Background in SDRT

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Mots-clefs – Keywords

relation de discours, structure du discours
discourse relation, discourse structure

Résumé - Abstract

Dans cet article, nous réexaminons la nature de la relation d'Arrière-Plan de la SDRT du point de vue de la structure du discours. Nous exploitons la méthodologie développée dans (Asher & Vieu, to appear) pour déterminer la nature subordonnante ou coordonnante de cette relation de discours.

In this paper we reconsider the nature of the Background relation in SDRT, from the view point of discourse structure. We apply the methodology proposed in (Asher & Vieu, to appear) for determining the subordinating or coordinating nature of this discourse relation.

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1 Introduction

Background is one of the first discourse relations that appeared in works on SDRT (Lascarides & Asher, 1993; Asher, 1993). It has been extensively used to account for the temporal and spatio-temporal structures of discourse (Lascarides & Asher, 1993; Bras & Asher, 1994; Asher *et al.*, 1995; Roussarie, 2000) as well as for presupposition (Asher & Lascarides, 1998). Since (Asher *et al.*, 1995) and (Asher & Lascarides, 1998), the semantics and structural effects of Background, in what can be called "standard SDRT", have somewhat changed, and the working hypotheses are the following (see (Asher & Lascarides, 2003)):

- Semantics: temporal overlap between the main eventualities of the two constituents;
- Structural nature: coordinating, i.e., an "horizontal" relation that "closes off" the left constituent, pushing forward the right-frontier;
- Other structural effects: requires a special kind of topic, a "Foreground-Background Pair"

In this paper, we reconsider these hypotheses at the light of the methodology for checking the structural nature of a discourse relation proposed in (Asher & Vieu, to appear). As a result, we propose a simpler account of Background that is also more faithful to the data. This new account has been used in (Prévot, 2004) for modelling route explanation dialogues, loaded with sequences describing landmarks in the background of the sequence giving the main instructions.

We assume the basics of SDRT and its language (as of (Asher & Lascarides, 2003)) are known.

2 One or two relations?

Background is actually two relations, even though it has often been treated as a single one. Both are triggered by an aspectual shift between the two clauses that are linked, as in (1) and (2).

(1)   Mary came home. It was pouring with rain.

(2)   It was pouring with rain. Mary came home.

The main one, called Background or $Background_1$ is triggered by an event followed by a state (1): if the main eventuality of the clause to be attached is a state, and that of the clause where to attach an event, then, by default, $Background_1$ holds. The intended meaning is that the first argument, the event clause, is the foreground, and the second, the stative clause, the background.

$$(?(\alpha, \beta, \lambda) \wedge event(\alpha) \wedge state(\beta)) > Background_1(\alpha, \beta, \lambda)$$

The other relation, called $Background_R$ or $Background_2$, is the dual or reverse one, triggered by a state followed by an event (2).

$$(?(\alpha, \beta, \lambda) \wedge state(\alpha) \wedge event(\beta)) > Background_2(\alpha, \beta, \lambda)$$

In the first version of SDRT, both premises were triggering the same relation, simply inversing the order of the arguments of the Background relation in the second case. This has been consid-

ered inappropriate since the attachment itself is encoded within discourse relations, that is, the order of the arguments of a discourse relation has to correspond to the order of the attachment.[1]

3   Semantics

Background$_{1/2}$ are veridical relations, that is, the conditions in the constituents they relate are taken to hold. The semantics of the relations themselves (the so-called semantics effects) is generally taken to be temporal overlap between the main eventualities of the foreground and the background; this is what is given in (Asher & Lascarides, 2003):

$$\phi_{Background1(\alpha,\beta)} \Rightarrow o(e_\beta, e_\alpha) \qquad\qquad \phi_{Background2(\alpha,\beta)} \Rightarrow o(e_\alpha, e_\beta)$$

This has been made more precise in several ways. For Background$_1$, (Asher *et al.*, 1995) takes into account the possible adverbials in β, which may "shift" the view point of the event in α, as in (3). However, it is well-known that, with an IP-adjunct temporal adverbial, the value of the French imparfait is not standard: it is a narrative imparfait with an inchoative value. This is why (Bras *et al.*, 2003) take (3) to be a Narration case rather than a Background.

(3)   Marie rentra à la maison. Dix minutes plus tard, il pleuvait. (Mary came home. Ten minutes later, it was raining.)

It has also been proposed in (Asher *et al.*, 1995) that the overlap relation must in fact be spatio-temporal to account for the fact that, in the examples above, it was not raining somewhere on earth, but in where Mary's home is.

Finally, one could make the temporal overlap itself more precise, pointing out at the fact that in Background$_1$ the focus is on the end of the event, i.e., the end of the event must be included in the state, while in Background$_2$, it is the start of the event which is included in the state.

We will not pursue any further these semantic considerations, as we want to focus on the behavior of Background with respect to the discourse structure.

4   Background within Discourse Structure

A simple route prescription[2] like (4) could be considered as presenting an alternation of Background$_1$ and Background$_2$. Actually, this is not an appropriate analysis. A simple "flat" structure in which $Background_1(\pi_1, \pi_2, \pi) \wedge Background_2(\pi_2, \pi_3, \pi) \wedge Background_1(\pi_3, \pi_4, \pi) \wedge Background_2(\pi_4, \pi_5, \pi)$ holds doesn't allow to recover the narrative sequence between events, as the constituents introducing them are not linked together by any relation. Fig.1 shows what such a flat structure would look like.[3]

(4)   You walk 30 meters.(π_1) There is a pedestrian crossing.(π_2) You cross the street.(π_3) There is a forking side street.(π_4) You take the right fork.(π_5) . . .

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[1]Note that this need has been acknowledged from the start in the case of the pair Result / Explanation.

[2]A similar point could be made with a narrative.

[3]We do not include the node of the overall SDRS on figures.

$$\pi_1 \xrightarrow{\quad Bckgd_1 \quad} \pi_2 \xrightarrow{\quad Bckgd_2 \quad} \pi_3 \xrightarrow{\quad Bckgd_1 \quad} \pi_4 \xrightarrow{\quad Bckgd_2 \quad} \pi_5$$
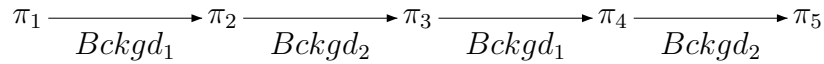
Figure 1: A "flat" structure for (4)

But since the beginning of SDRT, Background has been considered as a coordinating (i.e., non-subordinating) relation, and thus a priori inducing such a flat structure.

4.1 The Foreground-Background Pair

To overcome this problem, a more complex account has been proposed in (Asher *et al.*, 1995), and taken up in (Asher & Lascarides, 1998; Asher & Lascarides, 2003): two constituents related by any of the two Background relations are dominated by a (special kind of) topic, a "Foreground-Background Pair" or FBP. This new simple constituent duplicates the contents of both clauses, the main eventuality being the event (Roussarie, 2000). After a Background, a subsequent event clause may thus be attached by Narration to the open FBP node. In current standard SDRT, the structure of the SDRS for (4) is thus given on Fig.2.[4]
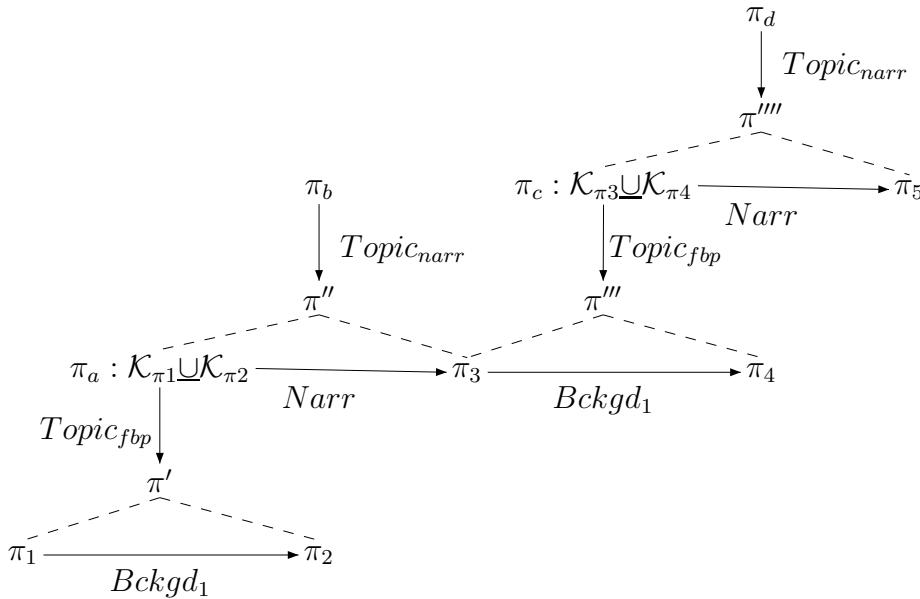
Figure 2: Graph of the (standard) SDRS of (4)

This mechanism was accompanied with a special update rule, to account for the possibility of a succession of several state clauses describing the same situation. Indeed, it had been observed that the FBP couldn't simply repeat the event clause and all state clauses, as the referents of the earlier state clauses weren't available for anaphora resolution. For example, in (5), π_{4a} is

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[4]One could object that this structure is wrong as *Continuing Discourse Patterns* is not respected for the attachment of π_4 to π_3. As it would make little sense to merge the narrative topic π_b with the FBP topic π_c, the only alternative solution would be to attach π_4 to π_b instead of π_3. This has the clear disadvantage of not letting the temporal overlap induced by the Background operate on the event in π_3, as intuition requires, but on the event "subsuming" (as specified by the narrative topic construction) that of π_1 and π_3.

difficult to interpret as *Ian entered the bar* because the bar is no longer available. Similarly, with the alternative (π_{4b}), the pronoun *it* can be resolved only with the fountain.

(5)   Ian reached a small square.(π_1) A bar stand at a corner.(π_2) There was a fountain in the middle.(π_3) ??Ian entered.(π_{4a}) / Ian got closer to it.(π_{4b})

The proposal consisted therefore in that, when attaching a new state clause to the same event clause by Background$_1$, and thus continuing the Background, the FBP topic had to be updated, substituting the contents of the previous state clause by that of the new state clause, as illustrated on Fig.3. The referents of the previous state clause were no longer available for pronouns in constituents attached to the FBP.
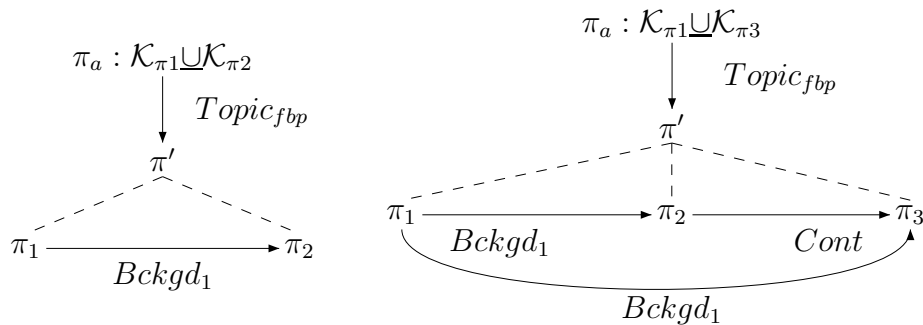

Figure 3: FBP update on (5)

4.2   The alternative: a subordinating relation

We propose to reconsider all this, simply dropping the initial assumption that Background$_1$ is coordinating. After all, the most accepted feature of coordinating relations as opposed to subordinating ones (see, e.g., (van Kuppevelt, 1995)), is that both arguments are on a par, i.e., there is no structural asymmetry between them; but acknowledging a foreground vs. background role amounts to recognizing such asymmetry. If taken to be subordinating, the structure of a little discourse consisting of two constituents linked with Background$_1$, like (1), would then be as on Fig.4. Following the methodology proposed in (Asher & Vieu, to appear), we now show that the grounds for introducing the rather complex FBP apparatus actually justify the subordinating nature of Background$_1$.
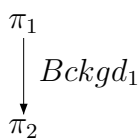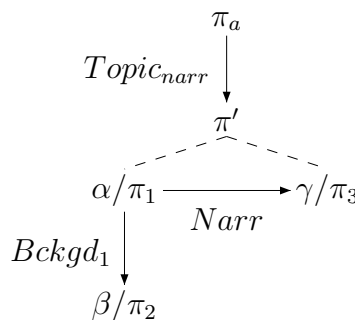

Figure 4: Subordinating Background$_1$
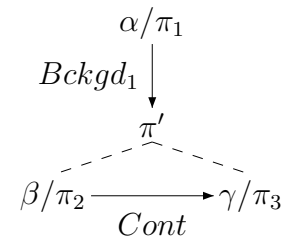
Figure 5: Attachment Test

Figure 6: Continuation Test

4.2.1 Testing the nature of Background$_1$

(Asher & Vieu, to appear) proposes a test in 4 parts to determine whether a given discourse relation is coordinating or subordinating, by default.[5] This test assumes $R_1(\alpha, \beta)$ is already established and considers the possible discourse extensions with a third constituent γ.

The Attachment Test: If you can attach some γ to α, then R_1 is Subord. If you can attach only to β, R_1 is Coord.
In (4), the need to attach π_3 to π_1 to recover the narrative sequence of events indicates a Subord case with this test, as seen on Fig. 5[6]

The Continuation Test: If you can introduce information γ that "continues" β in its relation to α, then R_1 is Subord, else it is Coord.
In (5), the continuation of the Background with π_3 points again to a Subord case(see Fig.6).

The Anaphora test: If for any γ attached to β no pronominal element in γ can be bound by referents in α, then R_1 is Coord. If some can, then R_1 is Subord.
This anaphora test on the following example shows again the Subord nature of Background$_1$: the pronoun "it" in π_3, attached to π_2 by Result (and Continuation as well), refers to the square.

(6)   Ian reached a square.(π_1) It had been raining for a week.(π_2) It was completely flooded.(π_3)

The last test, which we will not consider any further, amounts to checking the possibility that the relation co-occurs with either Narration (the Coord prototype) or Elaboration (the Subord prototype). Semantically, Background is incompatible with Narration, thus we wouldn't be able conclude to its coordinating nature with this test anyway.

All this suggests strongly that considering Background$_1$ as a subordinating relation fits well the SDRT notion of discourse structure, and, being much simpler, could be more appropriate than the FBP structure. Under this new perspective, the SDRS structure of (4) is now as on Fig.7.
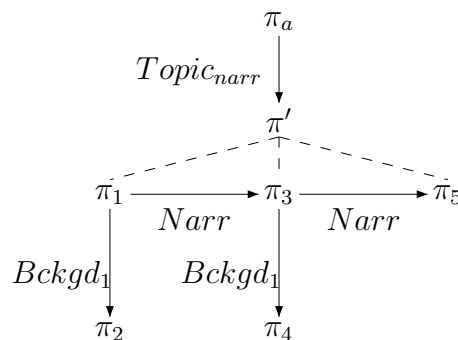

Figure 7: The proposed structure of the SDRS for (4)

Comparing Fig.7 with Fig.2, one can notice that the proposed solution has the advantage of

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[5]In (Asher & Vieu, to appear), it is shown that a specific use of punctuation and conjunctions between clauses can induce a change in the structural nature of a discourse relation. Here, we will not take this factor into account, and we will focus on the default case, that is, the case in which the clauses are all simple and separated by full stops.

[6]Obviously, the test does not take into consideration the use of a topic like the FBP, in which it is difficult to tell the difference between an attachment to the event constituent (here, π_1) and an attachment to the topic constituent (here, π_a).

keeping the linearity of the narrative structure clear, with a global narration topic, and without any *Continuing Discourse Pattern* infringement. We can also see on Fig.6 that it avoids the dubious attachment of π_3 to π_1 by Background$_1$ shown on Fig.3, for which an exception to the right-frontier rule had to be made. Thus, this new proposal satisfies in a more elegant way most of the structural requirements for Background that we have examined up to now. But there are two more aspects to consider.

4.2.2 Availability of the background referents

First, we need to account for the availability of a referent in the background clause from a subsequent event clause, e.g., in (4) "the forking street" in π_4 is the referent for "the right fork" in π_5, or in (7), taken from (Asher *et al.*, 1995), "a man" for the pronoun "him".[7]

(7)   Marie entra dans la librairie. Un homme lisait le journal près de la caisse. Elle s'approcha de lui. (Mary entered the bookshop. A man was reading the newspapers near the counter. She came up to him.)

In fact, the current SDRT definition of referent availability, based on the notion of right-frontier and described by the "look into the attachment node and the constituents (of the right frontier) that dominate it" rule, doesn't allow such anaphoric references. The FBP solution made it possible by duplicating all the conditions of the background in the FBP topic constituent. This "looking below" availability was recognized though as being ephemeral: the variation in (8) doesn't allow the pronominal anaphora any longer (as seen also earlier on (5)).

(8)   Marie entra dans la librairie. Un homme lisait le journal près de la caisse. La pièce était sombre et sordide. ?Elle s'approcha de lui. (Mary entered the bookshop. A man was reading the newspapers near the counter. The room was dark and gloomy. She came up to him.)

The ephemeral character of this kind of availability suggests a simple coordinating "flat" structure, but we have shown this to be problematic for several reasons. It also suggests that SDRT should somehow integrate into its definition of availability the focus stack of centering theory (Grosz *et al.*, 1995) and its notion of freshness of referents. As a first move into this direction, we propose to extend the availability rule "look into the attachment node and the constituents that dominate it" into "look into the last constituent, and look into the attachment node and the constituents that dominate it".

To be fully convincing, we should show that what we are allowing here is appropriate in other cases of subordinating relations. Let's consider an Elaboration, the prototype subordinating relation, on the following example:

(9)   a.   John experienced a shopping-therapy evening last night.(π_1)
        b.   He bought an expensive tuxedo.(π_2)
        c.   He booked a cruise to the caribbean.(π_3)
        d.   He ordered three cases of champagne.(π_4)
        e.   Early this morning, they've been delivered to him.(π_{5a})

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[7]The structure of (7) is, following our proposal, the one depicted on Fig.5.

e' ?Early this morning, the ticket has been delivered to him.(π_{5b})

e" #Early this morning, it has been delivered to him.(π_{5c})

f. He immediately went to tell everything to his doctor.(π_6)

It appears to be confirmed on this example that the referents of the earlier elaborating constituents (the cruise in π_3 or the tuxedo in π_2) are little (definite description involving a bridging anaphora) or not accessible from the pop up constituent (π_{5b} or π_{5c}). However the cases of champagne in π_4 seem to be perfectly accessible to the pronoun "they" in π_{5a}.

4.2.3 Topic coherence

The bulk of the analysis of presupposition in (Asher & Lascarides, 1998), based on a coordinating Background$_1$ with a FBP topic, can be all rewritten using a subordinating Background$_1$. There is one feature though that appears to be missing in our proposal: topic coherence, shown in (Asher & Lascarides, 1998) to be relevant for Background. The awkwardness of the example introduced in this work and reported in (10) shows that, in a null context, not any stative clause can serve as a background for a given foreground clause.

(10) ??Max smoked a cigarette. Mary had black hair.

(Asher & Lascarides, 1998) takes it to be the role of the FBP topic to guarantee this topic coherence, just as it happens with Narration. Even though the narrative topic still lacks a detailed account in SDRT, topic construction in standard SDRT uses a $\sqcup$ operator on the events of the two constituents linked by Narration that is supposed to fail if these events are not subsumable by a third not-too-generic event. For the FBP construction, no such mechanism has been proposed. The FBP conditions simply collects those of the foreground and those of the background.[8] As a result, the topic coherence supposed to be brought by the FBP construction remained virtual.

A subordinating Background does not trivially allow for the introduction of a topic, but it is anyway not obvious at all that this is required from a structural point of view (i.e., that the topic node is needed for subsequent attachments). The only way out seems to be adding a constraint on the foreground-background topic coherence within the semantics of the relation itself, without any structural modification. The alternative that may come to mind consists in enriching the triggering conditions (so that Background$_1$ wouldn't even fire in (10)), but in fact this is not an option. Indeed, the 'Glue Logic' which is taking care in SDRT of the construction process is only propositional, uses only the syntactic and some superficial semantic information available within the two clauses, and has a very limited access to inference mechanisms (Asher & Lascarides, 2003); this limitation is important for computational tractability and the corresponding cognitive plausibility. As a result, it is not possible at this stage to check the topic coherence, since this would, in the general case, require quite complex reasoning on lexical semantics and common-sense knowledge. In addition, eliminating so early the possibility of a Background$_1$, on the basis that there is no obvious topic coherence between the two clauses, would cut off any possibility to account for an existing coherence given by the discourse context.

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[8]Signaling the event of the foreground clause as being the main eventuality of the FBP (Roussarie, 2000).

5 Background$_2$

In the SDRT literature, Background$_2$ accounts for text beginnings like in (2) and (11).

(11)   a.   That morning, the sun was shining. Lea decided to go for a walk. She put on her trekking shoes.
        b.   That morning, the sun was shining. The spring atmosphere was very appealing. Lea decided to go for a walk. She put on her trekking shoes.

On such examples, it seems that considering this relation as simply coordinating, perhaps even without any topic, could be appropriate. Example (11-a) would thus have the structure depicted on Fig.8.[9] Accounting for the possibility that the background situation be described in several clauses, as in (11-b), requires however the introduction of a specific relation between two stative clauses. This relation, Description-Continuation, [10] requires the construction of a topic when it is not already explicit. In our case, the topic contents would consist of the global situation (a state) that is elaborated by the first two sentences. The structure of (11-b) is given on Fig.9.
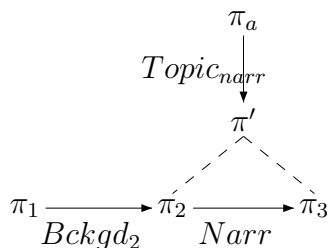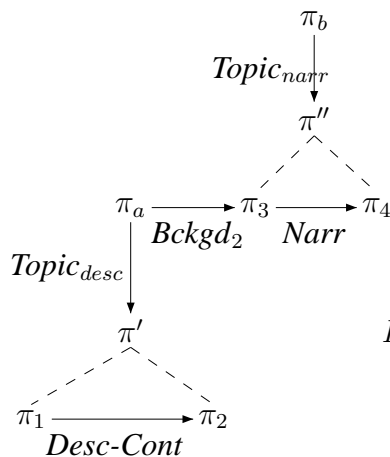
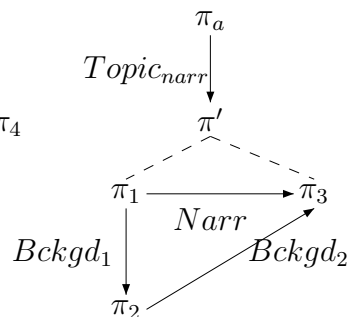Figure 8: Graph for (11-a)   Figure 9: Graph for (11-b)   Figure 10: Graph for the first 3 sentences of (4) with "oblique" attachment

Background$_2$ has not been used in the literature, nor in our proposal up to now, for texts like (4), in which all state constituents are already attached by a Background$_1$[11] to a previous event clause. However, this may appear inappropriate, as one clearly feels on this example that the state in π_2 serves as a background for both events in π_1 and π_3. Since the combined temporal semantic effects of Background$_1$ and Narration do not allow the entailment that e_2 and e_3 over-

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[9]It has often been claimed that progressive tenses (and the French imparfait) have an anaphoric value; our proposal for Background$_2$ doesn't do justice to this. Just as for (3), the anaphor in the first sentence of (11-a) should be solved with the time referent introduced by the adverbial, and not cataphorically by the event to come. Even in the first sentence of (2), without any explicit temporal anchor, one could consider that there in an implicit *temporal viewpoint* at which the state is going on. So, in some sense, there is already a Background$_1$ relation *within* the first clause of these two examples. We shall address this issue properly in further work on temporal *frames* in SDRT, since it is obvious that the scope of the temporal adverbial in (11-b) bears on the whole discourse.

[10]It already been introduced for the description of an entity which is not an eventuality (also called *entity-elaboration*) in several clauses (Prévot, 2004).

[11]Other relations for this attachment are possible; for instance Result, and not Background$_1$ (whose semantic effects are incompatible), holds in Hinrichs's famous example *Max turned off the light. The room was pitch dark.*

lap, we are tempted to propose a further modification[12] of SDRT, namely the possibility of an "oblique" attachment, as on Fig.10; the consequences of such a proposal should be investigated further, though.

6 Conclusion

We hope that this study has shed a new light on the nature of the Background relation, as well as on how to apply the methodology proposed in (Asher & Vieu, to appear) for assessing the structural nature of discourse relations.

Background$_2$, the role of frame adverbials in discourse, and "oblique" attachments still deserve more attention, but we leave refinements for a future paper.

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[12]To be precise, nothing in SDRTś last version forbids such a structure. As it is certainly not standard, we feel that it nevertheless deserves some attention. Note that the need for such a triangular structure had already been identified in (Bras *et al.*, 2003), with Narration + Contrast instead of Background$_2$ in a structure similar to Fig.10, on an example from Camus (La peste): *Mme Rieux détourna la tête vers la fenêtre. Le docteur se taisait. Puis il dit à sa mère de ne pas pleurer... (Mrs Rieux turned her head toward the window. The doctor remained silent. Then, he told his mother not to cry...)*