

FRENCH ADVERBIAL *Puis* BETWEEN TEMPORAL STRUCTURE AND DISCOURSE STRUCTURE¹

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1 INTRODUCTION

It has been shown in the literature that tense, aspect and world knowledge (also called common or shared knowledge) all play a role in determining the global temporal structure of a text as well as its discourse structure (Caenepeel and Moens, 1994; Kamp and Rohrer, 1983; Lascarides and Asher, 1993). In this paper we focus on the role of the French connective *puis* (then, afterwards) and its intersentential semantics. The objective is to give an account of the way this temporal connective interacts with discourse relations and thus bring a new contribution to the

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study of the interaction between temporal structure, i.e., the eventualities described by a text and the temporal relations between them (a is before b, a overlaps b...), and discourse structure, i.e., the segmentation of the text and the rhetorical relations between the segments (Narration, Background...).

We are concerned with cases in which *puis* is used to connect two *passé simple* sentences. This can be considered as the standard case, at least within a corpus of classical literary narrative texts. The interaction between temporal structure and discourse structure will be analyzed in the framework of Segmented Discourse Representation Theory, known as SDRT (Asher, 1993, 1996; Lascarides and Asher, 1993). SDRT is a theory of the semantics/pragmatics interface that extends DRT, taking into account discourse structure explicitly. As for any new linguistic study within a theoretical framework under development, we hope the analysis of *puis* within SDRT will be the occasion to put this theory to the test and possibly extract new requirements or suggestions for updating it.

In this paper, we first give a brief description of *puis* and present the scope of our study (Section 2). We next examine some data that motivate the investigation of the role *puis* plays within the discourse structure (Section 3). Then we present SDRT and the discourse relations we use in our analysis (Section 4). After that, we tackle the linguistic facts in all their complexity, examining how *puis* agrees or disagrees with different discourse relations (Sections 5 and 6). We finally conclude with some general ideas for further research.

2 SCOPE OF THE STUDY

Puis is a sentence adverb that is generally translated in English by *then* or *afterwards*. *Puis* can also be translated by *next* and by *besides* in some cases, as we will see below in some examples. However, the behavior of all these adverbs does not always match in both languages. In particular, *then* has other meanings corresponding to *alors* or *à ce moment-là* in French (see the work of Glasbey (1993) and of Thompson (1999) on *then* in English).

2.1 Syntax of *puis*

We consider that *puis* behaves, in the syntactical structure of the sentence, as a sentence adverb and not as a temporal modifier. In order to sustain this hypothesis, we use the classical test according to which it is impossible to extract a sentence adverb in a cleft construction:

- (1) a. *Nous avons commencé à discuter calmement. Puis les choses se sont gâtées.*
We began to chat serenely. Then things went wrong.
- b. *Nous avons commencé à discuter calmement. *C'est puis que les choses se sont gâtées.*
We began to chat serenely. It is then that things went wrong.

As a matter of fact, *puis* may not appear in a cleft construction, and in addition, its position may not be changed inside the sentence: it always appears at the beginning of the sentence or clause²—which nevertheless has not always been the case in a diachronic point of view (up to the 16th century, *puis* could have different places in the sentence).

Among sentence adverbs, there is an additional distinction between conjuncts and disjuncts (see (Greenbaum, 1969) and (Molinier, 1990, p. 30)).

The first category gathers adverbs that may not appear in the first sentence of a discourse, or, more specifically, adverbs that require the existence of a preceding context with which a connection is established. *Puis* clearly falls in this category of conjunctive adverbs (Mélis, 1983, p. 156). Conjunctive adverbs are also distinguished from disjunctive adverbs by their inability to be used as an answer to a yes / no question: such a criterion is used by Hansen (1995, p. 34–35) to classify *puis* among conjuncts. Thus, when we look at *puis* as a conjunct, we follow both Mélis (1983) and Hansen (1995). Let us add that underlying the conjunctive characteristic of *puis*, each of both authors is led to show that *puis* is very close to true coordination conjuncts (but we will not present here the arguments developed, in particular, by Hansen (1995, p. 36–37)).

2.2 Semantics

The basic meaning of *puis* is temporal succession as indicated in (Grevisse, 1993; Robert, 1994):

- (2) *Dieu nous prête un moment les prés et les fontaines [...] Puis il nous les retire. Il souffle notre flamme.* (Hugo, *les Rayons et les Ombres*, quoted by Robert (1994))

Succession can take a spatio-temporal dimension, thus expressing “succession from the point of view of an observer” according to Robert (1994):

- (3) *La grotte disparaissait sous l'assaut des feuillages. En bas, des rangées de roses trémières semblaient barrer l'entrée d'une grille de fleurs rouges, jaunes, mauves, blanches, dont les bâtons se noyaient dans les orties colossales [...] Puis, c'était un élan prodigieux, grimpant en quelques bonds : les jasmins, étoilés de leurs fleurs suaves; les glycines*

²We ignore the cases in which *puis* links two NPs or adjectives in enumerations.

aux feuilles de dentelle tendre; les lierres épais, découpés comme de la tôle vernie; les chèvrefeuilles souples, criblés de leurs brins de corail pâle; les clématites amoureuses, allongeant les bras, pomponnées d'aigrettes blanches. (Zola, *la Faute de l'abbé Mouret*)

According to Grevisse (1993), the notion of temporal succession can disappear and give place to a simple “logical succession”. This is when *puis* is translated in English by *besides* or *moreover*:

- (4) *On trouvait à Yonville qu'il avait des manières comme il faut. Il écoutait raisonner les gens mûrs [...] Puis il possédaient des talents.* (Flaubert, *Madame Bovary*, quoted by Grevisse (1993))

This meaning of *puis* is also described in (Robert, 1994), but only when it is used with *et* (*and*) in *et puis* (although the following examples that we have taken from our corpus illustrate the use of *puis* alone), as adding a new element in an enumeration:

- (5) *Et je voyais qu'il s'était baissé, puis qu'il riait, puis qu'il avait une drôle de pose et qu'il reniflait fort.* (Giono, *Un de Baumugnes*)

or, a new argument in a line of reasoning:

- (6) *Mais Aristide protesta. La république était une grande idée. Puis les insurgés pouvaient l'emporter.* (Zola, *La fortune des Rougons*)

Let us note, following Hansen (1995), that the function of *puis* in spoken French has progressively evolved from the basic temporal value to enumerative and argumentative values. French lexicographers, diachronic studies, as well as our own point of view, disagree with the position taken by Reyle (1999). In that work, it is argued that *puis* is basically a marker of enumerations and that temporal order is only a particular case of enumeration, inferred by default in narrative contexts. The given justification does not convince us, because of a decisive fact: when *puis* relates two clauses describing past events, as is the case when the French *passé simple* tense is used, it is just impossible for the events to have occurred in reverse order or simultaneously.³ Moreover, as we will see in Section 5.4, there are cases in which *puis* is the only element able to give the existing narrative reading. We thus assert that the basic meaning of *puis* is indeed temporal succession.

³The use of *et puis* is not so constrained.

2.3 Corpus and delimitation

Our data come from a corpus of ‘pieces’ of written texts from the French literature (over 1000 pieces of texts). These are the result of several requests to the Frantext database (and some additional personal research). We wanted to restrict the genre of texts to be studied to narrative, so we selected pieces of texts including sentences conjugated in *passé simple* (PS) and *imparfait* (IMP) and of course including *puis*. When necessary, we have added made-up examples.

In this paper, we focus on the standard case *S1-PS puis S2-PS*. The other cases, in which *puis* interacts with an IMP sentence, are studied in (Bras et al., 2001a). We not only consider the cases in which *puis* connects one sentence with the next in the textual order but also the cases in which *puis* links two discourse segments within a more complex discourse structure.

We set aside *et puis* whose argumentative value is particularly salient and necessitates specific studies.⁴ Since we restrict the study to PS sentences, as noted above, *puis* always has a temporal value in the cases we examine. Although this meaning may be combined with an enumerative or argumentative value, we will deliberately ignore these aspects. We also leave examples such as (3) in the previous section apart. They might be easily dealt with considering the perception events associated with the description.

3 PRELIMINARY OBSERVATIONS

It is almost a tautology to point out that *puis*—in its temporal sense—temporally connects two clauses, or, more generally, two discourse segments. Thus its role with respect to the temporal structure of a text is in no doubt. When it comes to its role within the discourse structure, the matter is *a priori* less obvious, even though it might have been taken for granted in (Asher, 1996; Bras and Asher, 1994).

In a classical dynamic semantics framework adopting a Davidsonian approach⁵, like DRT, there are two possible ways to deal with the semantic contribution of an anaphoric sentence adverbial indicating temporal succession:

- 1- the adverb introduces a temporal referent t localizing the main eventuality e_P of the clause, this time t being situated after some other temporal referent x , anaphorically referred to (typically, but not necessarily, the main eventuality of the previous clause). In a composi-

⁴In what follows, it is assumed that the analysis proposed for *puis* will **not** be used in a compositional way to derive the meaning of *et puis*.

⁵That is, in which eventualities are reified. Such a framework therefore uses two kinds of temporal referents, times and eventualities.

tion framework based on lambda-calculus, this semantic contribution is roughly

$$\lambda P [t x | P \wedge time(t) \wedge (e_P \sqsubseteq t \vee t \sqsubseteq e_P) \wedge x =? \wedge x \prec t],$$

where \sqsubseteq denotes temporal inclusion and \prec temporal precedence;

- 2- the adverb directly introduces a temporal relation of succession between the main eventuality e_P and some temporal referent x , anaphorically referred to. Roughly:

$$\lambda P [x | P \wedge x =? \wedge x \prec e_P].$$

In a dynamic semantic framework making use of discourse relations, like SDRT, a third possibility can be envisaged:

- 3- the adverb does not contribute to the semantic contents of the clause itself; it is a marker of some discourse relation, and this relation—say, *Narration*—implies, among other things, a temporal succession between the main eventualities of the two clauses it links.

It has been argued that the semantic contribution of what we will call ‘regular’ temporal adverbials expressing temporal succession, like *le lendemain* (*the day after*), *un peu plus tard* (*a little later*) or *peu après* (*shortly after*) is of one of the first two types (Asher et al., 2001a; de Swart, 1999; Johnston, 1994; Kamp and Reyle, 1993).⁶ As far as *puis* is concerned, let us first observe that its syntactic characteristic of conjunct distinguishes it from such regular temporal adverbials (cf. the cleft construction test seen above).⁷ Semantically speaking, it is easy to check that *puis* is unable to introduce a time referent, so we can discard the first hypothesis. This fact is revealed by contexts requiring a temporal referent to be overlapped with, for instance, the French IMP tense. This tense, in its standard use, is taken to be anaphoric by some authors (Molendijk, 1990; Vet, 1980). Example (7-a), taken from (Kamp and Rohrer, 1983), can be considered as an example of standard IMP.⁸ (7) shows that *puis* and regular temporal adverbials do indeed behave differently in such a context: *peu après*, *un moment après* or *un quart d’heure plus tard*, but not *puis*, are able to provide the temporal referent the standard IMP requires. (8) is a case of the so-called ‘narrative’ IMP, which also requires for its first occurrence a temporal anchor, provided by *peu après* but not by *puis*:⁹

⁶It is claimed in (Asher et al., 2001a) that adverbials involving a locative NP and introducing a temporal frame, like *le lendemain*, are of the first type, whereas the others are of the second type. When the latter ones involve a durative NP, though, like in *deux minutes plus tard* (*two minutes later*), contexts such as that of (7) below are able to coerce the introduction of a time referent, and therefore transform a type-2 adverbial into a type-1 one.

⁷Our own position on the classification of *puis* among temporal adverbials has changed since (Asher et al., 1995).

⁸See (Gosselin, 1999) for a similar example where the V-IMP may be paraphrased by *être-IMP en train de V-INF*.

⁹For a more detailed study of *puis* with the IMP tense, see (Bras et al., 2001a).

- (7) a. *Le docteur entra chez lui et vit sa femme debout. Il lui sourit. Un moment après elle pleurait.*
The doctor entered his house and saw his wife standing up. He smiled at her. A moment later, she was crying.
- b. *Il lui sourit. Un quart d'heure plus tard elle pleurait.*
He smiled at her. 15 minutes later, she was crying.
- c. *Il lui sourit. *Puis elle pleurait.*
He smiled at her. Then she was crying.
- (8) a. *Pierre déclara d'abord que ce livre ne l'intéressait pas. Peu après, il le recommandait chaudement à tous ses amis.*
Pierre first declared that this book was of no interest to him. Shortly after, he was heartily recommending it to all his friends.
- b. *Pierre déclara d'abord que ce livre ne l'intéressait pas. ?Puis, il le recommandait chaudement à tous ses amis.*
Pierre first declared that this book was of no interest to him. Then, he was heartily recommending it to all his friends.

To be able to tell whether *puis* is of the second or the third type with a similarly decisive test, we would first need to consider in detail candidate discourse relations. However, several more general considerations already constitute strong indications that *puis* is a rhetorical marker, i.e., of the third kind.

First, a semantics at the rhetorical level would indeed match the syntactic status of conjunctive adverb which indicates a linking function between sentences.¹⁰

Next, we can see that with hypothesis 2 in which *puis* is just a temporal marker, it would simply be redundant in contexts in which the temporal order can already be inferred from other explicit linguistic clues. For instance, in (9-a), since we assume that the contribution of *peu après* (with either hypothesis 1 or 2) implies the ordering between the two eventualities, *puis* would be unnecessary. Indeed, the reading obtained in (9-b) is quite similar.¹¹ This redundancy can be questioned, not only because the author has made use of it, but also because it does not give the repetition impression that, for example, (9-c) gives.

- (9) a. *Azarius l'entendit qui enjoignait à l'enfant de dormir. Puis, peu après, il la vit qui le surveillait, appuyée au chambranle de la porte.* (Roy, Bonheur d'occasion)
- b. *Azarius l'entendit qui enjoignait à l'enfant de dormir. Peu après, il la vit qui le surveillait, appuyée au chambranle de la porte.*

¹⁰A similar argument is exploited in (Gómez Txurruga, 2000) to deal with the connective *and*.

¹¹There are nevertheless some differences: see Section 5.3 below.

- c. *Azarius l'entendit qui enjoignait à l'enfant de dormir. ?Un peu plus tard, peu après, il la vit qui le surveillait, appuyée au chambranle de la porte.*

Third, in the same contexts and with hypothesis 2, *puis* could be removed as we have just seen, but also added. Let us examine if this is an acceptable operation. In some examples, *puis* can indeed be added without changing the semantics, as in the made-up example (10) or the corpus example (11):

- (10) a. *Ce jour-là, Marie écrivit une lettre ; elle alla la poster au village voisin.*
On that day, Marie wrote a letter; she went to the next village to post it.
- b. *Ce jour-là, Marie écrivit une lettre ; puis elle alla la poster au village voisin.*
On that day, Marie wrote a letter; then she went to the next village to post it.
- (11) a. *Elle lui proposa d'aller voir sa soeur, à Trouville. Félicité répondit, par un geste, qu'elle n'en avait pas besoin. Il y eut un silence. Le bonhomme Liébard jugea convenable de se retirer.* (Flaubert, *Un cœur simple*)
- b. *Félicité répondit, par un geste, qu'elle n'en avait pas besoin. Puis il y eut un silence.*
- c. *Il y eut un silence. Puis le bonhomme Liébard jugea convenable de se retirer.*

But there are cases in which this seems difficult if not impossible. (12-a) shows that *puis* cannot be inserted between the first and the second sentence of (11-a), even though they are temporally ordered in the same way as the subsequent sentences. The same occurs in (13), a made-up example. Notice in (12-b) that this is not the case with a regular temporal adverbial.

- (12) a. *Elle lui proposa d'aller voir sa soeur, à Trouville. *Puis Félicité répondit, par un geste, qu'elle n'en avait pas besoin.*
- b. *Elle lui proposa d'aller voir sa soeur, à Trouville. Tout de suite après, Félicité répondit, par un geste, qu'elle n'en avait pas besoin.*
- (13) a. *L'acide tomba dans le liquide. Le mélange réagit en explosant.*
The acid fell into the liquid. The mixture reacted by exploding.
- b. *L'acide tomba dans le liquide. * Puis le mélange réagit en explosant.*
The acid fell into the liquid. Then the mixture reacted by exploding.

Discourse analysis makes the difference between these last two examples and the previous ones. Even though authors do not always agree on their names, they agree on the fact that different discourse relations (rhetorical links) are involved. The whole of (11-a) involves the *Narration* relation between its clauses, i.e., the description in sequence of successive events 'of the same story'. Examples (12) and (13) crucially involve, in addition, a causal link between two

events and can be assumed to be cases of the *Response* and *Result* relations. We are thus inclined to believe that, among discourse relations implying successive events, *puis* is compatible with some but not all of them.

The previous observations, together with the necessity to account for differences in behavior when different discourse relations hold, make a strictly temporal interpretation of *puis* seriously questionable, and lead us to consider hypothesis 3 as the most plausible. We thus undertake the analysis of *puis* within the framework of a theory of discourse structure and discourse relations. We have chosen SDRT for its effective methodology in investigating and formalizing how different linguistic clues interact at the semantic/pragmatic interface to recover the discourse structure of a text.

4 FRAMEWORK: SDRT

SDRT is a non trivial extension of DRT that takes discourse structure into account and offers a theory of the semantics/pragmatics interface. In this section, we will only give a brief outline of SDRT. The reader is invited to refer to (Asher, 1993, 1996; Busquets et al., 2001; Lascarides and Asher, 1993) for a thorough presentation.

4.1 SDRS

In SDRT a discourse is represented by an SDRS. An SDRS is a recursive structure consisting of elementary DRSS (i.e., DRSS representing a single clause) and sub-SDRSSs linked together by discourse relations, such as Narration, Elaboration, Background, Continuation, Result, Contrast and Explanation. These elementary DRSSs and the sub-SDRSSs corresponding to complex discourse segments are the *constituents* of the SDRS representing the discourse. We use Greek letters as variables for constituents, and K_i as constants.¹²

SDRSSs are built up incrementally. SDRT defines a “Glue Logic” and an “Update Function” that together determine a new SDRS for a given SDRS τ representing the context (the discourse already processed), and a new constituent α representing the information to be integrated into that context. The Glue Logic is the part of the theory modeling the semantics-pragmatics interface. It is embedded in the framework of “Commonsense Entailment” (Asher and Morreau, 1991), a

¹²We are neglecting here an important element of SDRSS, namely the *labels* that make the distinction between different occurrences of the same constituent possible, while representing speech acts to some extent. Discourse relations actually link *labelled* DRSSs and SDRSSs, not just the bare constituents.

logic that exploits both monotonic (\rightarrow) and nonmonotonic ($>$)¹³ conditionals. This Glue Logic is specified by:

- definitions characterizing which constituents in τ are open for attaching α ,
- axioms detailing what discourse relations may be inferred, on the basis of a variety of linguistic and common knowledge clues, in order to actualize the attachment of α to some open constituent of τ ,
- axioms specifying the semantic effects of those discourse relations.

We will see some of these two kinds of axioms below. The Update Function is in charge of the proper hierarchization of the structure and of the resolution of the possibly existing under-specifications (e.g., anaphora and ellipses).

4.2 Discourse Relations

In the following, we only present the discourse relations used in SDRT that are particularly helpful to analyze our data: Narration, Result (and its inverse Explanation), Elaboration and Contrast.

Building on previous work on discourse relations (among which are (Hobbs, 1985) and (Polanyi, 1988)), SDRT distinguishes coordinating relations from subordinating ones, Explanation and Elaboration being subordinating, Narration, Result and Contrast coordinating. Only subordinating relations may introduce complex SDRSS, in other words, the Update Function may gather several SDRSS into a new complex SDRS only if these constituents are attached to the same site with the same subordinating relation. One more aspect of SDRT that is worth emphasizing at this point is that several discourse relations may simultaneously link the same two constituents, departing from other discourse approaches, notably RST (Mann and Thompson, 1987).

Narration. Narration is a relation which is based on the Gricean pragmatic constraint “be orderly”. When two clauses are linked by Narration, they describe in their order of occurrence two successive events ‘of the same story’.

Let us first see more precisely what the semantics effects of Narration on discourse content are. Building on the previous analyses of Lascarides and Asher (1993), we showed in (Asher

¹³ $\phi > \psi$ means “if ϕ then normally ψ ”. From $\phi > \psi$ and ϕ , Commonsense Entailment (CE) entails ψ ‘by default’, that is, defeasibly, in the absence of further information regarding the truth value of ψ . From $\phi > \psi$, ϕ and $\neg\psi$, CE no longer entails ψ , but $\neg\psi$. From $\phi > \psi$, $\zeta > \neg\psi$, $\phi \rightarrow \zeta$, ϕ and ζ , ψ (and not $\neg\psi$) is inferred (Penguin principle). From $\phi > \psi$, $\zeta > \neg\psi$, ϕ and ζ , if ϕ and ζ are logically independent, CE cannot conclude ψ nor $\neg\psi$ (Nixon Diamond).

et al., 1995) that a relation of Narration between two constituents α and β entails a temporal overlap (noted \circ) between the resulting state of the main eventuality of α (noted e_α ¹⁴), $post(e_\alpha)$, and the preceding state of e_β , $pre(e_\beta)$, in the absence of regular locating adverbials. This is what axiom (A1) expresses:

$$\mathbf{A\ 1} \quad Narration(\alpha, \beta) \rightarrow post(e_\alpha) \circ pre(e_\beta)$$

(A1) aims at capturing the fact that narratives must cohere in the sense that the events linked together by Narration must fit consistently and without significant spatio-temporal gaps, as expressed in (Asher, 1996) and observed in earlier work on temporal order in narratives (see, e.g., Caenepeel, 1989). From (A1) and uncontroversial ordering assumptions on eventualities and their pre- and post-states¹⁵, we can deduce a relation of temporal precedence between the eventualities e_α and e_β : $e_\alpha \prec e_\beta$. Actually, to fully capture the ‘no-significant-gap’ constraint, a temporal overlap is too weak. As we will see in Section 5.3, we should guarantee that $post(e_\alpha)$ persists (at least) up to the beginning of e_β , and, conversely, that $pre(e_\beta)$ starts when (or before) e_α ends. So we propose here an improved version of (A1), where \supset denotes the temporal abutment relation and \sqcap the ‘intersection’ operator¹⁶:

$$\mathbf{A\ 2} \quad Narration(\alpha, \beta) \rightarrow e_\alpha \supset (post(e_\alpha) \sqcap pre(e_\beta)) \supset e_\beta$$

Narration has another semantic effect. It is motivated by the intuition that the elements of a Narration must belong to the ‘same story’, i.e., they must have some common subject matter. To this effect, axiom (A3) expresses that the constituents connected together by Narration must have a common *Topic*.

$$\mathbf{A\ 3} \quad Narration(\alpha, \beta) \rightarrow \exists \gamma (Contingent(\gamma) \wedge \gamma \Downarrow \alpha \wedge \gamma \Downarrow \beta)$$

where \Downarrow is a subordinating discourse relation whose semantics essentially involves subsumption.

A topic is a simple constituent which is contingent (i.e., not vacuous, not contradictory, not tautological), and subsumes the constituents of a sub-SDRS, in this case, the constituents linked by Narration. If not already present in the context, it has to be added to the SDRS during the update. (A3) and the rules of the underlying logic actually imply that Narration can be non-monotonically inferred only if such a topic exists or can be built.

¹⁴As regards the ontology of eventualities, SDRT keeps building on DRT, and assumes the same Davidsonian approach. Two basic aspectual classes are distinguished among eventualities: events and states. Following Kamp and Rohrer (1983), SDRT assumes that IMP sentences introduce state referents and that PS sentences introduce event referents.

¹⁵ $Event(e) \rightarrow pre(e) \supset e \supset post(e)$, where \supset denotes temporal abutment, as used in DRT, or the ‘meets’ relation as used in Allen’s theory (Allen, 1984).

¹⁶We assume that $s1 \sqcap s2$, when applicable, yields a new state lasting the maximum interval of time during which both $s1$ and $s2$ hold, and whose propositional contents is the conjunction of $s1$ and $s2$ ’s propositional contents.

Now, how do we infer Narration? Since (Lascarides and Asher, 1993), the triggering axioms for Narration have changed to reflect the fact that Narration is not always a default in narratives (Asher, 1996). It is inferred only if no other relation can be triggered, that is, if in the discourse there are no clues that other axioms could exploit to infer other discourse relations:

A 4 $(\langle \tau, \alpha, \beta \rangle \wedge \neg \text{Clues_}R_1(\tau, \alpha, \beta) \wedge \neg \text{Clues_}R_2(\tau, \alpha, \beta) \wedge \dots \wedge \neg \text{Clues_}R_n(\tau, \alpha, \beta)) > \text{Narration}(\alpha, \beta)$

where $\langle \tau, \alpha, \beta \rangle$ means that β is to be attached to α in the SDRS τ , $R_1 \dots R_n$ are all the discourse relations used in SDRT¹⁷ but Narration, and $\text{Clues_}R_i(\tau, \alpha, \beta)$ holds whenever the propositional content of α and β and the discourse structure of τ contain clues that could be exploited for inferring $R_i(\alpha, \beta)$.

In addition, Narration can be nonmonotonically inferred if the predicate *Occasion* holds between the clauses to be related:

A 5 $(\langle \tau, \alpha, \beta \rangle \wedge \text{Occasion}(\alpha, \beta)) > \text{Narration}(\alpha, \beta)$

Occasion holds if the two clauses contain clues indicating that their main eventualities are of types that may belong to ‘the same story’. In other words, *Occasion* exploits lexical semantics and shared knowledge in terms of scripts connecting certain event types in sequences in which one event ‘naturally’ leads to the next. For instance, (14) is an example of Narration in which *Occasion* holds (in addition to the use of *puis*), since there is clearly in the shared knowledge a script in which, before entering, people knock at the door.

- (14) *Justin frappa à la porte. Il entra.*
Justin knocked at the door. He entered.

We can assume this kind of script to be encoded in the following axiom schema:

A 6 $(\langle \tau, \alpha, \beta \rangle \wedge [\text{knock}(e_\alpha, x, y) \wedge \text{door-of}(y, z)]\alpha \wedge [\text{enter}(e_\beta, x, z)]\beta) \rightarrow \text{Occasion}(\alpha, \beta)$

where $[\phi]\alpha$ means that the condition ϕ appears in the constituent α .

In this case, the sequence of events is only typical, i.e., ‘natural’: knocking is not a necessary precondition to enter, and it does not cause the entering. Obviously, stronger dependence links between event types like ‘being a precondition of’ and ‘causing’ also give rise to *Occasion* (and usually, by nonmonotonic inference, *Narration*), but some of them are also exploited to infer more specific discourse relations, like the next one, *Result*.

¹⁷SDRT explicitly states that there should be a finite set of discourse relations, even though what these are precisely is not yet settled. For the purposes of the present work, we restrict ourselves to: *Narration*, *Background*, *Elaboration*, *Continuation*, \Downarrow (i.e., ‘Topic’), *Result*, *Explanation*, *Contrast* and *Parallel*, for which an SDRT account can be found in the literature.

Result. A Result relation between constituents α and β represents the narrator's intention to signify that β is a result of α . It has the semantic effect of implying a causal link between the main eventualities¹⁸ of the constituents it relates:

$$\mathbf{A\ 7} \text{ Result}(\alpha, \beta) \rightarrow \text{Cause}(e_\alpha, e_\beta)$$

The predicate $\text{Cause}(e_1, e_2)$, that can be glossed with e_1 causes e_2 , implies, among other things, that if e_1 and e_2 are events¹⁹, the first temporally precedes the second:

$$\mathbf{A\ 8} (\text{Cause}(e_1, e_2) \wedge \text{Event}(e_1)) \rightarrow e_1 \prec e_2$$

Result may be monotonically inferred on the basis of the presence in β of an explicit marker of causation as e.g., the conjunct *donc* (*therefore*) or the adverbial *en conséquence* (*as a consequence*):

$$\mathbf{A\ 9} (\langle \tau, \alpha, \beta \rangle \wedge [\text{donc}]\beta) \rightarrow \text{Result}(\alpha, \beta)$$

Result can also be nonmonotonically inferred on the basis of lexical semantics and shared knowledge on the types of eventualities in α and β , as in the following two famous examples from (Lascarides and Asher, 1991) and (Hinrichs, 1981):

(15) *John pushed Max. He fell.*

(16) *Paul éteignit la lumière. Il faisait nuit noire autour de lui.*

In (15) and (16), it is again generic script-like information on pushing and falling event types, and on switching off the light event types and being dark state types that enables the reader to recover the causal links that the narrator most likely wants to express. The presence of such clues indicating a possible causal link is expressed by the predicate *D-Permissible-Cause*. For instance, we assume that the following axiom schema encodes a plausible piece of shared knowledge:

$$\mathbf{A\ 10} (\langle \tau, \alpha, \beta \rangle \wedge [\text{push}(e_\alpha, x, y)]\alpha \wedge [\text{fall}(e_\beta, y)]\beta) \rightarrow \text{D-Permissible-Cause}(\alpha, \beta)$$

which is in turn exploited by axiom (A11) to infer Result:

$$\mathbf{A\ 11} (\langle \tau, \alpha, \beta \rangle \wedge \text{D-Permissible-Cause}(\alpha, \beta)) > \text{Result}(\alpha, \beta)$$

The classical version of example (15) actually is (Lascarides and Asher, 1991):

¹⁸This axiom corresponds to the regular case when the two constituents do describe eventualities. When one (or both of them) is a fact, causality bears on the constituent itself. We do not give the full axiom here because we are interested in temporal phenomena, and therefore, eventualities.

¹⁹This holds too when e_1 is an event and e_2 a state, but when e_1 is a state, it can persist while the eventuality e_2 occurs. It must be noted here too that we assume \supset to be a special case of \prec .

(17) *Max fell. John pushed him.*

and illustrates Explanation, Result's inverse relation. This relation is triggered by the symmetric axiom:

A 12 $(\langle \tau, \alpha, \beta \rangle \wedge D\text{-Permissible-Cause}(\beta, \alpha)) > \text{Explanation}(\alpha, \beta)$

and has symmetric semantic effects:

A 13 $\text{Explanation}(\alpha, \beta) \rightarrow \text{Cause}(e_\beta, e_\alpha)$

Elaboration. Elaboration is one of the main subordinating discourse relations, i.e., a relation that may introduce a complex constituent, a sub-SDRS. A famous example of Elaboration was given in (Kamp and Rohrer, 1983):

(18) *[L'été de cette année-là vit plusieurs changements dans la vie de nos héros.]S1 [François épousa Adèle,]S2 [Jean-Louis partit pour le Brésil]S3 [et Paul s'acheta une maison à la campagne.]S4*

In (18), the first sentence is *elaborated* by the clauses of the second sentence. S1 can be seen as an explicit topic for each of the changes described in the following clauses. Between K_1 , the constituent representing S1, and each of K_2 , K_3 and K_4 , we have an Elaboration relation. Between K_2 and K_3 , and K_3 and K_4 , we have a Continuation relation. Continuation is a rather weak discourse relation. It merely records that all the constituents of a sub-SDRS connected to a constituent by a subordinating relation are siblings. It has no temporal effects. Elaboration, on the other hand, implies that the main eventuality of each elaborating clause is part of that of the elaborated clause, which in turn implies that there is a temporal inclusion between them:

A 14 $\text{Elaboration}(\alpha, \beta) \rightarrow \text{Proper-Part-of}(e_\beta, e_\alpha)$

A 15 $\text{Proper-Part-of}(e_1, e_2) \rightarrow e_1 \subset e_2$

Elaboration is triggered by the lexical semantics of the event predicates (verbs or nouns) involved, or by some piece of shared knowledge expressing that typically a certain event type is a subtype of another event type. In example (18), lexical semantics alone should tell us that marryings, leavings, and buyings are changes. The predicate *D-Permissible-Subtype* gathers all these clues enabling Elaboration to be nonmonotonically inferred:

A 16 $(\langle \tau, \alpha, \beta \rangle \wedge D\text{-Permissible-Subtype}(\alpha, \beta)) > \text{Elaboration}(\alpha, \beta)$

Contrast. Contrast is a structural relation, as it is usually triggered by a partial isomorphism on the syntactic trees of the two constituents and the presence of contrasting themes²⁰ (see (Asher, 1993) and (Asher et al., 2001b)):

$$\mathbf{A\ 17} \quad (\langle \tau, \alpha, \beta \rangle \wedge \text{Structurally-similar}(\alpha, \beta) \wedge \text{Contrasting-themes}(\alpha, \beta)) > \text{Contrast}(\alpha, \beta)$$

It can also be monotonically inferred by the sole presence of an explicit marker of contrast like *but* in English or *mais* in French:

$$\mathbf{A\ 18} \quad (\langle \tau, \alpha, \beta \rangle \wedge [\textit{mais}]\beta) \rightarrow \text{Contrast}(\alpha, \beta)$$

Here is an example taken from (Asher, 1996):

- (19) *As-tu acheté le livre? Oui, je l'ai acheté, mais je l'ai prêté.*
Did you buy the book? Yes, I did, but I have lent it.

On the semantic side, $\text{Contrast}(\alpha, \beta)$ implies that α and β have incompatible implicatures, i.e., that from the propositional content of α one can derive a fact whose negation can be derived from the propositional content of β . Contrast has no temporal effects. Thus it is, in particular, compatible with Narration. In (19), we have Contrast together with Narration²¹.

5 *Puis* AND COMPATIBLE DISCOURSE RELATIONS

One of the hypotheses present in the literature is that *puis* is an explicit marker of *Narration*, just as *donc* (*therefore*) is a marker of *Result* and *mais* (*but*) a marker of *Contrast*. We would therefore have the following as an additional triggering axiom for *Narration*, which is what is assumed in (Bras and Asher, 1994) and in (Asher, 1996):

$$\mathbf{A\ 19} \quad (\langle \tau, \alpha, \beta \rangle \wedge [\textit{puis}]\beta) \rightarrow \text{Narration}(\alpha, \beta)$$

Our objective here is precisely to analyze what is the rhetorical role of ‘temporal’ *puis* so we will, for the moment, assume that we do not have this axiom. To better understand the interaction between *puis* and *Narration*, we will examine some examples from our corpus, that is, examples in which *puis* occurs, and is therefore compatible with whatever discourse relations happen to link the corresponding segments.

²⁰The same verb with opposed polarities, or two verbs with opposed lexical semantics.

²¹With the assumption that some piece of shared knowledge links buyings and lendings so that *Occasion* holds.

In the first group of examples considered, we have good reasons to assume that Narration could be inferred without the presence of *puis*, that is, in such examples, *puis* would be redundant if it had a semantics limited to (A19). In a second group of examples, the rhetorical link seems to be—at least—Narration, but *puis* cannot be removed without either removing this Narration link and thus altering the meaning of the discourse or yielding an incoherence.

Let us first examine the ‘redundant’ uses of *puis*. As we have just seen, (see Section 4.2), Narration can be inferred either if Occasion holds, or by default, when no other discourse relation can be triggered.

5.1 *Puis* and Narration with Occasion

Our corpus contains examples in which *puis* appears and that are very similar to (14); it is thus reasonable to assume that Occasion holds:

(20) *Justin frappa à la porte de Renée, puis ouvrit.* (Arland, L’ordre)

(21) *Au-dessus de la porte on lisait : qvarentana. Tout gardait un air d’abandon. Ils heurtèrent, puis entrèrent.* (Pourrat, Gaspard des Montagnes)

In addition, many other examples can be assumed to be Occasion cases. Here is a couple of them:

(22) *Il descendit jusque sur le trottoir, puis fit quelques pas. Un malaise subit l’avait pris dans la salle à manger, mais cela passait ; à présent, il allait mieux.* (Green, Moira)

(23) *Décidément le sort était contre Gilbert. Du moins, il fallait qu’il n’attendît plus ; elle ferma les volets, se déshabilla, puis éteignit la lumière : il comprendrait qu’elle était couchée.* (Arland, L’ordre)

All these examples describe typical series of actions of a same agent, i.e., instantiations of some plans, and most of them²² use subject ellipsis after the clause describing the first action. In such examples (as well as in many others analyzed below), it seems that some kind of ‘glue’ is necessary to finish up such a series of successive events smoothly. This is especially clear in (23) which contains a series of three events instead of two in the other examples. When *puis* is used as a ‘gluing’ agent, it can hardly be disposed of. Even if their reading is extremely similar, neither (24-b), which is slightly awkward unless it is followed by another clause describing a further action, nor (24-c–d), which are perfectly correct, have the smoothness of (24-a). Other

²²Up to now, all but (2) and the made-up (10-b) use subject ellipsis. But see also (26) and (29) below, for instance.

conjuncts like *et* (*and*), as in (24-e), may play the same connective role, but as it has been argued that the actual meaning of *and* could well be temporal too²³, in the remainder, replacing *puis* with *et* will not be considered further. To assess the difference in reading in the examples with and without *puis*, we will only consider filling in the ellipsis by a pronoun as in (24-c–d). It is also interesting to note that in these subject ellipsis contexts, regular temporal adverbials like *un peu plus tard* or *peu après* and are not substitutable for *puis* as a gluing agent, witness (24-f). We can thus conclude that *puis* shows in these examples its conjunct—or rhetorical—nature, much more than its temporal meaning.

- (24) a. *Il descendit jusque sur le trottoir, puis fit quelques pas.*
He went down to the sidewalk, then took some steps.
- b. *Il descendit jusque sur le trottoir, ?fit quelques pas.*
He went down to the sidewalk, took some steps.
- c. *Il descendit jusque sur le trottoir, puis il fit quelques pas.*
He went down to the sidewalk, then he took some steps.
- d. *Il descendit jusque sur le trottoir. Il fit quelques pas.*
He went down to the sidewalk. He took some steps.
- e. *Il descendit jusque sur le trottoir et fit quelques pas.*
He went down to the sidewalk and took some steps.
- f. *Il descendit jusque sur le trottoir, *un peu plus tard fit quelques pas.*
He went down to the sidewalk, a little later took some steps.

In some examples, as the following ones as well as (2) seen at the beginning of this paper, there seems to be more than typicality involved:

- (25) *Elle entendit glisser ses savates jusqu'à l'escalier, les premières marches grincèrent puis le silence retomba.* (Bernanos, *Sous le soleil de satan*)
- (26) *C'est à peine s'il quitta la digue un instant et alla manger un sandwich chez un marchand de tabac qu'il se rappelait dans une petite rue de derrière. Puis il revint se poster sur un banc dans l'ombre du mur des algues.* (Drieu La Rochelle, *Rêveuse Bourgeoisie*)
- (27) *Il poussa un juron, puis s'assura craintivement qu'on ne l'avait pas entendu.* (Arland, *L'ordre*)

As in the preceding ones, in examples (25) and (26), one could assume that sequences of events like *x leaving / x coming back* and *steps creaking / silence falling again* are typical, at least in some sense. Accordingly, one could assume that the corresponding 'occasionings' are pieces

²³See (Gómez Txurruka, 2000) for a recent discussion on the semantics of *and*, denying such a temporal role.

of shared knowledge. Example (27) is in the same spirit, even though it seems more difficult to assume that the sequence *x cursing / x checking whether no-one has heard* is typical. It is nevertheless clear that lexical semantics and shared knowledge about typical situations suffice in all these examples to understand how the events are temporally ordered.

Examples (2) and (25)–(27) have a specific common feature: the clause in which *puis* appears presupposes some kind of event of which the previous clause’s event is a subtype. For instance, the silence falling event in the third clause of (25) presupposes some previous noise event, that is understood here as being the steps creaking. Whatever may be or not present as scripts in the shared knowledge, it seems reasonable to assume we have a more general axiom schema than those like (A6) for inferring Occasion in such presuppositional contexts:

A 20 $(\langle \tau, \alpha, \beta \rangle \wedge ([\phi(e_\beta)]\beta \rightarrow \exists e(\text{Presuppose}(e_\beta, e) \wedge \psi(e)) \wedge ([\xi(e_\alpha)]\alpha \rightarrow \psi(e_\alpha))) \rightarrow \text{Occasion}(\alpha, \beta)$

So what about the role of *puis* in these examples? Here again, with Occasion, SDRT predicts that *puis* should be unnecessary to recover Narration and the right temporal order, and there is not much more to be said than for the previous cases. In (27), the ellipsis requires the kind of ‘glue’ mentioned above, and *puis* or some other conjunct is needed. In examples (25) and (26) there is no ellipsis, but nevertheless, without *puis*, as observed before for (24-d), the text loses some fluidity:

- (28) a. *Elle entendit glisser ses savates jusqu’à l’escalier, les premières marches grincèrent. Le silence retomba.*
 b. *C’est à peine s’il quitta la digue un instant et alla manger un sandwich. Il revint se poster sur un banc.*
 c. *Il poussa un juron. Il s’assura craintivement qu’on ne l’avait pas entendu.*

Let us now examine discourses in which the predicate Occasion does not hold between the eventualities of the two segments connected by *puis*, but Narration could be inferred by default if we removed *puis*.

5.2 *Puis* and Narration without Occasion

Several examples with a clear underlying plan are still found here. However, not all plan descriptions correspond to some typical plan that can be assumed to be available as a script in the shared knowledge. Accordingly, we cannot assume that Occasion holds in the following examples:

- (29) [...] *il rangea ses vêtements dans une valise, régla sa note et prévint qu'il ne rentrerait plus. Il porta la valise à la consigne de la gare de l'est. Puis il se rendit au commissariat où il était convoqué.* (Arland, L'ordre)
- (30) *Alban baissa son feutre jusqu'aux sourcils, contre le soleil, puis jeta un coup d'œil pour voir où était Jesus.* (Montherlant, Les bestiaires)

There are of course narratives that do not describe actions corresponding to any obvious plan, and others that describe events which are not even actions of a same agent. In (31)–(32), it is even clearer that Occasion does not hold:

- (31) *Il eut un geste de mépris, presque de haine, puis se mit à tousser.* (Montherlant, Les bestiaires)
- (32) *Nous nous assîmes sur un banc. Marceline se taisait. Des Arabes passèrent ; puis survint une troupe d'enfants.* (Gide, L'immoraliste)

In examples (29) to (32), the predicate Occasion does not hold. However, with (A4), SDRT predicts that Narration can still be inferred by default because there are no clues for neither Contrast, nor Elaboration, Result, etc. This corresponds to what occurs in these examples, since, as before, these examples would still be correct and keep the same reading if *puis* was removed (possibly filling in the ellipses). Here too, it must be noted though, that even without ellipsis, when a sequence of actions is described, there is a feeling that the discourse is not finished until the last clause of the sequence is introduced by some 'gluing' agent like *puis*. This is particularly clear with (29).

Apart from its noteworthy 'gluing' role, the presence of *puis* seems redundant in all these examples, with Occasion or without. Before turning to examples in which *puis* is an essential element to obtain a narrative reading, we still need to examine in more details whether the different semantic effects of Narration are altered, i.e., enhanced or restricted, with the use of *puis*.

5.3 *Puis* and the semantics effects of Narration

We have stressed before that Narration is not simply temporal succession, which of course is unquestionably compatible with *puis*. Two points need to be examined: the existence of a common topic and the spatio-temporal cohesion constraint on poststates and prestates that is more demanding than temporal precedence.

Puis and topic. In many of the examples we have seen, the clauses connected by *puis* have the same syntactic subject, with or without ellipsis. We know that this subject continuity helps in building the topic required by Narration, since at least this common participant will appear in the propositional content of the topic. Does *puis* systematically require a common ‘theme’ in order to connect two segments? More generally, would it be the role of *puis* to enhance Narration’s axiom (A3), i.e., to enhance the thematic link between the two segments?

Let us try to modify the parameter of subject continuity in order to check the felicity of discourses in which *puis* connects two segments between which the reader can hardly see any link. We first build an example in which the two sentences have different subjects and the thematic link between both sentences is not obvious :

- (33) a. *Anna s’endormit. Il se mit à pleuvoir.*
 Anna fell asleep. It started raining.
 b. *Anna s’endormit. ?Puis il se mit à pleuvoir.*
 Anna fell asleep. Then it started raining.

In (33-a), we have a default Narration, provided a topic can be built. The contents of this topic is not really obvious, but it can be assumed for the moment to be something like “what happened where Anna was on that day”. With *puis*, (33-b) is decidedly odd, unless we are able to build a context in which the rain has some relevance to the story, for instance if it was expected, or if it disturbed Anna’s sleep. In other words, (33-a), which is not the most coherent discourse, is nevertheless clearly better than (33-b). (32) above is an example from the corpus in which the context is able to provide the topic “what the characters are seeing from their bench” without which the two clauses connected by *puis* would be incoherent.

Turning back to our made-up example, modifying it as in (34) in order to recover subject continuity (but not much more) and give some more flesh to the topic, we indeed get a better discourse:

- (34) *Anna sortit. Puis elle se mit à chanter.*
 Anna went out. Then she started to sing.

If we modify it once more so that the Occasion predicate holds, we get (35-a) which is a perfectly coherent discourse, much better than (33-b). The knowledge about typical situations encoded by Occasion can be assumed to be available for the topic construction as well.

- (35) a. *Anna s’endormit. Puis elle se mit à ronfler.*
 Anna fell asleep. Then she started snoring.

- b. *Anna s'endormit. Elle se mit à ronfler.*
Anna fell asleep. She started snoring.

(35-a), with *puis* in an Occasion context, is actually a better discourse than (35-b) without any connector. This corresponds to what was observed above with (24), but is opposed to what occurs with the almost topicless (33). If *puis* was indeed a rhetorical marker of Narration, it would not be otherwise: an explicit indication of the narrator's intention to link the two events within 'the same story' would, as observed, improve the fluidity of texts with clear topics²⁴, the rhetoric matching the propositional contents, and restrict the acceptability of apparently topicless discourses, with a manifest clash between the explicit rhetorical articulation of discourse and the description of the facts. Such an interpretation of the semantics of *puis* at the rhetorical level would constitute a first account of its 'gluing' role. Of course, further issues involved in this role, like ellipsis licensing, remain to be studied.

So *puis* is certainly compatible with the first semantic effect examined; it even reinforces the need of a thematic link, for the topic required by Narration must have a rich propositional contents. We have also observed additional evidence that *puis* is a rhetorical marker of Narration: it explicitly marks the intention of the narrator to link the two clauses within the 'same story'.

Puis and the 'no-significant-gap' constraint. The temporal effects of $Narration(\alpha, \beta)$ given in (A2) characterize the fact that no intervening relevant event may occur in between e_α and e_β . This is guaranteed by the assumption that in $post(e_\alpha)$ all relevant facts resulting from e_α hold, and that in $pre(e_\beta)$, all relevant facts that are preconditions to e_β hold. The intersection constraint entails that there is no logical incompatibility between these two sets of facts, and that both sets of facts hold in the interval of time between e_α and e_β . For instance, in (33-b), Anna being asleep is assumed to be true in $post(e_1)$, and (A2) imposes that this must be the case up to e_2 , while it is not yet raining ($pre(e_2)$). Therefore, a way to test the impossibility of a spatio-temporal gap between the two events is to try to insert a third event in between e_1 and e_2 such that it terminates $post(e_1)$, i.e., an event whose poststate is incompatible with $post(e_1)$, for instance the event of Anna's waking up:

- (36) a. *Anna s'endormit. Il se mit à pleuvoir. *Elle venait juste de se réveiller.*
Anna fell asleep. It started raining. She had just woken up.
- b. *Anna s'endormit. Puis il se mit à pleuvoir. *Elle venait juste de se réveiller. / *Entretemps elle s'était réveillée*
Anna fell asleep. Then it started raining. She had just woken up. / Meanwhile, she

²⁴There is of course a limit to such an improvement. Adding *puis* between any two clauses linked by Narration will yield a terribly cumbersome text.

had woken up.

The no-significant-gap constraint that SDRT assumes to be imposed by Narration is clearly sustained by the unacceptability of examples like (36), with or without *puis*.²⁵ During the prestate of the raining event, Anna cannot be simultaneously asleep and awake. This is to be contrasted with the following acceptable examples:

- (37) a. *Anna s'endormit. Puis il se mit à pleuvoir. La nuit venait juste de tomber. / Entretiens, la nuit était tombée.*
 Anna fell asleep. Then it started raining. The night had just fallen. / Meanwhile, the night had fallen.
- b. *Anna s'endormit. Un peu plus tard, il se mit à pleuvoir. Elle venait juste de se réveiller. / Entretiens elle s'était réveillée*
 Anna fell asleep. A little later, it started raining. She had just woken up. / Meanwhile, she had woken up.

In (37-a), the intervening event does not interfere with Anna's sleep nor with the rain: Anna can be still asleep and it can be not yet raining once the night has fallen. (37-b) gives further evidence that *puis* does not behave like regular temporal adverbials indicating temporal succession. What is more puzzling is that at the same time, (37-b) suggests that such adverbials do not enforce Narration but actually block it, since they block some of its temporal semantic effects. This point will not be developed further here, because the study of regular temporal adverbials falls outside the scope of this paper²⁶.

To conclude this section, we can say that the introduction of a specific axiom for triggering Narration with *puis* does not seem to be fully justified, since Narration is already triggered by other means in all the examples studied up to now. However, we observed that *puis* significantly contributes to the fluidity of some narratives and strengthens the semantic effects of a simple Narration. A plausible interpretation of these phenomena is that *puis* is indeed a rhetorical marker of Narration.

We now need to examine the second group of examples found in our corpus: those in which we have a Narration reading that disappears when *puis* is removed. That is, without *puis*, we lose, among other things, the temporal ordering present in all of them. Together with the arguments in favor of the rhetorical role of *puis* previously expounded, the mere existence of such exam-

²⁵It might be possible to improve (36-a) and (36-b) by introducing the third event with something like *Ajoutons/précisons que, entretiens, Anna s'était réveillée* (Let us add / point out that, meanwhile, Anna had woken up). In such a case, however, there is an explicit phenomenon of correction (of the way the events have been narrated), and so it is not surprising that the temporal effects of Narration should be revised.

²⁶See (Bras et al., 2001b) for a more detailed comparison of *puis* and *un peu plus tard*.

ples should suffice to conclude that axiom (A19) should be retained. But let us examine these examples in more detail to see whether Narration does not come with other discourse relations.

5.4 *Puis* and Contrast

In the following examples SDRT predicts that the rhetorical relation of Contrast holds between the two clauses linked by *puis*:

- (38) *Il s'en moqua d'ailleurs comme d'une naïveté, puis la vanta comme un moyen de contraindre la sottise des petites gens au respect du savoir et de la puissance, sans lesquels ils iraient aux délires révolutionnaires, à l'anarchie et à la sauvagerie des septembriseurs.* (Adam, L'enfant d'Austerlitz)
- (39) *La figure de ce dernier sourit d'abord, puis s'allongea, eut un air de stupéfaction profonde.* (Zola, Pot-Bouille)
- (40) *Vaton se tut sous le choc, puis bredouilla quelques mots [...]* (Malègue, Augustin ou le Maître est là)

It can indeed be shown that the required partial structural isomorphism²⁷ is accompanied by a lexical opposition of the main predicates (*to mock / to praise, to smile / to fall (for a face), to be silent / to mumble*). These predicates all describe actions of a same agent, so that the corresponding events necessarily are temporally disjoint. However, *puis* is not redundant at all in these examples. It emphasizes the separation between the two actions, ordering them temporally. Without *puis* (and filling in the ellipses when necessary), we lose the temporal succession reading and obtain incoherent discourses:

- (41) a. *Il s'en moqua d'ailleurs comme d'une naïveté. *Il la vanta comme un moyen de...*
 b. *La figure de ce dernier sourit d'abord. *Elle s'allongea, eut un air de stupéfaction profonde.*
 c. *Vaton se tut sous le choc. *Il bredouilla quelques mots.*

The incoherence remains if *puis* is replaced with the explicit Contrast marker *mais*:

- (42) a. *La figure de ce dernier sourit d'abord, *mais s'allongea, eut un air de stupéfaction profonde.*
 b. *Vaton se tut sous le choc, *mais bredouilla quelques mots.*

²⁷The partiality of the isomorphism entails the graduality of the relation of Contrast. Here, the isomorphism is stronger in (38) and (39) than in (40).

This is not the case for (38). In (43), the use of a Contrast marker focusses on the co-existence of two different features of the object being mocked and praised (a naivety and a restrictive means) that can be evaluated, one negatively and the other positively, at the same time. However, the narrative reading is lost: the mocking and the praising are no longer temporally ordered.

- (43) *Il s'en moqua d'ailleurs comme d'une naïveté, mais la vanta comme un moyen de contraindre la sottise des petites gens au respect du savoir et de la puissance, sans lesquels ils iraient aux délires révolutionnaires, à l'anarchie et à la sauvagerie des septembriseurs.*

All this actually confirms SDRT axiom (A4): Narration cannot be inferred by default (i.e., without Occasion and without any specific marker like *puis*) when other discourse relations, for instance Contrast, can be triggered²⁸. However, SDRT does not at present explain why discourses like (41) and (42) are incoherent. It seems that further semantic constraints on the Contrast relation are needed, requiring some explicit temporal separation when the two events cannot occur simultaneously.

Puis is not the only marker that can be used to temporally separate the two events. A regular temporal adverbial like *un peu plus tard* would do, but it must be noticed that the narrative reading would then be altered. As shown in the previous section, the reading that the two actions follow one another without significant spatio-temporal gaps, would be lost.

A similar phenomenon occurs in the following examples, in which instead of Contrast, we have a Parallel relation in addition to Narration. Here too, without *puis*, Narration is lost. In this case however, the actions are not incompatible so we do not get incoherent discourses, provided we add sufficiently strong 'glue' for licensing the parallelism ellipses (something like *aussi (too)* or *et (and)* is needed), a mere repetition of the rest of the clause being hardly acceptable. Nevertheless, removing *puis* alters the meaning; temporal ordering is lost, and simultaneity seems to be the preferred reading:

- (44) a. *J'entendis monter Mme Floche, puis Mlle Verdure.* (Gide, Isabelle)
 b. *J'entendis monter Mme Floche, et Mlle Verdure.*

Contrast examples, unlike such Parallel ones, are rather frequent in our corpus. However, most examples are not clear Contrast cases such as the ones we have just seen. Many of them, like the following ones, describe events that indirectly presuppose incompatible states of mind:

²⁸Notice that with Occasion, we may have both Contrast and Narration relations without *puis*. For instance, we have already seen that if we remove *puis* in example (26) above, we have a coherent text. It can be reasonably assumed that Contrast holds in this example.

- (45) *C'était plus fort que lui, il ne pouvait pas lui parler. Il se demanda pourquoi : ils causaient de source, tantôt. Il crut d'abord que le cinéma l'avait gelé ; puis il comprit que c'était, simplement, parce qu'il n'avait plus rien à lui dire.* (Montherlant, *Le démon du bien*)
- (46) *Walter Schnaffs demeura d'abord immobile, tellement surpris et éperdu qu'il ne pensait même pas à fuir. Puis un désir fou de détalé le saisit[...]* (Maupassant, *Contes et nouvelles*)
- (47) *Il commença, il lisait bizarrement d'une façon que Jean-Louis jugea d'abord ridicule ; puis il pensa que c'était sans doute le seul ton qui convînt.* (Mauriac, *Le mystère Frontenac*)

In these examples, it is difficult to assume that some known SDRT axiom is able to trigger Contrast: there is no contrast marker like *mais*, and there is no direct lexical opposition within matching syntactic structures. And yet, removing *puis* yields incoherent texts, the temporal ordering between two perceptibly incompatible eventualities being lost:

- (48) a. *Il crut d'abord que le cinéma l'avait gelé ; *il comprit que c'était, simplement, parce qu'il n'avait plus rien à lui dire.*
- b. *Walter Schnaffs demeura d'abord immobile, tellement surpris et éperdu qu'il ne pensait même pas à fuir. *Un désir fou de détalé le saisit.*
- c. *Il commença, il lisait bizarrement d'une façon que Jean-Louis jugea d'abord ridicule ; *il pensa que c'était sans doute le seul ton qui convînt.*

Actually, in examples (45) and (47), there is a partial structural isomorphism. But superficially there is more lexical similarity than opposition (*to believe / to understand, to regard / to think*), so if SDRT were to exploit this structural isomorphism, it would rather (and wrongly) conclude Parallel than Contrast. There is, however, some kind of Contrast reading available, some kind of incompatibility that renders simultaneity impossible. This semantic opposition is only obtained after enough inference steps exploiting shared knowledge, which suggests that a mechanism similar to that used for Narration (with Occasion) or Result (with D-Permissible-Cause) is also needed for Contrast. At present, SDRT would incorrectly predict that in (48-a-c) either Parallel holds or Narration holds by default since no other discourse relation can be triggered, and there is no particular difficulty in constructing a common topic. We do not proceed further and propose any additional triggering axiom for Contrast here. We believe a deeper study of this relation is needed, taking into consideration other types of texts than those analyzed here.

It may be interesting to note the presence of *d'abord* (*at first*) in the first clause of most of these examples. This adverbial presupposes that a different phase is to come, but this presuppo-

sition does not suffice to move the time forward in the second clause and guarantee coherence. *Puis* or another marker is needed for that, just like in the clear Contrast example (39) seen above. This is to be distinguished from the lexical presupposition in the second clause, that was shown to induce a Narration reading and was considered as an Occasion case (see Section 5.1).

Let us now examine another set of examples describing incompatible events in which current SDRT can be assumed to predict Contrast:

- (49) *Le pape le laissa quatre heures entières dans l'antichambre, attendant aux yeux de tous, puis le renvoya sans vouloir l'admettre à l'audience.* (Stendhal, *La duchesse de Palliano*)
- (50) *Elle resta un instant immobile, puis secoua la tête : cela, c'était le passé, un vilain passé qui ne reviendrait plus, et qu'il fallait oublier.* (Arland, *L'ordre*)
- (51) *Il hésita une seconde, puis suivit son frère.* (Martin Du Gard, *Les Thibault*)

In such examples, removing *puis* is much more acceptable than in (38)–(47). The narrative reading is preserved, even though the texts are not quite fluid:

- (52) a. *Le pape le laissa quatre heures entières dans l'antichambre, attendant aux yeux de tous. Il le renvoya sans vouloir l'admettre à l'audience.*
- b. *Elle resta un instant immobile. Elle secoua la tête : cela, c'était le passé, un vilain passé qui ne reviendrait plus, et qu'il fallait oublier.*
- c. *Il hésita une seconde. Il suivit son frère.*

This discrepancy can be explained, noticing that in (49)–(51) the first clauses quantify the duration of the events described. Such a quantification, contrary to the use of the adverbial *d'abord*, enables the reader to consider that the first event is complete and that the time has moved forward.²⁹ Indeed, even if we assume that the use of a perfective tense like PS yields an event with all kinds of verbs, including verbs whose aktionsart is that of a state like *to leave someone waiting*, *to stay immobile*, *to hesitate*, there might be subtle aspect differences that require a more explicit marker of the state ending. Duration markers focus on the definiteness of the boundaries of the first eventuality. *Puis*, for its part, explicitly marks precedence between the two main eventualities of the clauses it links, thus the ending of the first one. This ending role is especially clear in many of the 'Contrast' examples seen above, like (45) in which the first eventuality describes a state of mind (*to believe*). One could tend to think that the PS tense on such verbs yields an inchoative reading. However, in (53), in which there is no particular

²⁹Without a duration marker in the first clause, the same reading is obtained replacing the V-PS verb in the second clause by some expression like *finir-PS par V-INF*, although this is better in conjunction with a Contrast marker like *mais*.

semantic opposition between the eventualities, the use of *puis* clearly entails that the protagonist gave up running after Jacqueline, that is, *puis* ends the whole eventuality of considering running after her, not just the beginning of this eventuality.

- (53) “*Jacqueline !*” *Elle s’enfonçait en courant dans une ruelle. Il songea à la poursuivre, puis s’avisa de ce qu’il tenait dans sa paume. C’était une petite bourse bleue que Jacqueline avait dû faire elle-même, il en écarta les cordons.* (Aragon, *Les beaux quartiers*)

In addition to the need to study more generally the semantic constraints that SDRT should impose on Contrast and the triggering rules of this relation, we see here, en passant, that there is a need to further study what other clues, in addition to Occasion and *puis*, may trigger Narration, since Narration by default cannot apply in example (52), for Contrast holds (or should hold). Completion markers, like duration adverbials, may provide such clues.

We have just seen that when the first clause is temporally quantified, *puis* is not really necessary to end this period of time and move to the next. This is true for a quantification inside the clause, which acts as a VP modifier. When the quantification is brought at the beginning of the sentence, it sets a temporal frame within which, not just the clause’s event but a whole series of events from subsequent clauses may occur. In that case, removing *puis* alters the meaning, for the second clause falls under the scope of the temporal frame, as in the following examples:

- (54) a. *Un instant, je demeurai stupide, puis je sentis que le sang me quittait le visage, et mes doigts se serrèrent sur l’accoudoir.* (Gracq, *Le rivage des syrtés*)
 b. *Un instant, je demeurai stupide, je sentis que le sang me quittait le visage, et mes doigts se serrèrent sur l’accoudoir.*
- (55) a. *Jusqu’en 1830, les habitants restèrent catholiques pratiquants et fervents royalistes ; le peuple lui-même ne jurait que par Dieu et que par ses rois légitimes. Puis un étrange revirement eut lieu ; la foi s’en alla [...]* (Zola, *La fortune des Rougon*)
 b. *Jusqu’en 1830, les habitants restèrent catholiques pratiquants et fervents royalistes. ?Un étrange revirement eut lieu ; la foi s’en alla.*

The reading obtained in (54-b) is such that all the three events are situated in the *instant*³⁰. It is very different from the reading in (54-a), in which only the first event is located during the instant. In (54-a), there is a sequence of at least two separated phases, and most probably three,

³⁰Their temporal order remains unclear. It seems that the preferred reading is simultaneity, which may be explained by the relatively short duration of an instant that could trigger a Parallel relation and thus rule out Narration by default.

the grasping being possibly interpreted as a reaction to the blood withdrawing from the face. In (55) the same time frame effect conflicts with the presupposition phenomenon seen before (and with Occasion tending to trigger Narration) to produce an awkward discourse.

In these examples, we clearly see that an explicit marker like *puis* is needed to end the period of time introduced by the time noun as a temporal frame. We also see that *puis* does not simply order two events, which would remain within the temporal frame. It closes off this time frame, and moves to the next phase of the story. These observations could rather easily be accounted for by considering that one aspect of the discursive semantics of duration adverbials in their time frame sense, i.e., in fronted position, is to trigger a Topic structure and thus enable a Continuation of this topic. But this is beyond the scope of this paper. Let us point out, though, that in our corpus we found further evidence that *puis* helps closing off a whole episode of a story, and so to speak, going back up in the discourse structure. In (56), the clause S1 is elaborated by the following ones. Then, *puis* closes off this Elaboration, resulting in S2 attaching to S1 and not its preceding clause:

- (56) [Ce fut un chagrin désordonné.]S1 *Elle se jeta par terre, poussa des cris, appela le bon Dieu, et gémit toute seule dans la campagne jusqu'au soleil levant. Puis [elle revint à la ferme,]S2 déclara son intention d'en partir ; et, au bout du mois, ayant reçu ses comptes, elle enferma tout son petit bagage dans un mouchoir, et se rendit à Pont-l'Évêque.* (Flaubert, *Un cœur simple*)

We have explored the positive facets of the semantics of *puis*. Let us now turn to the narrative contexts in which *puis* is unacceptable, and examine the negative ones.

6 *Puis* AND INCOMPATIBLE RELATIONS

As we have seen in Section 3, *puis* cannot be inserted between any two clauses describing successive events, and in fact, between any two clauses linked by a Narration relation. We had noticed that the counterexamples (12) and (13) involve, in addition to Narration (with Occasion), discourse relations establishing causal links between the eventualities. SDRT distinguishes only one such relation, Result³¹. This relation is clearly at stake in the following examples (we first recall here (13)):

³¹There is only one relation R such that $R(\alpha, \beta) \rightarrow Cause(e_\alpha, e_\beta)$. Of course, as we have seen, SDRT uses the inverse relation Explanation as well.

- (57) a. *L'acide tomba dans le liquide. Le mélange réagit en explosant.*
The acid fell into the liquid. The mixture reacted by exploding.
b. *L'acide tomba dans le liquide. * Puis le mélange réagit en explosant.*
The acid fell into the liquid. Then the mixture reacted by exploding.
- (58) a. *L'acide tomba dans le liquide. Une explosion se produisit.*
The acid fell into the liquid. An explosion happened.
b. *L'acide tomba dans le liquide. Puis une explosion se produisit.*
The acid fell into the liquid. Then an explosion happened.
- (59) a. *Max trébucha. Il tomba et se cassa la jambe.*
Max stumbled. He fell and broke his leg.
b. *Max trébucha. ?Puis il tomba et se cassa la jambe.*
Max stumbled. Then he fell and broke his leg.

One may want to distinguish other causal relations, for instance, Response and Reaction³² to better account for the following examples (we first recall here (12)):

- (60) a. *Elle lui proposa d'aller voir sa soeur, à Trouville. Félicité répondit, par un geste, qu'elle n'en avait pas besoin.*
b. *Elle lui proposa d'aller voir sa soeur, à Trouville. *Puis Félicité répondit, par un geste, qu'elle n'en avait pas besoin.*
- (61) a. *Max lui envoya une lettre d'insultes. Elle réagit très violemment en lui accrochant une casserole à sa voiture.*
Max sent her an offensive letter. She reacted strongly by tying a saucepan to his car.
b. *Max lui envoya une lettre d'insultes. *Puis elle réagit très violemment en lui accrochant une casserole à sa voiture.*
Max sent her an offensive letter. Then she reacted strongly by tying a saucepan to his car.
- (62) a. *Max dit une grosse bêtise. Le professeur leva les bras au ciel, cria très fort et le renvoya a sa place.*
Max said something very stupid. The teacher threw his arms up in the air, shouted

³²Response has been introduced in (Sandström, 1993) as a sub-case of the Narration relation (although she considered all these relations as relations bearing on events instead of constituents). We feel here the need to group Response, as well as the very similar Reaction that we introduce here, with Result because of their clear causal nature. Intuitively, though, there seems to be a difference in the degrees of intentionality and of determinism of the causal link.

loudly and sent him back to his seat.

- b. *Max dit une grosse bêtise. ?Puis le professeur leva les bras au ciel, cria très fort et le renvoya a sa place.*

Max said something very stupid. Then the teacher threw his arms up in the air, shouted loudly and sent him back to his seat.

Since we could not find a corresponding differentiated behavior for *puis*, there actually is no need to enter into such detail. In the remainder, we will only use the relation Result.³³

With *puis*, the acceptability of the b. texts in (57)–(62) does nevertheless vary. How do we account for the incoherent cases and at the same time, for this variety? Considering only the cases in which the use of *puis* is infelicitous (the majority of them, rated ‘*’ or ‘?’), we are driven to conclude that *puis* blocks the causal discourse relations; that is, *puis* is incompatible with Result, and so the following axiom

$$\mathbf{A\ 21} \quad (\langle \tau, \alpha, \beta \rangle \wedge [puis]\beta) \rightarrow \neg \mathbf{Result}(\alpha, \beta)$$

or the more cautious

$$\mathbf{A\ 22} \quad (\langle \tau, \alpha, \beta \rangle \wedge [puis]\beta) > \neg \mathbf{Result}(\alpha, \beta)$$

should be adopted.

Looking closer at (58-b), apparently not complying with these blocking rules, we notice that its felicity comes with a very different reading from that of (58-a), and, for that matter, (57-a). In (58-a), just as in (57-a), we clearly get a causal reading: the explosion results from the falling of the acid into the liquid. SDRT could explain this by exploiting some piece of shared knowledge on chemical experiments implying that D-Permissible-Cause holds between the two constituents representing the two clauses, to nonmonotonically infer Result with axiom (A11). On the other hand, the reading we get in (58-b) is one in which the author does not commit himself regarding a possible causal relationship between the events, and tries to objectively tell the story of “what happened during the chemical experiment”. If *puis* blocked Result as proposed in (A21) or (A22), the previous defeasible reasoning would not apply (see footnote 13 on page 118), and we would be left with a Narration relation, applying our axiom on the semantics of *puis*, (A19). This would correctly account for the reading obtained for (58-b). This would also explain why we get different anaphoric resolutions with and without *puis* in the following pushing example. (63-b) yields the preferred reading in which the pronoun *il* is resolved with *Max* instead of *John* in (63-a):

³³When compelled to distinguish Response and Reaction, we will need to reproduce any axiom on Result introduced below for Response and Reaction as well.

- (63) a. *Max poussa John dans le fossé. Il tomba.*
 Max pushed John in the ditch. He fell.
 b. *Max poussa John dans le fossé. Puis il tomba.*
 Max pushed John in the ditch. Then he fell.

Now, why does the same phenomenon (Result blocked leaves a mere Narration) not occur with the other examples, that is, why do we obtain apparently incoherent discourses at all? Actually, the narrative and non-causal reading is indeed available in (59-b) and (62-b), although the preferred reading in these two examples is not the neutral one, but one in which the two events are totally unrelated. With such a reading, (59-b) describes two distinct occasions on which Max lost his balance. Nevertheless, the reader feels puzzled (texts rated ‘?’). It is plausible that the reader assumes the narrator should have the competence to tell whether Max’s falling is due to Max’s stumbling, as well as whether the professor’s shouting is due to Max’s foolishness (but note that we cannot assume that everyone is an expert in chemical experiments). As a consequence, the reader expects more information as to why the narrator does not want to commit himself regarding the quite obvious causal relationship, or explain more clearly that there is indeed no causal relationship between the two events. The clash between the use of rhetorical *puis*, that indicates Narration and blocks Result, and the propositional contents of the two clauses, that suggest a Cause between the events, is in these two examples of the same nature as that occurring when the rhetoric does not match the ease to build a topic (see Section 5.3).

As far as the other unacceptable examples, rated ‘*’, are concerned, the same clash is even more prominent since the causality between the two events is made explicit by the narrator in the propositional contents of the second clause, with anaphoric verbs like *répondre* (to answer) or *réagir* (to react). Indeed, we can assume that from the lexical semantics of such verbs, one can derive (at least) $Cause(x, e_P)$, where x is to be recovered by anaphora resolution. The patent clash makes the neutral reading³⁴ hardly available to the reader and renders the text incoherent, unless it is embedded in a very specific context. Even though we have not found any example of this kind in our corpus, we actually can construct a context in which (61-b) loses its incoherence. The following one clearly focusses on telling the story of the successive Max and Anna’s misadventures:

- (64) *La relation entre Max et Anna se dégradait très rapidement. Anna commença par l’ignorer dans plusieurs occasions. Max lui envoya une lettre d’insultes. Puis elle réagit très violemment en lui accrochant une casserole à sa voiture. Après cela, ils ne se parlèrent plus.*

The relationship between Max and Anna deteriorated quickly. Anna started ignoring

³⁴The one in which the two events are unrelated is of course impossible here.

him on several occasions. Max sent her an offensive letter. Then she reacted strongly by tying a saucepan to his car. After that, they did not speak to each other again.

Disregarding such specific contexts and in order to theoretically account for the unacceptability of examples presenting a strong clash, one could propose to add an axiom so that $Cause(e_1, e_2)$ would directly and monotonically entail $Result(K_1, K_2)$:

PotA 23 $Cause(e_1, e_2) \rightarrow Result(K_1, K_2)$

Together with axiom (A21) stating that *puis* is strongly incompatible with Result, this potential axiom would predict the incoherence of all the texts in which *puis* links two clauses describing causally connected events. This would correspond to regarding any lexical expression of causation (e.g., *réagir*, *to react*) as a rhetorical marker of Result like—presumably—*donc* (therefore) and *en conséquence* (as a consequence).

SDRT, unlike most theories, is capable of drawing a distinction between the level of the propositional contents of the basic constituents and the rhetorical level—e.g., it distinguishes $Cause(e_1, e_2)$ from $Result(K_1, K_2)$ and $e_1 \prec e_2$ (or the more complex intersection condition) from $Narration(K_1, K_2)$ —even though these two levels interact. It is important to point out that an axiom like (PotA23), together with (A7), would entail an equivalence between $Cause(e_1, e_2)$ and $Result(K_1, K_2)$, which means that the two levels, rhetorical and factual, would collapse as far as causal relations are concerned. This would prevent us from analyzing (58-b) as not displaying the Result relation, accounting for the objective neutral reading, and simultaneously being truthfully used in a world in which there really is a Cause relation between the two events.³⁵ Actually, this is exactly why in (A21) and (A22) we have not proposed that *puis* is incompatible with Cause but rather that it blocks the inference to Result.

Let us note in addition that we have seen before a number of reasons to consider that *puis* is a rhetorical marker of Narration, contrary to other markers of temporal succession like *un peu plus tard*³⁶. It is legitimate to think that, by and large, language draws this distinction between lexical items that mark a rhetorical connection between two utterances, i.e., that make the speech act of the second utterance explicit, and lexical items merely denoting relations on objects belonging to the world. In that perspective also, it seems dubious to assume that any lexical expression of causality should be considered as a marker of Result.

Therefore, on top of the mere fact that (PotA23), together with (A21), will analyze (64) as incoherent while it is acceptable, more general considerations make its adoption as an axiom of

³⁵The neutral presentation of the facts is not restricted to causal discourses. Something similar happens in texts like (18) seen earlier, in which the events described are not temporally ordered by the discourse (and SDRT predicts that Continuation holds, and that, without more information, Narration does not), even though they of course did happen with a specific temporal pattern.

³⁶See (Bras et al., 2001b) for a deeper contrastive analysis.

our theory problematic. And even though one can be left with the feeling that (A21) or (A22) is not enough to fully account for the awkwardness of the examples we have examined, we believe it is a safer approach. And to be on the safest side, we choose to retain (A22).

Actually, the awkwardness or unacceptability of some examples may involve an additional factor. The temporal semantic effects of Narration imply the existence of a state filling the interval between the two events, the intersection between the poststate of the first and the prestate of the second. The properties of this state account for the ‘no-significant-gap’ constraint described earlier. On the other hand, the mere existence of this state entails the existence of a non-null temporal interval between the two events, that is some kind of temporal separation. This can be enough to explain a conflict in cases in which shared knowledge stipulates that some kinds of causally related events occur in a single flow, without any temporal gap at all between them, like with a stumbling evolving into a falling. This phenomenon can be evidenced by replacing *puis* with regular temporal adverbials also indicating a non-null temporal gap, for instance *quelques minutes / deux jours plus tard* (a few minutes / two days later). When shared knowledge implies no gap at all, using such an adverbial also blocks Result (not directly, but via the blocking of the Cause relation), as in:

(65) *Max trébucha. ?Immédiatement après / quelques secondes plus tard, il tomba et se cassa la jambe.*

Max stumbled. Immediately after / a few seconds later, he fell and broke his leg.

When shared knowledge allows for a gap between the cause and the outcome, such an adverbial does not modify the reading obtained without any adverbial:

(66) *Max lui envoya une lettre d’insultes. Deux jours plus tard, elle réagit très violemment en lui accrochant une casserole à sa voiture.*

Max sent her an offensive letter. Two days later, she reacted strongly by tying a saucepan to his car.

Note that even though this temporal phenomenon may be involved in some cases, it does not suffice to account on its own (i.e., without using (A22)) for the interaction of *puis* and Result, as (66) shows when contrasted with (61-b). Moreover, the ‘no-gap-at-all’ reading cannot strongly block Narration and explain why texts are rated ‘*’, for, again, there are acceptable variations of (65) that do describe a gap between the causing event, the stumbling, and the resulting one at stake, the falling:

(67) *Max trébucha. Il fit trois pas incontrôlés. Puis il tomba et se cassa la jambe.*

Max stumbled. He took three uncontrolled steps. Then he fell and broke his leg.

What is remarkable as well in this example, is that *puis* becomes acceptable between the first resulting event, the uncontrolled stepping, and the second one, the falling. It is in fact plausible that we are here facing a causal chain of multiple events, i.e., that besides the Cause between the stumbling and the uncontrolled stepping, there is a Cause between the uncontrolled stepping and the falling, as well as between the falling and the breaking of the leg. Nevertheless, *puis* does not make the text awkward. We feel entitled to argue that here, the clash that we have taken to explain the infelicity of (59-b), is no longer prominent. There is, without doubt, a resultative reading between the stumbling and the three subsequent events together. With that reading, the corresponding SDRS has a complex structure, the three constituents representing the three clauses of the last two sentences being grouped together into a complex sub-SDRS, linked with a Result relation to the simple constituent representing the first sentence.³⁷ Within the sub-SDRS itself, it is not clear that the constituents should be further linked by Result and not simply by Narration. In other words, it is not clear that the text does not present the three results in a narrative way, just as for the acceptable variant (64) of the infelicitous (61-b).

We did find a similar example in our corpus, in which the answering is separated from the question by ‘long negotiations’:

- (68) *Qui est à l'appareil ? Un bruit sec lui apprit qu'on avait raccroché. Le fait le surprit ; il téléphona à la surveillante pour savoir qui venait de parler ; cela exigea de longues négociations, puis on lui répondit : "cabine bourse," ce qui devait être une erreur et n'expliquait rien.* (Maurois, Climats)

To conclude this section, it might be important to stress that the incompatibility of *puis* with discourse relations involving causal links does not contradict the compatibility of *puis* with other kinds of dependence links. We agree with what is said in (Reyle, 1999) regarding the incompatibility of *puis* with patent causality, but we do not conclude as Reyle does that *puis* is infelicitous with any dependence link.

We have seen in Sections 3 and 5.1 that *puis* is compatible with Narration between two successive stages of a same plan. In some of these examples, the first clause describes a precondition—or an event whose resulting state is a precondition—for the second to occur. This relation is clearly at stake in (10), for instance. *Puis* does not contradict this particular case of Narration, distinguished as *Enablement* in (Sandström, 1993). In addition, in examples such as (2) and (25)–(27), there is a clear dependence between the two clauses: as we have seen, the second presupposes that (some event of the type of) the first has occurred. We believe the precondition and presupposition types of dependence to be very different from the causal one.

³⁷This example as well as (1), brings into question the coordinating nature of the Result relation. We will leave this discussion for a further occasion.

7 CONCLUSION

In this work we have studied ‘temporal’ *puis* in a large corpus of examples from French literature. After having justified the rhetorical status of its semantics, we have tried to analyze in detail what the examples tell us regarding its formalization in SDRT.

The global conclusion on the semantics of ‘temporal’ *puis* is that it is a rhetorical marker of Narration, that is, that it links two segments within the same ‘story’, and without significant spatio-temporal gap between them. This is correctly captured by axiom (A19), once the axiom on the semantics effects of Narration, (A1), is slightly improved into (A2).

As we have seen in Section 5.3, *puis* presents a feature slightly departing from standard Narration: it seems to impose stronger constraints on topics. It is actually well-known in SDRT studies that what exactly is a topic requires further investigation; our observations just add more evidence for this need. Nevertheless, we have suggested that *puis*’s rhetorical character might help explain the clash between an explicit indication of Narration and the absence of clear propositional contents supporting this rhetorical connection, even though this type of discrepancy is not at present recognized as a source of incoherence by SDRT.

We have observed on many occasions an additional feature: the ‘gluing’ effect of *puis*, that most notably enables subject ellipsis. It is well-known that some particles with positive or negative polarities, like *aussi* (*too*) and *non* (*not*) mark VP ellipsis, but we have not seen any work considering *puis* as a particle marking subject ellipsis. As *puis* is certainly not the only particle presenting such a property, this kind of phenomena has to be investigated on a larger scale before being properly formalized in SDRT.

The last section has shown that *puis* blocks Result, so that axiom (A22) is needed in addition to (A19) to give a full SDRT account of the semantic and pragmatic contribution of this conjunct to discourse. While examining the interactions of *puis* in causal contexts, we also observed a phenomenon that *too* was analyzed as the expression of a clash between what is rhetorically explicitly marked and what is described within the propositions.

During this work, we were forced in several places to face phenomena that SDRT had not taken into account yet. In addition to the ones we have just recalled here, we were confronted with evidence that Contrast should be given further triggering rules, as well as additional semantic effects. We have also found a few cases in which additional axioms are needed to trigger Narration.

All these constitute requirements for further developments of SDRT. But it is interesting to note that these requirements essentially aim at revising or introducing new axioms on discourse relations, and not at altering any basic principle of this theory. On the contrary, we believe that this work shows how fruitful is the distinction brought by SDRT into dynamic semantics between

discourse structure—the part of the representation accounting for the rhetorical connections between discourse segments—, and the propositional contents of these segments—to which the temporal structure belongs—partially describing how the world should be so that the discourse be true, although the two are intimately related. We have discussed the need to distinguish between the rhetorical relation of Narration and temporal precedence, as well as between the relation of Result and a Cause between two events. This distinction is a prerequisite to theoretically account for the clashes between the rhetorical articulation of a discourse and its propositional contents, which we believe would constitute a worthwhile addition to SDRT.

We have exploited a variety of arguments to show that *puis* is indeed a rhetorical marker of Narration. But we have also found evidence that could have been used to prove that a large number of lexical items are markers of Result, though, we have argued, improperly. To investigate this distinction further, we believe it is now time to clarify how to separate the lexicon into two categories, and try to answer the following question: What kind of evidence—syntactic, semantic and pragmatic—may in general be used to tell which lexical items are direct markers of some discourse relation, leaving the rest of the lexicon primarily contributing to the propositional contents of the clauses?

We thus leave some interesting studies for the future. To conclude, let us point out that, from the start, we had left much more work aside: the other senses of *puis*, as well as *et puis*, await to be studied. It would be also very instructive at this point to compare ‘temporal’ *puis* with other non-standard temporal adverbs, i.e., temporal adverbs that, like *puis*, do not introduce a temporal referent. Reyle (1999) has begun to compare *puis* and *alors*; *ensuite* is another interesting candidate in this perspective.

REFERENCES

- Allen, J. F. (1984). Towards a General Theory of Action and Time. *Artificial Intelligence*, **23**, 123–154.
- Asher, N. (1993). *Reference to Abstract Objects in Discourse*. Kluwer, Dordrecht.
- Asher, N. (1996). Mathematical Treatments of Discourse Contexts. In: *Proceedings of the 10th Amsterdam Conference on Formal Semantics*, volume 1, pp. 21–40. ILLC Publications, Amsterdam.
- Asher, N., Aurnague, M., Bras, M., Sablayrolles, P., and Vieu, L. (1995). De l’espace-temps dans l’analyse du discours. *Sémiotiques*, **9**, 11–62.
- Asher, N., Aurnague, M., Bras, M., and Vieu, L. (2001a). Spatio-temporal Semantics for Locating Adverbials. Forthcoming.

- Asher, N., Hardt, D., and Busquets, J. (2001b). Discourse Parallelism, Ellipsis and Ambiguity. *Journal of Semantics*. In press.
- Asher, N. and Morreau, M. (1991). Commonsense Entailment: A Modal Theory of Non-monotonic Reasoning. In: *Proceedings of the Twelfth IJCAI* (J. Mylopoulos and R. Reiter, eds.), pp. 387–392. Morgan Kaufman, Los Altos, CA.
- Bras, M. and Asher, N. (1994). Le raisonnement non-monotone dans la construction de la structure temporelle de textes en français. In: *Actes de RFIA'94*, volume 2, pp. 223–234. AFCET, Paris.
- Bras, M., Le Draoulec, A., and Vieu, L. (2001a). Connecteurs et temps verbaux dans l'interprétation temporelle du discours : Le cas de 'puis' en interaction avec l'imparfait et le passé simple. *Cahiers Chronos*. In press.
- Bras, M., Le Draoulec, A., and Vieu, L. (2001b). Temporal Information and Discourse Relations in Narratives: The Role of French Connectives 'puis' and 'un peu plus tard'. In: *Proceedings of the ACL'01 Workshop on Temporal and Spatial Information Processing*.
- Busquets, J., Vieu, L., and Asher, N. (2001). La SDRT : Une approche de la cohérence du discours dans la tradition de la sémantique dynamique. *Verbum*. In press.
- Caenepeel, M. (1989). *Aspect, Temporal Ordering and Perspective in Narrative Fiction*. Ph.D dissertation, University of Edinburgh, Edinburgh.
- Caenepeel, M. and Moens, M. (1994). Temporal Structure and Discourse Structure. In: *Tense and Aspect in Discourse* (Co Vet and Carl Vetters, eds.), pp. 5–20. Mouton de Gruyter, Berlin, New York.
- de Swart, H. (1999). Position and Meaning: Time Adverbials in Context. In: *Focus: Linguistic, Cognitive and Computational Perspectives* (Peter Bosch and Rob van der Sandt, eds.). Cambridge University Press.
- Glasbey, S. (1993). Distinguishing between Events and Times: Some Evidence from the Semantics of Then. *Natural Language Semantics*, **1**, 285–312.
- Gómez Txurruka, I. (2000). The Semantics of 'and' in Discourse. Technical Report ILCLI-00-LIC-9, ILCLI, University of the Basque Country.
- Gosselin, L. (1999). Le sinistre Fantomas et l'imparfait narratif. *Cahiers de Praxématique*, **32**, 19–42.
- Greenbaum, S. (1969). *Studies in English Adverbial Usage*. Longmans, London.
- Grevisse, M. (1993). *Le bon usage*. Duculot, 13th edition.
- Hansen, M.-B. (1995). Puis in Spoken French: From Time Adjunct to Additive Conjunct? *French Language Studies*, **5**, 31–56.
- Hinrichs, E. (1981). *Temporale Anaphora im Englischen*. Magisterarbeit dissertation, Universität Tübingen.
- Hobbs, J. R. (1985). On the Coherence and Structure of Discourse. Report CSLI-85-37, Center

for Study of Language and Information, Stanford.

- Johnston, M. (1994). *The Syntax and Semantics of Adverbial Adjuncts*. PhD Dissertation, University of California at Santa Cruz.
- Kamp, H. and Reyle, U. (1993). *From Discourse To Logic*. Kluwer, Dordrecht.
- Kamp, H. and Rohrer, C. (1983). Tense in Texts. In: *Meaning, Use and the Interpretation of Language* (R. Bauerle, C. Schwarze, and A. Von Stechow, eds.), pp. 250–269. De Gruyter, Berlin.
- Lascarides, A. and Asher, N. (1991). Discourse Relations and Defeasible Knowledge. In: *Proceedings of the 29th annual meeting of the ACL*, pp. 55–63.
- Lascarides, A. and Asher, N. (1993). Temporal Interpretation, Discourse Relations, and Commonsense Entailment. *Linguistics and Philosophy*, **16**(5), 437–493.
- Mann, W. and Thompson, S. (1987). Rhetorical Structure Theory : A Theory of Text Organization. Reprint Series ISI/RS-87-1190, Information Sciences Institute, Marina del Rey, CA.
- Mélis, L. (1983). *Les circonstants et la phrase*. Presses Universitaires de Louvain, Louvain.
- Molendijk, A. (1990). *Le passé simple et l'imparfait : une approche reichenbachienne*. Collection Faux titre. Rodopi, Amsterdam.
- Molinier, C. (1990). Une classification des adverbes en -ment. *Langue française*, **88**, 28–40.
- Polanyi, L. (1988). A Formal Model of the Structure of Discourse. *Journal of Pragmatics*, **12**, 601–638.
- Reyle, U. (1999). A Note on Enumerations and the Semantics of ‘puis’ and ‘alors’. *Cahiers de Grammaire*, **23**, 67–79.
- Robert, P. (1994). *Le Grand Robert de la langue française (version électronique)*.
- Sandström, G. (1993). *When-clauses and the Temporal Interpretation of Narrative Discourse*. PhD thesis, University of Umeå, Department of General Linguistics.
- Thompson, E. (1999). The Temporal Structure of Discourse: The Syntax and Semantics of Temporal Then. *Natural Language and Linguistic Theory*, **17**, 123–160.
- Vet, C. (1980). *Temps, aspect et adverbes de temps en français contemporain*. Droz, Genève.