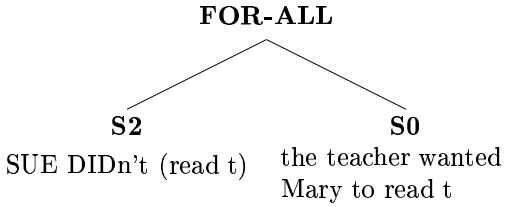
(111) Reading b: Narrow scope of *every*, small ellipsis.
LF: The teacher wanted [everything that [SUE DIDn't (read t)$]_{S2}$ [Mary to read t$]_{S1}$]



(112) $[\![$[Mary to read t $]_{S1}]\!] \in$ F([SUE DIDn't$_{Pol}$ (read t)]$_{S2}$)

Let us turn to reading (c). Wide scope of *every* results in attachment of E to S_0 and the ellipsis is resolved to *read t*, as represented in the tree under (113). Matching between the discourse sisters S_0 and S_2 cannot be satisfied if we use the polarity-based set of alternatives; we need the VERUM-set to fulfill matching. This is shown in (114a-b):

(113) Reading c: % Wide scope of *every*, small ellipsis.
LF: Everything that [SUE DIDn't (read t)]$_{S2}$ [the teacher wanted [Mary to read t]$_{S1}$]$_{S0}$



(114) a. Polarity-based alternative set:
[the teacher wanted Mary to read t]$_{S0} \notin$ (nor implies a proposition in) F([SUE DID$_{Pol}$ (read t)]$_{S2}$), which equals { Sue read t, Sue didn't read t, Mary read t, Mary didn't read t, ... }

b. VERUM-based alternative set:
[the teacher wanted Mary to read t]$_{S0} \in$ F([SUE DID$_{Verum}$ (read t)]$_{S2}$) =
{ it is true that Sue read t, it is true that Mary read t, ..., the teacher wanted that Sue read t, the teacher wanted that Mary read t, ... }

This means that, because reading (c) necessarily involves the VERUM set of alternatives and readings (a) and (b) do not, reading (c) is less economical than readings (a) and (b). Hence, following Focus Economy, unless the context primes the VERUM interpretation, the VERUM-based alternative set and the reading (c) that depends on it are dispreferred.

It is crucial to note that Focus Economy (105) could not by itself derive this result. If we abandoned the Discourse Condition, the non-sister S_1 would be allowed to match S_2 in (115). But then the polarity interpretation of auxiliary focus would be sufficient and Focus Economy (105) could not possibly make this reading dispreferred. This is shown in (116).

(115) [The teacher wanted [Mary to read t]$_{S1}$]$_{S0}$ everything [SUE DIDn't (read)]$_{S2}$

(116) [Mary to read t]$_{S1}$ $\in$ F([SUE did (read)])$_{S2}$.

Alternatively, one could try to couple the Focus Economy principle (105) with a new constraint –instead of the Discourse Condition– that dictates preference for non-embedded VP antecedents *a*. This new constraint would be able to rank reading (c) as hard for (115), but it would also predict the same difficulty for the wide scope - small ellipsis reading of (117), since the antecedent VP is equally embedded in both cases. This prediction is contrary to fact. If we take the Discourse Condition, instead, the aforementioned reading of (117) is correctly predicted to be perfectly available, since the discourse sisters S_0 and S_2 match without the resource to the VERUM set of alternatives. This is shown in (118):

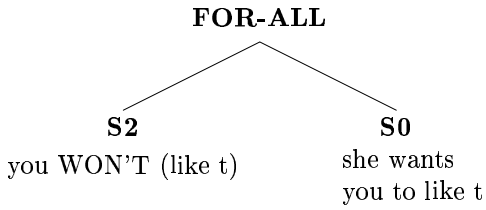
(117) [The teacher wanted [Mary to read t]$_{S1}$]$_{S0}$ everything [SUE wanted her to (read)]$_{S2}$

(118) Reading c: Wide scope of *every*, small ellipsis:
LF: Everything that [SUE wanted [Mary to (read t)]$_{S3}$]$_{S2}$ [the teacher wanted [Mary to read t]$_{S1}$]$_{S0}$
[the teacher wanted Mary to read t]$_{S0}$ $\in$ F([SUE wanted Mary to (read t)]$_{S2}$)

Before concluding this section, let us briefly consider example (90), repeated below. We saw that here the context makes reading (c) easily available. Why? Note that what the beginning of the discourse *Pat won't get her wish* does is to make salient the conflict between desire and reality. That is, it makes salient two of the propositions in the VERUM set: "Pat wants/wishes that p" and "it is true that $\neg p$". Given this priming, the focal stress on *WON'T* is readily understood as VERUM-focus and the two discourse sisters S_0 and S_2 in (120) can be matched, as shown in (121). Thus, in this case, the context overrides Focus Economy, which favors the polarity-set over the VERUM-set only in case there is no contextual bias.

(119) Pat won't get her wish... She wants you to like everybody you won't (like).
Reading c: For every x: if you won't (like x), then she wants you to like x.

(120) Reading c: Wide scope of *every*, small ellipsis.
LF: Everybody that [you WON'T (like t)]$_{S2}$ [she wants [you to like t]$_{S1}$]$_{S0}$



(121) VERUM-based alternative set:
[she wants you to like t]$_{S0}$ ∈ F ([you WON'T$_{Verum}$ (like t)]$_{S2}$)
=
{ it is true that you will not like t, it is true that you will like t, ..., she wants you not to like t, she wants you to like t, ... }

To sum up section 5, the Discourse Condition has an effect on the ranking of some possible readings over others in ACD. This condition, together with economy considerations favoring the polarity use of auxiliary stress over its VERUM use, can derive the dispreference for reading (c) in neutral contexts: when the antecedent of an ACD site is the small VP, wide scope of the host NP over a higher VP is dispreferred. This effect is not captured by other ellipsis approaches in the literature that do not impose any discourse requirement on matching.

6. Conclusions and further issues

Before concluding this paper, we would like to consider a case involving symmetric focus. Recall our claim that example (36), repeated below, is unacceptable under ellipsis resolution to *eat*.

(122) If [Agnes arrived after [John ate] $_{S3}$]$_{S1}$ then [Bill didn't]$_{S2}$.
*(eat)/ (arrive after John ate)

In our view, this judgement obtains as long as there is not symmetric focus on John and Bill. What happens if there is symmetric focus on John and Bill?

(123) If [Agnes arrived after [JOHN ate] $_{S3}$]$_{S1}$ then [BILL didn't]$_{S2}$.
%(eat)/ %(arrive after John ate)

Now both readings (*eat* and *arrive after John ate*) have an intermediate status, according to our judgements. We suggest that this is because, under any possible resolution, there is a clash between matching and c-command. On the one hand, the focus on JOHN requires that

ellipsis is resolved as *eat* (this way, the phrase [JOHN ate] contrasts with [BILL didn't eat]). But this leads to a violation of the local c-command discourse condition, since S_3 does not c-command S_2. On the other hand, if ellipsis is resolved as *arrive after John ate* and c-command obtains, then the phrase [JOHN ate] is not matched, and, hence, it is infelicitous. Hence, the accenting in (123) may be marginal under any ellipsis resolution because there is no winning resolution candidate. Instead, on either resolution of the ellipsis, we obtain a violation.

The claim that semantic matching governs ellipsis resolution is widely held in the semantics literature, while the relevance of discourse structure to anaphora and ellipsis is a widely held view in the discourse literature. The main contribution of the present paper is the suggestion that the semantic matching condition is governed by discourse structure in a very specific way: the matching must involve two clauses that are related by local c-command in the discourse tree. We have shown how this simple claim successfully captures facts about the selection of antecedent for ellipsis, and about the determination of possible readings with a given antecedent. We have also shown how our claim interacts with implicit semantic material and with inferencing.

To our knowledge, this is the first proposal to link semantic matching with discourse structure in this way. However, it would be interesting to compare discourse-based approaches such as (Hobbs, 1979; Asher, 1993; Prust et al., 1994; Asher et al., 2001) with the current approach. In particular, these approaches all incorporate parallelism mechanisms that are somewhat akin to the semantic matching mechanism. Finally, the right-frontier constraint of (Webber, 1991), which figures in much subsequent work, such as that of (Asher, 1993), has interesting connections to our c-command constraint. We leave the comparison between these approaches and the present proposal for future research.

Daniel Hardt
Dept. of Computational Linguistics
Copenhagen Business School
Denmark
dh@id.cbs.dk

Maribel Romero
Linguistics Department
610 Williams Hall
University of Pennsylvania
Philadelphia, PA 19104 USA
romero@ling.upenn.edu

Acknowledgements

We thank the audiences of the Philadelphia Semantics Society, Sinn und Bedeutung 2001 and the Penn Linguistic Colloquium 2002 for helpful comments. Special thanks to Satoshi Tomioka and to two anonymous reviewers for their helpful comments and criticisms.

References

Asher, N.: 1993, *Reference to Abstract Objects in English*. Dordrecht.

Asher, N., D. Hardt, and J. Busquets: 2001, 'Discourse Parallelism, Ellipsis, and Ambiguity'. *Journal of Semantics* **18**(1).

Büring, D.: 1997, *The Meaning of Topic and Focus – The 59th Street Bridge Accent*. London: Routledge.

Chung, S., W. Ladusaw, and J. McCloskey: 1995, 'Sluicing and Logical Form'. *Natural Language Semantics* **3**, 1–44.

Dahl, O.: 1974, 'How to open a sentence: abstraction in natural language'. In: *Logical Grammar Reports 12*. Sweden: University of Gothenburg.

Dalrymple, M., S. Shieber, and F. Pereira: 1991, 'Ellipsis and Higher-Order Unification'. *Linguistics and Philosophy* **14**(4).

Fiengo, R. and R. May: 1994, *Indices and Identity*. Cambridge, MA: MIT Press.

Fox, D.: 2000, *Economy and Semantic Interpretation*. MIT Press.

Hardt, D.: 1993, 'Verb Phrase Ellipsis: Form, Meaning, and Processing'. Ph.D. thesis, University of Pennsylvania.

Heim, I.: 1982, 'The Semantics of Definite and Indefinite Noun Phrases'. Ph.D. thesis, University of Massachusetts-Amherst.

Heim, I.: 1997, 'Predicates or Formulas? Evidence from Ellipsis'. In: *Proceedings of the Seventh Conference on Semantics and Linguistic Theory*. Palo Alto, CA.

Heim, I. and A. Kratzer: 1998, *Semantics in Generative Grammar*. Oxford: Blackwell.

Hobbs, J.: 1979, 'Coherence and Coreference'. *Cognitive Science* **3**, 67–90.

Höhle, T.: 1992, 'Ueber Verum Fokus in Deutschen'. *Linguistische Berichte*.

Jacobson, P.: 1992, 'Antecedent Contained Deletion in a Variable-Free Semantics'. In: *Proceedings of the Second Conference on Semantics and Linguistic Theory*. Columbus, Ohio.

Kamp, H. and U. Reyle: 1993, *From Discourse to Logic*. Dordrecht: Kluwer.

Kehler, A.: 2000, 'Coherence and the Resolution of Ellipsis'. *Linguistics and Philosophy* **23**(6), 533–575.

Kratzer, A.: 1979, 'Conditional necessity and possibility'. In: R. B. U. Egli and A. von Stechow (eds.): *In Semantics from different points of view*. Berlin: Springer-Verlag, p. 117147.

Lascarides, A. and N. Asher: in press, 'Segmented Discourse Representation Theory: Dynamic Semantics with Discourse Structure'. In: H. Bunt and R. Muskens (eds.): *Computing Meaning: Volume 3*. Kluwer Academic Publishers.

Mann, W. and S. Thompson: 1986, 'Relational Propositions in Discourse'. *Discourse Processes* **9**(1), 57–90.

Marcu, D.: 2000, *The Theory and Practice of Discourse Parsing and Summarization*. The MIT Press.

Merchant, J.: 2001, *The syntax of silence: Sluicing, islands, and identity in ellipsis*. Oxford.

Prust, H., R. Scha, and M. van den Berg: 1994, 'A Discourse Perspective on Verb Phrase Anaphora'. *Linguistics and Philosophy* **17**(3), 261–327.

Roberts, C.: 1986, 'Modal Subordination, Anaphora and Distributivity'. Ph.D. thesis, University of Massachusetts-Amherst, Amherst, MA.

Roberts, C.: 1996, 'Anaphora in Intensional Contexts'. In: S. Lapin (ed.): *The Handbook of Contemporary Semantic Theory*. Cambridge, MA, pp. 215–246, Blackwell.

Romero, M.: 1998, 'Focus and Reconstruction Effects in Wh-Phrases'. Ph.D. thesis, University of Massachusetts-Amherst.

Romero, M. and C. Han: 2002, 'Verum Focus in Negative Yes/No Questions'. In: *Proceedings of Semantics and Linguistic Theory*, Vol. 12. Ithaca, NY, CLC Publications.

Rooth, M.: 1985, 'Association with Focus'. Ph.D. thesis, University of Massachusetts-Amherst.

Rooth, M.: 1992a, 'Ellipsis Redundancy and Reduction Redundancy'. In: *Proceedings of the Stuttgart Ellipsis Workshop*. Stuttgart, Germany.

Rooth, M.: 1992b, 'A Theory of Focus Interpretation'. *Natural Language Semantics* **1**, 75–116.

Sag, I. A.: 1976, 'Deletion and Logical Form'. Ph.D. thesis, Massachusetts Institute of Technology. (Published 1980 by Garland Publishing, New York).

Schwarzschild, R.: 1999, 'GIVENness, Avoid F and other Constraints on the Placement of Focus'. *Natural Language Semantics* **7**(2), 141–177.

Tancredi, C.: 1992, 'Deletion, Deaccenting and Presupposition'. Ph.D. thesis, Massachusetts Institute of Technology.

von Fintel, K.: 1994, 'Restriction on Quantifier Domains'. Ph.D. thesis, University of Massachusetts-Amherst.

Webber, B.: 1991, 'Structure and Ostension in the Interpretation of Discourse Deixis'. *Natural Language and Cognitive Processes* **6**(2), 107–135.

Webber, B., M. Stone, A. Joshi, and A. Knott: 2003, 'Anaphora and Discourse Semantics'. *Computational Linguistics* **29**(4), 545–587.

Webber, B. L.: 1978, 'A Formal Approach to Discourse Anaphora'. Ph.D. thesis, Harvard University. (Published 1979 by Garland Publishing, New York).