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Presuppositions and Pedigrees for Discourse Markers*

Jacques Jayez

1. Introduction

In this paper I defend the claim that certain discourse markers (DMs) are presupposition triggers. In itself, this claim is not new but its exact content and consequences are rarely analyzed in detail. However, such an analysis is required for at least three reasons, which correspond to the three main contributions of the paper.

(1) The claim that DMs are presuppositional contrasts with two other approaches in the literature. According to Bach (1999) and Potts (2003), DMs like *but* contribute information on the same level as what is asserted and do not trigger any implicature or presupposition. According to Grice (1989), DMs trigger conventional implicatures. In section 2, I show that certain DMs trigger presuppositions (2.1), that Bach's and Potts' view must be rejected (2.2) and that presuppositions are a special kind of conventional implicature, characterized by their epistemic dynamic behavior (2.3., 2.4, 2.5).

(2) In section 3, I offer a DRT representation of the presuppositional pattern described in section 2.

(3) DMs express relations between discourse segments (discourse relations) and the interplay between their presuppositional behavior and their connective import raises substantial problems for a presuppositional analysis. It turns out that certain consequence DMs are sensitive to the semantic information or *pedigree* carried by the presupposed proposition. In section 4, I explore the modal/attitudinal status of pedigrees and show how they can be integrated in a DRT framework.

2. The presuppositional status of DMs

2.1 DMs as presupposition triggers

There are two reasons to claim that certain DMs trigger presuppositions. First, the information they convey is not asserted, as evidenced by the well-known tests of conservation and suspension (see Geurts, 1999 for a general presentation). For instance, the presupposition introduced by the consequence DMs studied here is defined in (1).

1. Certain DMs presuppose the existence of a proposition ϕ and presuppose that it is connected to the current proposition ψ through a certain consequence discourse relation ($\text{CONS}(\phi, \psi)$).

* I thank Danièle Godard for her comments and suggestions on a previous version of this paper. I am the only responsible for every remaining weakness.

E.g. *as a result* presupposes the existence of a proposition and presupposes that the current proposition is one of its consequences. *As a result* passes the conservation and suspension tests. (2a.B) presupposes $\exists\phi (\phi \Rightarrow \text{edgy})$. This presupposition is retained in (2b.B) but suspended in (2c.B). In contrast, the asserted content ('John is edgy') does not survive the conservation environment and creates problems in the suspension environment ('?If John is edgy, he might be edgy').

2. a. [John is on speed]_A, [as a result he is rather edgy]_B
- b. [John is on speed]_A [but the coach does not believe that, as a result, he is very edgy]_B
- c. [John took snot]_A. [If, really, speed makes one very nervous, he might, as a result, be rather edgy]_B

Note that, whereas *p, as a result q* presupposes that *p* caused *q*, *p because q* might assert that *q* explains *p*, in contrast to what is assumed by Asher and Lascarides (1998) and Lagerwerf (1998). However, a discussion of this point would take me too far. Particles such as *well*, *you know*, or *bon* 'well', *alors* 'then', etc. in French seem to be presuppositional in that they make sense only if one assumes an existing discourse/context with special features. However, spelling out these features, that is, determining what relation holds between the current discourse segment and the presupposed segment/context is much more difficult than for standard discourse relations and I will not consider them here (see Mosegaard Hansen, 1998:chapter 10, on *bon*).

The second reason for invoking presuppositions here is the fact that the consequence discourse relation is presented as 'taken for granted' (Stalnaker 1973, 1974). The speaker of (2a) acts as if the consequence relation $\text{speed} \Rightarrow \text{edgy}$ was accessible to the participants of the exchange. This epistemic preexistence will be analyzed more precisely in section 2.5.

Intuitive as it is, the view that certain consequence DMs trigger presuppositions is endangered by (i) the existence of an alternative view (Bach 1999, Potts 2003), under which DMs like *but* contribute 'at-issue' propositions in Potts' (2003) parlance, and (ii) the imprecision of the notion of presupposition. I consider these two problems in turn. In the next subsection (2.2), I show why Bach's and Potts' option must be rejected. In section 2.3, I summarize the distinctions between implicatures and presuppositions and recall Potts' (2004) four criteria. In section 2.4, I proceed to show that all these criteria but one –epistemic preexistence– are shaky. Finally, in section 2.5, I propose an account of epistemic preexistence under which presuppositions are characterized as a special kind of conventional implicature. In this respect, the two claims that DMs trigger presuppositions and conventional implicatures are correct but not strictly equivalent.

2.2 Are DMs part of 'what is said'?

Bach (1999) and Potts (2003) oppose the claim that words like *also*, *but*, *continue* or *although* are conventional implicature triggers. I will discuss the thesis of Bach (1999), which Potts relies on to a large extent.¹ According to Grice, the semantic content worlds like *therefore* is not part of 'what is said' (Grice's terminology). However, Bach observes that they 'can also contribute to what is being reported' (3a,b). Clearly, (3a) admits of an interpretation under which Mary mentioned herself the opposition between being huge and being agile. Similarly, (3b) is open to an interpretation under which Mary made clear that Shaq had already been working (at some time). So, in a sense, the conventional implicatures involved in such sentences and many similar ones are part of what is said.

¹ For space reasons, I cannot discuss Bach's analysis in detail. I will focus on the main issue of this paper, that is, the presuppositional status of certain elements.

3.
 - a. Mary said that Shaq is huge but that he is agile [Bach's example 1, section 2]
 - b. Mary said that Shaq continued to work
 - c. No, you are wrong, people can be both big and agile

This argument misconstrues the interpretation of 'what is said' as roughly equivalent to 'what is explicitly communicated'. I can report on what Mary explicitly communicated, by (3a), but (3a) certainly does not entail that Mary asserted that there is a –particular or general– contrast between being huge and being agile. Jayez and Rossari (2004) show that conventional implicatures are essentially 'non-asserted' in that they cannot be directly refuted. E.g. (3c) is not a felicitous reply to (3a). More generally, expressions such as *you are wrong*, *it's false*, etc. target the asserted content. If Grice's idea that implicatures do not affect the truth of a sentence is to be taken seriously, the refutation test shows that implicatures are additions to the asserted content and suggests that, at least for assertions, 'what is said' denotes the 'asserted content', *not* the explicitly communicated content, which involves conventional implicatures. Therefore, I do not see any reason to espouse Bach's and Potts' view that DMs convey 'at-issue' propositions (in Potts' terms). In fact, the refutation test shows precisely the contrary and points to an intuitive construal of Grice's thesis.

2.3 DMs as (presupposition vs. implicature) triggers

In the literature, DMs have been said to trigger presuppositions or to convey conventional implicatures.

The presuppositional analysis of DMs comes in two different forms. First, in virtue of their connective (i.e. relational) status, DMs have been said to be anaphoric, that is, they refer to some target segment or proposition connected to the current one by the discourse relation associated with the DM (see Berrendonner, 1983 for French and Webber et al., 2003 for English). In theories like van der Sandt's (van der Sandt 1992, Geurts 1999), there is a strong link between anaphora and presupposition. Geurts (1999:83-84) discusses the relation between presuppositions and anaphors and proposes that the term of anaphora be reserved for a relation between the semantic content of an expression and a 'discourse entity which is at the focus of attention'. So, for instance, accommodation of previously unmentioned, non-topical, material does not give rise to an anaphora. I follow Geurts in assuming that anaphora is a kind of presupposition. Under this perspective, DMs are presuppositional *because* they are anaphoric.

Second, it has been held that DMs presuppose the discourse relation they are associated with. A celebrated example is the analysis by Lakoff (1971) of *but* in its 'denial of expectation' use, illustrated in (4).

4. John is tall, but he's no good at basketball (Lakoff's example (59))

According to Lakoff, (4) presupposes that there is a mental or/and worldly connection between being tall and being good at basketball. While Lakoff does not use the word *presupposition* in the more technical sense it came to acquire subsequently, her notion of presupposition is partly similar to Stalnaker's. She indicates (1971:118-119) that presupposing is supplying non-explicit information on the basis of knowledge or prior discourse. She thereby makes clear that presupposing is using a resource which is, in some sense, 'already there'.

König (1986) notes that although $p q$ and *even though p q* presuppose that p normally entails $\neg q$. More recently, Lagerwerf (1998) has proposed that *although*, *because* and other DMs presuppose the existence of default implicature relations between propositions.

It is also well-known that Grice (1989) analyzes *therefore* –a typical DM– as a conventional

implicature trigger². The idea of having at least two layers of information, truth-conditional and conventional, has been argued for independently by Dummett (1973:85-88) and is in part inspired by Frege.

Are these two trends of analysis just variants of each other or are they significantly different? The can be distinguished only in so far as presuppositions and implicatures can be. The existence of a frontier between conventional or conversational implicatures and presuppositions has frequently been questioned in the literature.³ A well-known example is the claim by Karttunen and Peters (1979) that presuppositions are conventional implicatures. Horn endorses a similar view when he speaks of conventional implicatures ‘as corresponding essentially to the Stalnaker-Karttunen notion of pragmatic presupposition’ (1996:310).⁴ However, two (sets of) reasons for keeping implicatures and presuppositions distinct have also been put forward.

First, Geurts (1999) makes clear that conversational implicatures, in contrast to presuppositions, do not show any projection behavior. For instance (5a) conversationally implies that John will not be able to run the marathon, whereas (5b) conveys no such implicature. In contrast, the presupposition that John has a wife projects in (5c,d).

5.
 - a. John is very tired
 - b. The coach does not believe that John is very tired
 - c. John’s wife is very tired
 - d. The coach does not believe that John’s wife is very tired

Second, Jayez and Rossari (2004) and Potts (2003) argue independently that presuppositions and conventional implicatures represent different semantic contributions. This is of particular importance since traditional Gricean examples of conventional implicatures involve DMs like *but* and *therefore*. Potts (2003) mentions several differences between presuppositions and conventional implicatures, which I summarize in (6). Note that point 4 echoes Geurts’ observation for conversational implicatures.

6. Potts’ differences

1. The falsity of a conventional implicature does not affect the truth-value of the propositions that are asserted. The falsity of a presupposition makes these propositions neither true nor false. This is the *detachability* criterion of Grice (1989): conventional implicatures are detachable.
2. Conventional implicatures should not be part of the initial context whereas presuppositions are usually ‘taken for granted’ (Stalnaker 1973, 1974).
3. It is much more difficult (if possible at all) to deny/cancel a conventional implicature than a presupposition.
4. *Plugs*⁵ do not filter out conventional implicatures.

²The implicature consists in the existence of a consequence relation between two propositions.

³To my best knowledge, Grice was the first to discuss in detail the differences between *conversational* implicature and presuppositions (see Grice, 1989).

⁴So-called *pragmatic* presuppositions (Stalnaker 1974) are not relative to sentences, but to the attitudes and intentions of the speaker and her audience. It seems that Karttunen (1973) does not consider this distinction as really crucial.

⁵That is, environments which prevent presuppositions from projecting (see Karttunen 1973).

2.4 How different are presuppositions and implicatures?

I now show that three of the tests (1, 3, 4) listed in (6) do not discriminate clearly implicatures from presuppositions. I conclude that, if a frontier is to be drawn at all, it requires that criterion 2 be made precise, a task I carry out in section 2.5.

1. The detachability test is conceptually and technically unclear. If the connection $\text{tallness} \Rightarrow \text{good-at-bb}$ is a conventional implicature, its falsity should leave the other propositions untouched. If we have $\text{tallness} \Rightarrow \text{good-at-bb}$, the facts that John is tall and that he is not good at basketball remain. But, the truth-conditional import of presuppositions has been defined mainly for NPs and verbs. The clearest examples concern the complements of verbs or their lexical semantics, e.g. the fact that *John strokes his cat* presupposes that John has a cat or that *John started walking* (at *t*) presupposes that John was not walking immediately before (*t*). The situation is different for sentential adjuncts which do not influence in general the truth-conditional status of the phrases they adjoin to.⁶ On this basis, one might decide that sentential adjuncts cannot be presupposition triggers.

However, refusing the status of presuppositions to DMs on the basis of their detachability goes with the symmetric claim that conventional implicatures are ‘detachable’. Unfortunately, the notion of detachability is elusive. In (7a,b), the reportive adjunct seems to trigger a conventional implicature because the information it conveys is detachable in some sense: the fact that Mary has no opinion about John’s abilities does not impinge on the truth of ‘John is no good at basketball’.⁷ Still, the truth of ‘John is no good at basketball’ cannot be assessed independently of the implicature triggered by the adjunct. If it were the case, (7b) would be contradictory. Therefore, the detachability criterion proves very difficult to apply unless one offers a detailed compositional analysis.

7.
 - a. According to Mary, John is no good at basketball
 - b. According to Mary, John is no good at basketball, but, actually, he is a very good player

2. The second criterion seems to suggest that (4) is not a case of conventional implicature. Normally, issuing (4) at *t* makes sense only if one believes before *t* that the connection $\text{tallness} \Rightarrow \text{good-at-bb}$ holds. However, we will see below (2.5) that this conclusion is challenged by Potts, so I defer any judgment based on this test to the discussion offered there.

3. Can we cancel the connection $\text{tallness} \Rightarrow \text{good-at-bb}$? König’s (1986) example (15d) can be adapted to this aim (8a). A similar configuration with a genuine conventional implicature does not give a markedly different result (8b).

8.
 - a. John is tall but he’s no good at basketball. This shows that one can be tall and a poor player
 - b. Surprisingly, John is no good at basketball. But, after all, maybe that is not much of a surprise

⁶ I ignore the well-known problematic cases of ‘intensional’ adjectives like *pseudo*, *alleged*, etc.

⁷ Note that the status of reportives with respect to the distinction between implicatures and presuppositions is far from clear. On one side, suspending the information seems possible: *If Mary has any opinion at all, according to her, John is no good at basketball* allows for the evidential reading ‘If Mary has any opinion at all, she must believe that John is no good at basketball’. On the other side, it is difficult to claim that Mary’s opinion is taken for granted.

One might object that cases like those ones illustrate *revision* rather than cancellation/suspension.⁸ However, when one turns to standard hypothetical suspension environments, the difference remains thin. What complicates the matter somewhat is the role played by the consequence relation. In classical examples, like (9), there is a consequence relation between a possible state of affairs (John has a son) and the belief that the son of John will be bald, (9a) being roughly paraphrased by (9b).⁹ It does not seem possible to construct a similar relation of the form *If A, B but C*, since B and C would have to be consequences of A and B is conducive to non-C. However, we can take an indirect route by embedding *B but C* into a presuppositional environment, as in (9d). In (9c), the connection $\text{tallness} \Rightarrow \text{good-at-bb}$ is presupposed. In (9d) it is suspended. So, it behaves like a presupposition once the auxiliary coherence conditions for the suspension test have been satisfied.

9.
 - a. If John has a son, his son will be bald
 - b. If John has a son, I conclude that his son will be bald
 - c. It is surprising that John is tall but that he is no good at basketball
 - d. If tall people are in general tolerable basketball players, it is surprising that John is tall but that he is no good at basketball

With conventional implicatures, we observe the same kind of suspension. In (10), it seems difficult to ignore the effect of the *if*-clause on the implicatures conveyed by the underlined phrases. For instance, the epithetic NP *the stupid fool* in (10c) can be interpreted as ‘dependent’ on the possibility that John could not be silent.

10.
 - a. If Mary said that John had stolen the funds, then, according to her, he is dishonest
 - b. If to be fired by Microsoft is really a bad thing, then, unfortunately, they fired John
 - c. If John could not shut it, then the stupid fool deserved what happened next

4. Finally, consider a plug like *to say* in (11). The first sentence does not necessarily convey the idea that there is a connection $\text{tallness} \Rightarrow \text{good-at-bb}$, as the second sentence makes clear.

11.
 - a. Mary said that John is tall but that he is no good at basketball. She seems to believe that it’s enough to be tall to be a good player

However, the status of plugs is far from clear in presupposition theories. For a sentence like (12a), many speakers consider that the existence of John’s sister is presupposed. This is in agreement with theories (van der Sandt 1992, Geurts 1999) which prefer the highest possible projection for presuppositions (global accommodation in this case). The fact that the difference with *holes* –i.e. expressions that let the presuppositions project (Karttunen 1973)– is rather thin is shown by (12b), where the alleged hole *to hope* is compatible with explicit cancellation. If the presupposition that John has a sister was attributed to speaker of (12b), explicit cancellation would be blocked, as it is in (12c).

12.
 - a. John said that he had to pick up his sister

⁸ I owe this remark to Olivier Bonami’s (p.c.), who noted that Geurts (1999) uses revision without making it clear whether he puts it on a par with suspension.

⁹ So, what we have here is an *epistemic* relation in the sense of Sweetser (1990), that is, one that involves beliefs.

- b. Mary hopes that John picked up his sister, but she is confused for some reason:
John has no sister
- c. John picked up his sister, ^{??}but he has no sister

I conclude that the distinction between holes and plugs is not empirically robust and should not be appealed to when telling apart implicatures from presuppositions. In addition to these theory-dependent problem, Bonami and Godard (2004) observe that conventional implicatures are not necessarily assigned to the speaker, contrary to what is assumed by Potts. For instance, in (13), the idea that John's obligation is unfortunate might be entertained by John only.

13. John said that, unfortunately, he had to pick up his sister

Taking stock, we see that only one of the features mentioned by Potts (2003) could lead us to conclude that the connection associated with *but* is a presupposition. Specifically:

1. Criterion 1 is unclear and might be irrelevant.
2. Criterion 2 shows that *but* behaves like a presupposition trigger.
3. Criterion 3 does not show any salient difference with conventional implicatures.
4. Criterion 4, like criterion 1, is too fragile to ground anything substantial on it.

These results suggest that, except perhaps for criterion 2, there is no compelling evidence that presuppositions and conventional implicatures are distinct. So, the whole issue revolves around the second criterion. This is not exactly a surprise since most theories of presupposition agree on the pretheoretical intuition that to be presupposed is to be 'already there', in some relevant belief state (see for instance Stalnaker, 1973, 1974 Geurts, 1995, 1999, Beaver, 2001). Accordingly, I propose that presuppositions are conventional implicatures that have a special ('presupposed') epistemic status.

2.5 Presuppositions revisited. A dynamic treatment

If (so-called) presuppositions can be part of what is explicitly communicated, like conventional implicatures, what can distinguish them from conventional implicatures? As we saw above, the criterion of epistemic preexistence ('taken for granted') is the most promising. However, Potts (2003) argues that (i) the property of being taken for granted is essential to all meanings and does not characterize presuppositions and (ii) the opposition relation conveyed by *but* is not taken for granted in all cases.

Concerning (i), one can say that meanings are *shared* but that being shared is not being presupposed. The case of *but* probably blurs this distinction because the particle *presupposes* the existence of an opposition relation between the conjuncts.¹⁰ The abstract relation of opposition corresponds to a certain meaning, that one can simulate roughly by the logical form $\lambda\phi, \psi. \phi > \neg\psi$, where $>$ is any suitable conditional operator. This meaning is 'presupposed' in a different sense, namely through the shared belief that every discourse agent is able to decide whether two propositions are opposed (along certain dimensions). However, this common assumption is different from the (genuine) presupposition that there *exists* a proposition which 'entails' (in any suitable sense) the negation of the proposition on the right of *but*. More generally, a presupposition is not a general precondition for communication but a proposition that the discourse points to. Knowing the mean-

¹⁰ I consider only the 'denial of expectation' interpretation of *but* here. Similar remarks would apply to its other uses (for example, contrast and concession).

ing of *cat* is a precondition for understanding *The cat is sleeping*, but what is presupposed by the sentence is the existence of an individual which satisfies the property of being a cat, not the meaning of this property. The difference manifests in two ways: (1) being ignorant of the meaning of *cat* makes one unable to assess the truth of *The cat is sleeping* by other means than indexical (non-descriptive) reference; (2) a sense that is unknown cannot be ‘accommodated’, unlike a presupposed proposition. So, whereas it is possible that presuppositions and word meanings are both preconditions in a very general sense, their contribution to meaning is different.

Turning to (ii), we must ask in what sense a presupposition is ‘taken for granted’. Potts notes that nonsensical *but* sentences raise a problem since, the meaning of the words being unknown, no opposition relation can be assumed to be present before the discourse (14).

14. John was reperting, but he stawled through all the same

Stalnaker too mentions problematic cases for his analysis in (Stalnaker 1973). Generally speaking, one can use presupposition triggers *without* assuming that the presupposition is part of the common ground. First, one can use presupposition triggers to introduce new information, as observed by Stalnaker. Second, one can use presupposition triggers and not know whether the presupposition is part of the common ground, as observed by Sadock in a personal communication to Stalnaker (Stalnaker 1973, note 2). E.g., adapting Sadock’s example, (15) can be used in contexts where the speaker knows (resp. does not know) that (resp. whether) the addressee does not know (resp. knows) that the speaker has a sister.

15. I can’t come with you because I have to pick up my sister, who is waiting for me

Stalnaker does not provide any precise answer to the difficulty pointed out by Sadock. However, the observations by Potts, Stalnaker and Sadock converge towards the same conclusion: presupposing is not equivalent to assuming some previous (shared) knowledge. This conclusion conflicts with the rendering of presupposition in terms of previous acceptance. Some recent approaches to the satisfaction problem for presuppositions rely on the notion of *update*, familiar from various versions of dynamic semantics. Traditionally, updates (Stalnaker 1978, Heim 1982, 1983, Veltman 1986), are eliminative procedures. The update of a set of worlds s with a proposition p , $s \oplus p$, is the set of worlds in s where p is true. s is said to *accept* p iff p is true at every world in s . s is said to *admit* p iff p is true at some world in s . So, in an update, the worlds where p is false are eliminated and $s \oplus p \neq \emptyset$ iff s admits p . I call an update *genuine* if it really eliminates worlds; so, $s \oplus p$ is genuine iff $s \oplus p \neq s$. Beaver (2001), elaborating on (Karttunen 1973) and (Heim 1983), proposes that the presupposition relation be defined as in (16).¹¹

16. A. p presupposes q iff, for every s , if s admits p then s accepts q .
 B. Let ∂p be the presupposition that p , $s \oplus \partial p = s$ if s accepts p , and is undefined otherwise.

(16.A) entails that no presupposition can be used for a genuine update. Let s be an information state, if p presupposes q and p is compatible with s (s admits p), then s accepts q , that is, $s \oplus q = s$ and $s \oplus q$ is not a genuine update. The idea that presuppositions are taken for granted seems to entail that they cannot give rise to genuine updates. When confronted with examples like (15), we are left with only two choices: reject the existence of a sister as a valid presupposition or modify or

¹¹ See (van Eijck 1994) for a similar proposal.

reject (16). The first option is intuitively strange. (15) sounds like a typical scholarly example of presupposition and the presupposed proposition seems to enjoy a different status from both the conventional implicature triggered by the non-restrictive relative clause and the asserted proposition *I can't come with you*.¹²

I propose to modify (16) by incorporating the multi-agent perspective developed in (Jayez and Rossari 2004). There, assertions and conventional implicatures are distinguished by the *intentions* of the agent who is responsible for them. Ignoring the detailed technical structure of the proposal, I summarize the main point in (17).

17. a. If an agent *a* asserts that *p*, she intends that the other agents update their belief states with *p*.
- b. If an agent *a* conventionally implicates that *p*, she intends that the other agents update their belief states with the proposition that *a* believes *p*.

The upshot of this proposal is that conventional implicatures constitute information supported by *a* but, in contrast with assertions, there is no direct attempt to force them into the belief states of the addressees. This difference accounts for the differences in dialogue exchanges noted by Jayez and Rossari (2004) and recalled in section 2.2. Note that nothing prevents agents different from *a* to *adopt* a conventional implicature, that is, to update their belief states with it. What (17) says is that it is not the default intended effect of conventional implicature triggers. Turning to presuppositions, I propose that they correspond to the intention defined in (18).

18. If an agent *a* presupposes that *p*, she intends that the other agents update their belief states with the belief that *a* 'presupposes' *p*.

Under this view, presuppositions differ from conventional implicatures only by the fact that *a*'s belief state supports the presupposition that *p*. What does it mean for a belief state to support a presupposition? One might recycle (16) and define '*s* (a belief state) supports the presupposition that *p*' as the fact that $s \oplus \partial p = s$, or equivalently that *s* accepts *p*. This solution would raise a problem similar to the one observed by Potts. Imagine that John said 'I picked up my sister' and I was not sure he had a sister. The representation of John's belief state I had up to this point was mixed: since I ignored whether he had a sister, my beliefs were compatible with the two possibilities and so were my beliefs about John's beliefs; let *s* denote the beliefs I believed that John entertained and *p* the proposition 'John has a sister'. Then, *s* contained *p*-worlds and $\neg p$ -worlds. What happens to *s* when John mentions that he picked up his sister? I could update *s* in the usual way, replacing it by $s \oplus p$. But what I learn is not that John believes (now) that he has a sister but that he already believed it, before telling me that he picked up his sister. So I have to change my view on John's *previous* beliefs and I can do so by *downdating* the information through some revision. Specifically, if ρ is a revision function, I can replace each world *w* of *s* where $\neg p$ held by a set of worlds $\rho(w, p)$ where *p* holds. The general problem of defining reasonable revision procedures is far beyond the scope of this paper and I will simply assume that there is at least one such procedure (see Hansson, 1999, Herzig and Rifi, 1998 for surveys).

¹² Following Potts, I assume that non-restrictive relatives trigger conventional implicatures.

19. Let $s_{x_1 \dots x_n}$ denote the belief state at the end of the belief path ‘ x_1 believes that x_2 believes that ... that x_n believes [...]’ . Let $\rho(s,p)$ denote $\{w \in s : w \models p\} \cup \cup \{\rho(w',p) : w' \in s \ \& \ w' \models \neg p\}$. If an agent a presupposes that p , she intends that any other agent b downdates her belief state by replacing s_{ba} by $\rho(s_{ba}p)$.

Presupposing is not asserting: if a presupposes that p , she does not intend that b should learn p . It is not just conventionally implicating : if a presupposes that p , she does not intend that b should learn that a believes p but that b learns that a already believed p . As with conventional implicatures, if a is considered as trustworthy, it is possible that in effect b adopts this belief or even comes to believe that p . It might even be the actual intended effect of the presupposing action, but it is not the default intended effect. Of course, as with assertions and non-presuppositional implicatures, the other agents can adopt the presupposition, reject it, postpone downdating, etc.

Summarizing, although I share Potts’ concern about the misleading character of the expression ‘taken for granted’, I do not derive the conclusion that expressions like *but* are not presuppositional. Presuppositions are not ‘old’ information but information which is presented as such. Moreover, downdates based on revision provide a powerful alternative to the standard model of eliminative updates and do not commit one to the view that information is elimination, a view which proves problematic with presuppositions, since they put together two perspectives: information modification (downdate) and information stability (propositions ‘taken for granted’). In a more fine-grained approach one would have to consider temporal belief states and their evolution, but this is not a step I can take within the limits of this paper.

In the following sections, I will rely almost exclusively on Geurts’ (1999) version of van der Sandt’s (1992) *anaphoric* theory of presuppositions. There are two reasons for doing so. First, the anaphoric theory directly captures the intuition that presuppositions are presented as ‘already there’ by requiring that they be bound to preexisting material or introduced as supplementary assumptions. Second, Geurts’ own version of anaphoric theory adds power and flexibility to van der Sandt’s initial proposal.

3. DRT representation

3.1 Basics

I use the traditional resources of DRT: individual discourse referents x, y , etc. and simple or complex conditions. I ignore the presuppositional behavior of names and introduce them globally for simplicity. To formulate the conditions on DMs, I add handles on DRSs (in a way similar to Asher and Fernando (1999)), but quite conservatively, i.e. preserving the standard architecture used by Geurts and van der Sandt. Presuppositions are considered to be DRSs; however they do not enter the logical relations that make up complex conditions. Graphically, they are boxed and coloured (e.g. K_1). DRSs are declared as any other referent. Finally, DRS conjunction is simulated by a non-commutative conjunction \bullet , which connects ‘normal’ (= non-presuppositional) DRSs. It does not connect normal DRSs and presupposed DRSs. The standard commutative conjunction is noted $\&$. Presupposed DRS are ‘dangling’, that is, they are not connected to the other DRSs. So, the general form of a DRS is like in (20a). Handles point to DRS contents, as in (20c). Global referents and conditions are taken out of particular DRSs. Thus, in (20c), x and $John(x)$ do not belong to K_1 or K_2 .

20. a. $[x_1 \dots x_n, K_1 \dots K_m, K'_1 \dots K'_k : C_1 \& \dots \& C_p \& (K_1 = [] \bullet \dots \bullet K_m = []) \ K'_1 = [] \dots \ K'_k = []]$
 b. John is on speed. He is edgy
 c. $K = [K_1, K_2, x : John(x) \& (K_1 = [: on-speed(x)] \bullet K_2 = [: edgy(x)])]$

Since the ontology is slightly richer than with the original van der Sandt's approach, one has to provide accessibility conditions for DRS referents. This is by no means a novelty, though, since Geurts (1999) extends the representation in the same direction for attitude verbs. For lack of space, I will not use or discuss the full 'SDRT with labels' version proposed by Asher and Fernando (1999) and Asher and Lascarides (1998, 2003). Two cases must be distinguished: 'ordinary' accessibility, which concerns individual discourse referents (*i-accessibility*) and propositional accessibility, which concerns propositions (*p-accessibility*). Since I am not proposing a theory of discourse relations, I need only a very weak form of p-accessibility on presupposed DRSs (see Asher and Lascarides, 2003:149, def. 15 for a more elaborate approach).

21. **Accessibility**

1. If $K = [\dots K_i \dots : \dots K_i = [] \dots]$, every $K' \neq K$ i-accessible to K is p-accessible to K_i and K is i-accessible to K_i .
2. If $K = [K_1, \dots, K_n, \dots : \dots (K_1 = [] \bullet \dots \bullet K_n = [])]$, K is i-accessible to $K_1 \dots K_n$ and $K_1 \dots K_n$ are sequentially i-accessible (every K_i is i-accessible to every K_j such that $i \leq j$)¹³.
3. If $K = [\dots : K_1 = [] \Rightarrow K_2 = [] \dots]$ K_1 is i-accessible to K_2 , etc. (the usual accessibility conditions)

The fact that K is (i/p)-accessible to K' is noted by $K \leq_{(i/p)\text{-acc}} K'$.

Note that sequential accessibility is not sufficient in general; suppose we have a sequence of the form $K_1 = [] \bullet K_2 = []$, K_2 can access K_1 but it might have to access DRSs inside K_1 and not be able to do so, as in the following structure, where K_2 cannot access $[x : \alpha]$ to resolve y .

$$K_1 = [: \neg[x : \alpha]] \bullet K_2 = [y : C(y)]$$

Since presupposed DRSs are 'dangling' (not logically connected to the rest) they are not accessible out of subordination (a presupposed DRS containing another presupposed DRS, etc.). E.g., in $K = [\dots : K_1 = [] \bullet K_2 = [] \bullet K_3 = []]$, $K \leq_{i\text{-acc}} K_2$, and K_3 , $K_2 \leq_{i\text{-acc}} K_3$ but $K_1 \not\leq_{i\text{-acc}} K_2$ and $K_1 \not\leq_{i\text{-acc}} K_3$. For individual or DRS referents, anaphora resolution is standard: presupposed conditions are transferred to the DRS where the antecedent is declared. A simple example is provided in (22).

22. a. A man entered, he wore a hat
 b. $K = [K_1, K_2 : K_1 = [x : man(x) \& entered(x)] \bullet K_2 = [K_3 : K_3 = [y :] wore-hat(y)]]$
 By 21.2 and 21.1, $K_1 \leq_{i\text{-acc}} K_2$ and $K_2 \leq_{i\text{-acc}} K_3$, so $K_1 \leq_{i\text{-acc}} K_3$ and y can be bound to x . Therefore, $K = [K_1, K_2 : K_1 = [x : man(x) \& entered(x)] \bullet K_2 = [: wore-hat(x)]]$

Since we have handles, DRS merging must be adapted.

23. If K is a DRS, $gr(K)$ is the set of global individual referents of K (here, referents that are introduced through proper names). $gc(K)$ denotes the set of conditions through which global individual referents are introduced (the predications of proper names). The DRS obtained by withdrawing the global referents and conditions from K is noted $loc(K)$.

¹³ Remember that \bullet is non-commutative; so, $K_1 = [] \bullet K_2 = []$ is not the same as $K_2 = [] \bullet K_1 = []$.

24. **DRS merging**

Let K_1 and K_2 be two DRSs. Their merge $K_1 \oplus K_2$ is defined by:

$$K_1 \oplus K_2 = [gr(K_1) \cup gr(K_2) \cup \{K_1, K_2\} : gc(K_1) \& gc(K_2) \& (K_1 = loc(K_1) \bullet K_2 = loc(K_2))]^{14}$$

The result of left-adjoining a consequence DM to a sentence represented by a DRS K is defined in (25).

25. **Presupposition of consequence DMs**

$$DM_{cons}(K) = [gr(K), K_i, K_{i+1} : gc(K) \& (K_i = loc(K) \bullet K_{i+1} = [K_{i+2} : CONS(K_{i+2}, K_i)]), \text{ where } i \text{ is the smallest fresh DRS handle index.}]$$

According to (25), A consequence DM bearing on a DRS K introduces a presupposed DRS (K_{i+1}) which indicates that some proposition (K_{i+2}) entails the non-global content K_i of the initial DRS K . For a simple example, consider (26).

26. a. John is on speed, so he must be edgy
 b. $K_1 = [x : John(x) \& on-speed(x)]$
 $K_2 = [K_3 : Must K_3 = [K_4 : K_4 = [y :] edgy(y)]]$
 $so(K_2) = [K_5, K_6 : K_5 = [K_3 : Must K_3 = [K_4 : K_4 = [y :] edgy(y)]] K_6 = [K_7 : CONS(K_7, K_5)]]$
 $K_1 \oplus so(K_2) = [x, K_1, K_2 : John(x) \&$
 (= K) $(K_1 = [: on-speed(x)]) \bullet$
 $K_2 = [K_5, K_6 : K_5 = [K_3 : Must K_3 = [K_4 : K_4 = [y :] edgy(y)]]$
 $K_6 = [K_7 : CONS(K_7, K_5)]]$
 c. $K = [x, K_1, K_2 : John(x) \& (K_1 = [: on-speed(x)]) \bullet$
 $K_2 = [K_5 : K_5 = [K_3 : Must K_3 = [: edgy(x)]] \& CONS(K_1, K_5)])]$

Resolving y is easy by means of the accessibility chain: $K \leq_{i-acc} K_2 \leq_{i-acc} K_5 \leq_{i-acc} K_3 \leq_{i-acc} K_4$, which allows one to posit $x = y$. For K_6 , one has: $K \leq_{i-acc} K_2$ so $K \leq_{p-acc} K_6$, and one can resolve K_7 with K_1 . The two resolutions produce (26c).

3.2 Disjunctive structures

Disjunctive structures of the form *Either A or B* (*Ou (bien) A ou (bien) B* in French) are paired with structures (1) or (2). I follow Geurts and Frank, who argue against Robert's analysis and adopt (2). More precisely, I consider that a structure *Either ϕ or ψ* is felicitous only if ψ can be interpreted as incompatible with ϕ . So $\neg\phi$ is accommodated in the right term of the disjunction, unless $\psi = \neg\phi$, in which case accommodation would create a redundancy. This gives the representation in (28)

1. *Either ϕ or ψ* = $\phi \vee \Box(\neg\phi \Rightarrow \psi)$ (Roberts 1989)
2. *Either ϕ or ψ* = $\phi \vee (\neg\phi \wedge \psi)$ (Geurts 1995, Frank 1996)

To define the 'negation' of a DRS, we need to take care of the status of discourse referents.

¹⁴ In this and similar definitions, $gc(K_1) \& gc(K_2)$ abbreviates $C_1 \& \dots \& C_k \& C_m \& \dots \& C_p$, where C_1, \dots, C_k and C_m, \dots, C_p are the global conditions of K_1 and K_2 respectively.

27. **Contradictory DRSs**

Let $lr(K)$ be the set of local referents of K , that is, those referents which are declared inside K . $K' \approx_{loc} K$ iff K' is an alphabetic variant of K on $lr(K)$. K and K' are *contradictory* iff, for some K'' , $K'' \approx_{loc} K'$ and $K = [\neg K'']$.

28. **Exclusive disjunction**

Let $\sim K$ be any DRS contradictory to K .

A sequence K_1 <either-or> K_2 is construed as:

$[\{K_1, K_2\} \cup gr(K_1) \cup gr(K_2) : gc(K_1) \& gc(K_2) \& K_1 = loc(K_1) \vee K_2 = [K_i, K_{i+1} : K_i = \sim K_1 \bullet K_{i+1} = loc(K_2)]]$, where i is the smallest fresh DRS handle index.¹⁵

So, (29a) is actually (29b). Since $K_3 \leq_{i-acc} K_4 \leq_{i-acc} K_5$, z can be bound to u , resulting in (29c).

29. a. Either Fred has no rabbit or it is in hiding

b. $K = [K_1, K_2, x : Fred(x) \&$

$(K_1 = [: \neg[y : rabbit(y) owns(x,y)]]$

\vee

$K_2 = [K_3, K_4 : K_3 = [u : rabbit(u) \& owns(x,u)] \bullet$

$K_4 = [K_5 : K_5 = [z : non-human(z)] in-hiding(z)]]]$

c. $K = [K_1, K_2, x : Fred(x) \&$

$(K_1 = [: \neg[y : rabbit(y) owns(x,y)]]$

\vee

$K_2 = [K_3, K_4 : K_3 = [u : rabbit(u) \& owns(x,u) \& non-human(u)] \bullet K_4$

$= [: in-hiding(u)]]]$

In French, it turns out that disjunctive structures have unexpected effects on consequence DMs. A sentence like (30a) (the French counterpart of (29a) + *alors*) has the structure in (30b). Resolving z in K_3 gives $z = u$. $K'_2 \leq_{p-acc} K_8$, so K_6 can be bound to K_7 . The result is (30c)

30. a. Ou bien Fred n'a pas de lapin ou bien alors il se cache
'Either Fred has no rabbit or then it is in hiding'

b. $K_1 = [x : Fred(x) \& \neg[y : rabbit(y) \& owns(x,y)]]$, $K_2 = [K_3 : K_3 = [z : non-human(z)] in-hiding(z)]$

$K'_2 = then(K_2) = [K_4, K_5 : K_4 = [K_3 : K_3 = [z : non-human(z)] in-hiding(z)] K_5 = [K_6 : CONS(K_6, K_4)]]$

K_1 <either-or> $K'_2 = [x : Fred(x) \& K_1 = [\neg[y : rabbit(y) \& owns(x,y)]] \vee$

$K'_2 = [K_7, K_8 : K_7 = [\neg[\neg[u : rabbit(u) \& owns(x,u)]]] \bullet K_8 = [K_4, K_5 : K_4 =$

$[K_3 : K_3 = [z : non-human(z)] in-hiding(z)] K_5 = [K_6 : CONS(K_6, K_4)]]]$

c. K_1 <either-or> $K'_2 = [x : Fred(x) \& K_1 = [\neg[y : rabbit(y) \& owns(x,y)]] \vee$

$K'_2 = [K_7, K_8 : K_7 = [\neg[\neg[u : rabbit(u) \& owns(x,u) \& non-human(u)]]] \bullet K_8$

$= [K_4 : K_4 = [: in-hiding(z)] \& CONS(K_7, K_4)]]]$

However, this predicts that (31a,b) should be fine.

31. a. Ou bien Fred n'a pas de lapin ou bien ^{??} donc il se cache

b. Ou bien Fred n'a pas de lapin ou bien ^{??} dans ce cas il se cache

¹⁵ the <either-or> constructor behaves like a merging operator.

4. Pedigrees

4.1 What are they?

One can account for (31a) by mixing two observations.

- a. The propositions $\phi/\neg\phi$ occurring in exclusive disjunctions of the form ϕ <either-or> ψ are not standard assertions. Rather, they have an hypothetical status (Roberts 1989).
- b. *Donc* is not always felicitous in the apodosis of conditionals (Jayez and Rossari 2000).

32. a. Fred a un lapin, donc il se cache
[intended : since Fred has a rabbit and we don't see it, it must be in hiding]
'Fred has a rabbit, therefore it is in hiding'
- b. Si Fred a un lapin, ^{??}donc il se cache
'If Fred has a rabbit, therefore it is in hiding'

More generally, *donc* cannot always be naturally bound to propositions with a hypothetical status.

33. a. Peut-être que Fred a un lapin, mais ^{??}donc / alors il se cache
'Maybe Fred has a rabbit, but therefore / then it is in hiding'
- b. Est-ce que Fred a un lapin? Parce qu'alors / ^{??}donc je vais prendre de la salade
'Does Fred have a rabbit, because then / therefore I'll take some salad'

One can explain (31a) by assigning to the proposition that Fred has a rabbit a hypothetical status and assuming that certain consequence DMs are sensitive to the modal status of the proposition they presuppose. Roughly speaking, a *pedigree* is a trace of the modal/illocutionary status of an antecedent proposition

34. **Pedigrees**
Any DRS handle K receives a *pedigree*, which is a Boolean expression of types in some Boolean lattice of types.

The detailed structure of the type language is immaterial. I simply assume that we have Boolean expressions (that is, in particular, $\sigma \wedge \neg\sigma = \perp$). K with pedigree π is noted ${}^\pi K$. Pedigrees can be modal. Let m be a sequence of modal operators that defines the set of worlds at which some proposition must be evaluated; m can constitute a term in a Boolean pedigree. The sources of modal pedigrees are, for instance, morpho-syntactic and prosodic information, certain constructions or the context itself (e.g. descriptive vs. 'evidential' assertions). The important point is that certain consequence DMs are *sensitive* to pedigrees (35); e.g. *donc* demands elements already present in the common ground or 'taken for granted', hence the pedigree **gr(anted)**. The existence of pedigrees restricts the binding options (36).

35. **Pedigree sensitivity for consequence DMs**
A consequence DM is sensitive to pedigrees whenever it triggers a presupposition of the form $K_i = [{}^\pi K_{i+1} : \text{CONS}({}^\pi K_{i+1}, K')]$. In particular, *donc* triggers a presupposition of the form $K_i = [{}^{\text{gr}} K_{i+1} : \text{CONS}({}^{\text{gr}} K_{i+1}, K')]$.
36. **Binding with pedigrees**
 ${}^\pi K_i$ can be bound to ${}^{\pi'} K_j$ iff $\pi \wedge \pi' \neq \perp$. The result is ${}^{\pi \wedge \pi'} K_j$.

When we try to bind a handle to another handle with an incompatible pedigree ($\pi \wedge \pi' = \perp$), we get an anomaly. For (31a), we have the structure (31c). For simplicity I assume that the relevant pedigrees are incompatible atoms, **hyp** and **gr**. We have **hyp** \wedge **gr** = \perp , so the binding fails.

$$31. \quad c. \quad K_1 \langle \text{either-or} \rangle K'_2 = [x : \text{Fred}(x) \ \& \ K_1 = [\neg[y : \text{rabbit}(y) \ \& \ \text{owns}(x,y)]] \vee K'_2 = [{}^{\text{hyp}}K_7, {}^{\text{hyp}}K_8 : \\ {}^{\text{hyp}}K_7 = [\neg[\neg[u : \text{rabbit}(u) \ \& \ \text{owns}(x,u)]]] \bullet {}^{\text{hyp}}K_8 = [K_4, K_5 : K_4 = [K_3 : \\ K_3 = [z : \text{non-human}(z)] \ \text{in-hiding}(z)] \ K_5 = [K_6 : \text{CONS}({}^{\text{gr}}K_6, K_4)]]]]]$$

4.2 Disjunctive syllogism and pedigrees

Jayez and Rossari (2000) note that *donc* improves in contexts like (37a). The observation extends to (37b). Such structures correspond to an implicit reasoning of the form $A \vee B, \neg A \mid\text{-} B$ (disjunctive syllogism).

- 37. a. Si Fred était à l'étranger, ^(?)donc il ne peut pas être le meurtrier
'If Fred was abroad, he cannot be the murderer'
- b. Ou bien Fred n'était pas à l'étranger, ou bien, ^(?)donc, il ne peut pas être le meurtrier
'Either Fred was not abroad, or he cannot therefore be the murderer'

Epistemically, a disjunctive syllogism corresponds to the fact that there are only two possibilities that the speaker and the hearer are aware of. So, the validity of (37) is based on a **granted** proposition of the form ${}^{\text{gr}}[\text{abroad} \vee\vee \langle \text{murderer} \rangle]$, where $\vee\vee$ notes the exclusive disjunction. One can relax condition (35) as in (35').

35'. Pedigree sensitivity for *donc*

Donc triggers a presupposition of the form $K_i = [\Gamma : \text{CONS}(\Gamma, K')]$, where Γ is a non-empty list of DRSs that contains at least one DRS of pedigree **gr**.

With (30a) and (31a), there are additional possibilities: Fred has a rabbit and it is in hiding, Fred has a rabbit and he is on vacations with his rabbit, Fred has a rabbit but it lives in the garden, etc. The granted premise $\text{rabbit} \vee\vee \text{in-hiding}$ is not available as an element of the common ground. See fig. 1 and 2.

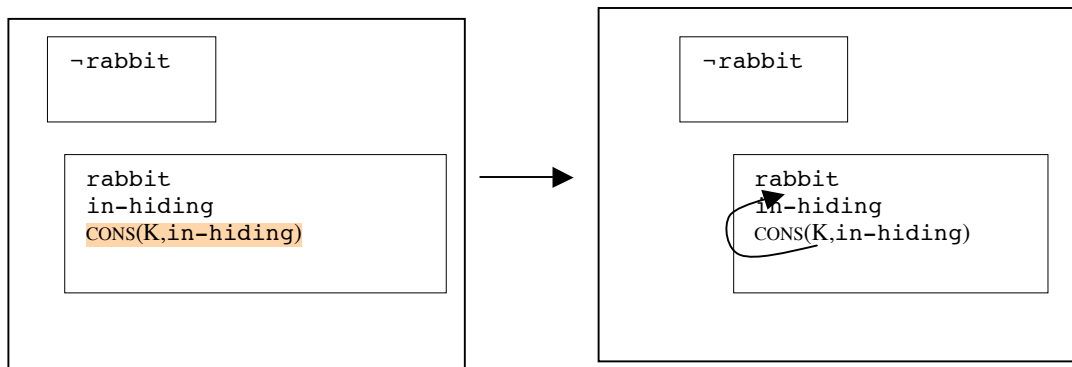


FIGURE 1 : (30a) and (31a)

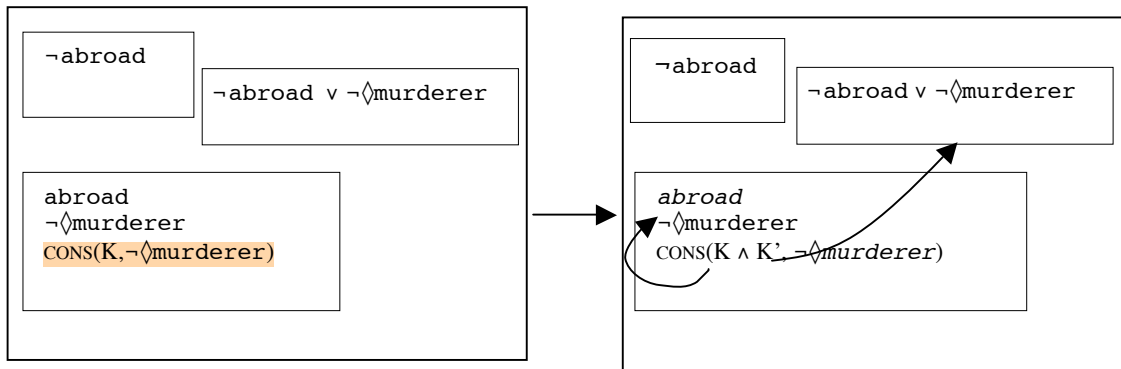


FIGURE 2 : (37b)

The relevance of the difference is confirmed by the improved versions (38a,b) of (32b) and (31a). The initial assertion in (38) introduces the necessary disjunction in the common ground.

38. a. Le lapin ne peut être que dans la maison. Si Fred en a un, donc il se cache
 ‘The rabbit can only be in the house. If Fred has one, therefore it is in hiding’
 b. Le lapin ne peut être que dans la maison. Ou bien Fred n’en a pas ou bien donc il se cache
 ‘The rabbit can only be in the house. Either Fred has no rabbit, or therefore it is in hiding’

4.3 ‘Dans ce cas’

What about (31b)? Since *dans ce cas* is compatible with **hyp**-type DRSs (39a), the explanation offered for *donc* is inappropriate. Similar observations hold whenever the presupposed proposition is not explicit.

39. a. Si Jean prend des amphets, dans ce cas il va être très nerveux
 ‘If John is on speed, in that case he is going to be very edgy’
 b. John prend probablement des amphets, sinon alors / ? dans ce cas je ne comprends pas pourquoi il est si nerveux
 ‘John probably takes speed, if not (then / in that case) I can’t understand why he is so edgy’
 c. Il faut que John prenne des amphets, faute de quoi alors / ? dans ce cas il ne pourra pas réussir l’examen de sémantique formelle
 ‘John must take speed, otherwise (then / in that case) he will not be able to pass the formal semantics exam’

The structure of (39b,c) is $M(\phi)$, if $\neg\phi$ then (*alors* vs *dans ce cas*) ψ , $\neg\phi$ being implicit. By and large, DMs such as *sinon*, *autrement*, *faute de quoi*, *sans quoi*, *dans le cas contraire* transform propositions into their implicit hypothetical inverse (ϕ becomes (if $\neg\phi$)). The data suggests that *dans ce cas* is sensitive to the explicit character of propositions. To be accepted in the common ground is not enough. In a discussion among mathematicians, the proposition that no contradiction can be admitted is probably part of the common ground.

40. Dans la démonstration classique de l'irrationalité de $\sqrt{2}$, ou bien on admet une contradiction ou bien alors / ?? dans ce cas $\sqrt{2}$ n'est pas fractionnaire
 'In the classical proof that $\sqrt{2}$ is irrational, either one admits a contradiction or then / in that case $\sqrt{2}$ is not fractional'

Dans ce cas is a demonstrative DM, so its behavior is analogous to what is observed for demonstrative determiners in the presence of bridging (see Corblin 1995, Kleiber 1989 for French, Diessel 1999 for a cross-linguistic study). Generally speaking, demonstratives do not like implicit antecedents (41).

41. a. J'ai examiné la voiture. Le/*Ce coffre était abîmé
 b. I inspected the car. The/*This trunk was damaged

Implicit DRSs can be tagged with a special tag **impl**. If *dans ce cas* and similar DMs demand a \neg **impl**-type DRS, the binding fails.

4.4 Pedigrees and attitudes

A *prima facie* reasonable assumption is that attitudes create non-accessible contexts, see (42).

42. Mary believes that a bear_i broke in, ??it_i crushed the TV¹⁶

However, Asher (1993:chap. 6) notes examples like (43a) (his 18).

43. a. John now believes that [Mary will leave him]_i. Fred has been expecting it_i to happen all along
 b. $[x,y,s : John(x) \ \& \ Mary(y) \ \& \ s\text{-believes}(x, [e : e\text{-leaves}(x,y)])]$

Asher's explanation is twofold:

- a. One can refer anaphorically to event-types (vs. events).
 b. Event-types are predicative DRSs of the general form $\lambda e \lambda x_1 \dots x_n [y_1 \dots y_k : e\text{-pred}(x_1 \dots x_n) \dots]$, e.g. the event of leaving is $\lambda e \lambda x,y [: x \ e\text{-leave} \ y]$. They behave as terms and are 'freely'¹⁷ available for anaphora. DRSs are 0-place predicative DRSs, so DRSs (*qua* event-types) are 'freely' available.

Disregarding time, the first sentence of (43a) can be coded as (43b). The underlined DRS is accessible (in contrast with the event referent *e*). I follow Asher in assuming that abstract objects are much more freely accessible than individual discourse referents. In practice, I will make all the propositions in the scope of attitudes accessible. This squares well with examples like (44a-c)

44. a. Marie croit qu'[un ours est entré]_i. Effectivement, c'_i est vrai
 'Mary believes that [a bear broke in]_i. Indeed it_i's true'
 b. Je pense qu'[un ours est entré]_i. Si ça_i n'était pas le cas, il n'y aurait pas autant de dégâts
 'I think that [a bear broke in]_i. If it_i were not the case, there would be less damage'

¹⁶ Note that the sentence is not uniformly rated as strange.

¹⁷ Not exactly. The accessibility conditions on individual discourse referents must be respected.

- c. Marie s' imagine que [Jean pense qu' [un ours est entré]_j]_i. C_{i or j} 'est ce que croit Fred
 'Mary imagines that [John thinks that [a bear broke in]_j]_i. It_{i or j} 's what Fred believes'

The possible sensitivity to attitudes requires an elaboration of pedigrees. Rossari (2002) shows that a DM like *effectivement* 'indeed' is sensitive to attitudes, see (45a-d). See (Zeevat 2003) for similar remarks on *indeed*.

45. a. Il y a des souris chez Julie. ^{??}Effectivement j'en ai vu (≈ Rossari's example (74))
 'There are mice in Julia's house. Indeed I saw some mice'
 b. Julie croit qu'il y a des souris chez elle. Effectivement j'en ai vu
 'Julia believes there are mice in her house. Indeed I saw some mice'
 c. Julie a rêvé qu'il y avait des souris chez elle. Effectivement j'en ai vu (≈ her (79))
 'Julia dreamt that there were mice in her house. Indeed I saw some mice'
 d. Julie a raison de croire qu'il y a des souris chez elle. Effectivement, j'en ai vu (≈ her (75))
 'Julia is right when she believes that there are mice in her house. Indeed I saw mice'
 e. Julia s' imagine qu'un ours est entré. ^{??}Effectivement, il y a de gros dégâts
 'Mary imagines that a bear broke in. Indeed there is a lot of damage'¹⁸

Effectivement demands that its antecedent be the object of a *veridical* (Zwarts 1995) attitude and that the attitude be assigned to an agent distinct from the speaker. Veridical attitudes entail that the agent under consideration believes the proposition which the attitude is about. Let a be an agent and ATT an attitude, then $R_{\langle a, ATT \rangle}$ is the accessibility relation between the current world and the accessible worlds w.r.t. a and ATT . As usual, $\Box_{\langle a, ATT \rangle} \phi$ is true at w iff ϕ is true at every world w' such that $w R_{\langle a, ATT \rangle} w'$.

46. **Presupposition of *effectivement***

$\Box_i = [{}^c K_{i+1} : K' \Rightarrow \Box_{\langle speaker, BELIEVE \rangle} {}^c K_{i+1}]$,
 where i is the smallest fresh DRS handle index and $C = \exists a, ATT (a \neq speaker \ \& \ (\Box_{\langle a, ATT \rangle} K_{i+1} \Rightarrow \Box_{\langle a, BELIEVE \rangle} K_{i+1}) \ \& \ (\Box_{\langle a, ATT \rangle} K_i \not\Rightarrow \Box_{\langle speaker, BELIEVE \rangle} \neg K_{i+1}))$

(46) says that the proposition in the scope of *effectivement* entails that the speaker believes a certain propositional antecedent such that (i) the attitude entertained by some agent a different from the speaker entails that a believes that the antecedent is true and (ii) does not entail that the speaker believes that the antecedent is false. For instance, in (45b), Julie believes that she has mice at home. In (45d), Julia's belief is already presupposed by the first sentence. (45e) may sound odd because the first sentence entails that the speaker believes that no bear broke in. (45c) is more problematic. Following Giannakidou (1998), I assume that dreaming that ϕ entails believing that ϕ during the dreaming event. Whether this belief is *about* the current world, as any normal belief is, is more debatable. The world which the dream-beliefs are about might give rise to different beliefs than those the current world gives rise to; e.g. x dreams that he is a tennis-player and he knows (in the real

¹⁸ I assume that, in the example, *s'imaginer* means *to suppose wrongly*.

world) that he is not a tennis-player. Since we usually do not entertain (simple) inconsistent beliefs about the same world, the current world of the dream and that of the reality are presumably not the same *unless* one considers that the difference between dream-beliefs and real beliefs is a matter of belief change.

In contrast with the treatment proposed by Zeevat (2003) for *indeed*, there is no accessibility problem: *effectivement* picks up propositions inside attitudes. This is not idiosyncratic; the conditional mood, for instance, can bypass attitudes in the same way (Jayez and Rossari 1999).

47. a. Marie a peur qu'il y ait des cafards dans sa salle de bains; elle serait obligée de s'en débarrasser
'Mary is afraid that there are roaches in her bathroom ; she would have to get rid of them'
b. Marie a peur qu'il y ait des cafards dans sa salle de bains; alors / dans ce cas/ du coup/ ^{??}donc elle serait obligée de s'en débarrasser

4.5. Some residual problems

In this section, I mention a few problems which call for an extension/modification of the present approach.

A. DMs are usually not cataphoric.

48. a. Either it is in hiding, or then Fred has no rabbit
b. Either, ^{??}then, it is in hiding or Fred has no rabbit

However, once the cataphor has been resolved there is no difference of structure with (30b). To deal with such examples, one has to provide for a temporal structure of resolution/accommodation. The DM cannot be used as long as its left argument has not been found or constructed. Obviously, the present framework is not adequate in this respect.

B. Anaphoric 'strength'

It is well-known that pronouns and DMs, in contrast with full NPs, resist in general accommodation.

49. a. ^{??}She came [intended: no salient antecedent]
b. ^{??}Therefore Mary came [intended: no salient plausible premise]
c. Mary picked up her children at school [intended: no salient antecedent]
d. Mary might be in the garden [intended: no salient reason for Mary being in the garden]
e. Mary ^{??}would be in the garden [intended: no salient condition for Mary being in the garden]

If the 'informational' account of these differences (Geurts) is right, (49a) and (49b) are strange because *she* and *therefore* cannot help to identify their 'referent', i.e. the left argument of the discourse relation for *therefore*. *Therefore* has descriptive content (in contrast with *she*), but it concerns the discourse relation, not the referent; *her children* corresponds to the property $\lambda X. X = \{x : x \text{ is one of Mary's children}\}$, which identifies uniquely its referent. Geurts (1999) propose that modals presuppose their domain (see also Geurts and van der Sandt 1999). A potential problem

with this assumption is that it does not explain why (49d) is admissible ‘out of the blue’ whereas (49e) is strange. (49) suggests rather that being dependent on a modal base (Kratzer 1981) and being presuppositional are distinct properties. *Might* (which requires a modal base) and conditional or DMs (which are based on presuppositions) would then be different in this respect.

C. Corblin’s observation

Francis Corblin (p.c.) observed that DMs like *donc* can be found inside *if*-clauses.

50. a. Si Marie dit la vérité, si donc elle a bien vu le meurtier, ça change tout
 ‘If Marys tells the truth, so if she actually saw the murderer, it changes everything’

What is the antecedent of *donc* in (50)? Presumably, it is the hypothetical proposition ‘if Mary tells the truth’. But this shows that conditions (35) and (35’) are too strong. In fact, in (50), *donc* is licensed by the fact that the conclusion (‘if Mary tells the truth’) has the same modal status than the antecedent. The general constraint is captured by (51), which requires that one of the DRSs in Γ have the same pedigree as the consequent. (51) allows in particular for cases where $\pi = \mathbf{hyp}$.

51. Pedigree sensitivity for *donc* (II)

Donc triggers a presupposition of the form $\mathbf{K}_i = [\Gamma: \text{CONS}(\Gamma, \text{“K”})]$, where Γ is a non-empty list of DRSs that contains at least one DRS of pedigree π .

5. Conclusion

Pedigrees constitute the semantic interface between DMs and their antecedents. Whereas pronouns and verbs have individual or propositional antecedents that exist or hold in the current world, DMs may impose more complex constraints on their antecedents. Although the notion of pedigree can be approximated by simple types in a Boolean algebra, the observations in sections 4.3, 4.4 and 4.5 show that we have to make room for a richer ontology. Pedigrees are not equivalent to discourse relations, in the traditional sense. The most obvious manifestation of this difference is the fact that the same relation of consequence is associated with otherwise very different DMs, such as *donc* and *alors*. In future work, I will examine other types of DMs and the general problem of the relation between pedigrees, modal status and speech acts, along the lines of (Jayez 2003).

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