

The discourse-level sensitivity of consequence discourse markers in French*

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Abstract

In this article, we show that the traditional taxonomies of discourse levels, usually formulated in terms of speech-act, belief and propositional content, are not sufficient to explain some linguistic data. It is well known that consequence discourse markers can connect beliefs, as in John's car is here, so he must be home, or its French counterpart La voiture de Jean est là, donc il doit être chez lui. In such cases, the first belief (that John's car is here) brings about the second belief (that John is at home). However, certain French causal discourse markers, such as de ce fait and du coup, are not appropriate in these or similar environments. Rather than rejecting the idea that there is a causal connection between beliefs, we propose that de ce fait and du coup are sensitive to the type of rule (causal or abductive) used to substantiate the consequence relation. De ce fait and du coup do not accept abductive rules (in which, superficially, the effect is mentioned before the cause), which we contrast with causal rules by means of the modal notion of perspective. We extend this treatment in terms of rule sensitivity to the subordinating conjunction parce que 'because', and introduce the dimension of illocutionary goals as defined by Searle to account for some unexpected linguistic contrasts involving parce que. The relevance of perspectives and illocutionary goals suggests that discourse-level sensitivity has to be conceived in a more refined and complex way than is usual.

Keywords: discourse markers; discourse levels; consequence; cause; abduction; modal logic; dynamic semantics.

1. Introduction

It is well known that discourse relations (sometimes abbreviated as DRs) and discourse markers (DMs) have the apparent ability to relate different types of semantic objects. For instance, (1a) seems to exploit a relation

between propositions and (1b) a relation between a proposition and a speech act.

- (1) a. I'm late, (so) I'll take a taxi.
b. I'm late, (so) can you call a taxi?

In this article, we show that this conception is intuitively correct but needs some refinement to be applied to more fine-grained phenomena in French. In section 2, we address the problem of epistemic states as possible terms of consequence/cause relations. In essence, we propose a richer ontology in which inference rules play a central role. In section 3, we consider the case of *parce que* 'because' in relation to the speech-act level.

2. Epistemic states and consequence discourse markers

2.1. The standard approach

It is generally assumed in the literature that discourse relations can be anchored at different discourse levels: the content level, the epistemic level and the speech-act level, as illustrated by the following three examples.

- (2) a. *Jean est arrivé en retard. Il a raté son train.* [Content level.]
'John was late. He missed his train.'
b. *Jean doit avoir eu un accident. Il a le bras dans le plâtre.*
[Epistemic level.]
'John must have had an accident. His arm has been plastered.'
c. *Depuis trois semaines Marie ne vient plus au séminaire. Est-ce qu'elle est malade?* [Speech-act level.]
'Mary has not attended the course for three weeks. Is she ill?'

Discourse markers can also exploit these three levels or *domains* (Sweetser 1990).

- (3) a. *Jean est arrivé en retard. Donc il a raté son train.*
'John was late. So he missed his train.'
b. *Jean doit avoir eu un accident, parce qu'il a le bras dans le plâtre.*
'John must have had an accident, because he has a plastered arm.'
c. *Depuis trois semaines Marie ne vient plus au séminaire. Donc est-ce qu'elle est malade?*
'Mary has not attended the course for three weeks. So, is she ill?'

This is not surprising. The two discourse relations of EXPLANATION and CONSEQUENCE can hold between entities of the sort denoted by abstract classifiers such as *proposition*, *fact*, or *event* (see Vendler 1967, 1972 and Asher 1993 for discussion); for simplicity, we will use the generic term of *content*, ignoring the differences between these three subclasses and many

others (*possibilities, tropes*, etc.). For example, a fact can be a consequence of another fact. The relations can also hold between epistemic states. While contents purport to refer to “objective” states of affairs, i.e., describe what is the case, epistemic states describe beliefs or, more generally, opinions (for instance deontic judgments) held and made by the speaker. Note that, in principle, the possibility that the same sentence refer to some content, for instance a fact *f*, and an epistemic state (the belief that *f*) is not excluded. Finally, a speech act can either be explained by an epistemic state or be a consequence of it. Connections between speech acts and other semantic objects are crucial in models which rely on some form of planning to account for some conversational or discourse moves (see Asher and Lascarides [1998] for a recent perspective).

2.2. *The problem of epistemic modals*

Like *must* in English or *muß* in German (Kratzer 1981), the verb *devoir* in French may signal that the speaker does not report a fact but rather the consequence of a personal inference. In example (4), the speaker indicates that John having had an accident is not necessarily a real event, but rather the result of an inference from the fact that John has a plastered arm.

- (4) *Jean a le bras dans le plâtre; il doit avoir eu un accident.*
‘John has a plastered arm; he must have had an accident.’

Starting from this property of *devoir*, we can make a number of observations or natural assumptions which, taken together, lead one to make the connection between discourse markers and epistemic discourse level more precise.

Assumption 1 (type-driven discourse-level sensitivity)

The different levels of discourse reflect the types of the entities which are linked by a discourse relation or a discourse marker. In particular, the epistemic level corresponds to a link involving at least one epistemic state.

Observation 1

In French, some consequence discourse markers cannot connect a fact and one of its possible explanations (Rossari and Jayez 1996). For instance, (5b) is quite strange.

- (5) a. *Jean a le bras dans le plâtre; donc/alors il a eu un accident.*
‘John has a plastered arm; therefore/so he had an accident.’
b. *Jean a le bras dans le plâtre; ?de ce fait / ?du coup il a eu un accident.*
‘John has a plastered arm; DM he had an accident.’

- c. *Jean a le bras dans le plâtre; ?de ce fait / ?du coup il doit avoir eu un accident.*

'John has a plastered arm; DM he must have had an accident.'

De ce fait and *du coup*, in contrast to *donc* and *alors*, do not tolerate causally abductive relations, that is, relations where the segment on the right expresses an epistemic state assessing the cause of the state of affairs mentioned in the left segment.¹ Note that this remains true when the right-hand segment contains an epistemic *devoir*, as in (5c).

Observation 2

The epistemic *devoir* is not compatible with parenthetical expressions of reportedness. In French, expressions such as *paraît-il*, *à ce qu'on dit*, *selon* + NP, which can be glossed by 'reportedly' or 'according to NP', signal that the speaker does not endorse what the sentence expresses. If *devoir* signals an inference by the speaker, the cooccurrence of report expressions and epistemic *devoir* is expected to be odd, which it is in (6). The observation generalizes to epistemic *pouvoir* 'may', modal predications on complement clauses (*il est possible que* 'it is possible that', etc.), and modal adverbs like *probablement* 'probably' or *certainement* 'certainly'.

- (6) *?Jean doit, paraît-il, avoir eu un accident.*
'John must reportedly have had an accident.'

Assumption 2

The epistemic *devoir* signals that the information expressed by the sentence is an epistemic state. This is a consequence of observation 2. One might argue that *devoir* signals only that the truth of the sentence is endorsed by the speaker, without giving any cue as to whether the sentence describes a state of affairs, an epistemic state, etc. *Devoir* would then be completely analogous to an explicit description of the speaker's mental state, like *je pense que* 'I think that', which is not compatible with *paraît-il*.

- (7) *Je pense que, ?paraît-il, Jean a raté son train.*
'I think that, reportedly, John missed his train.'

However, in contrast to *devoir* (see example [5c]), *je pense que* may be used in a pattern "X, *de ce fait / du coup je pense que* Y", where X and Y are abductively related.

- (8) *Jean a le bras dans le plâtre; de ce fait je pense qu'il a eu un accident.*
'John has a plastered arm; DM I think that he had an accident.'

So, *devoir* + VP does not describe a state of affairs corresponding to the speaker's mental state. The fact that causal connections signaled by

à cause de are compatible with explicit descriptions of mental states but not with *devoir* goes in the same direction.

- (9) a. *A cause de sa mine défaite, je pense que Jean a raté son examen.*
 'Because he looks terrible, I think that John flunked his exam.'
 b. *A cause de sa mine défaite, Jean ?doit avoir raté son examen.*
 'Because he looks terrible, John must have flunked his exam.'

Observation 3

De ce fait and *du coup* are compatible with the epistemic *devoir* when the sentences they connect follow the standard causal (non-abductive) order.

- (10) *Jean est arrivé en retard. De ce fait / Du coup il doit avoir raté son train.*
 'John was late. DM he must have missed his train.'

If assumption 2 is correct, *de ce fait* and *du coup* can introduce epistemic states. Observation 1 shows that these discourse markers are incompatible with abductive relations. So, it is not in virtue of introducing epistemic states that *du coup* and *de ce fait* are odd in (5b) and (5c), but in virtue of the abductive character of the relation, which is confirmed by observation 3. However, if *de ce fait* and *du coup* signal a standard causal connection, in which the mention of the cause precedes that of its effect, their incompatibility with abduction is not so clear. In abduction, the epistemic state paired with what is causally an effect is, in some sense, the cause of the epistemic state paired with what is causally a cause. For instance, in (5a), it is *because* the speaker knows that John has a plastered arm that she believes that John must have had an accident. We have to explain how *de ce fait* and *du coup*, which accept only causal relations, do not "see" abductive relations as causal at the level of epistemic states.

2.3. *Rules and discourse level*

We can maintain the set of assumptions presented in the previous section if we clarify the discourse-level sensitivity of consequence discourse markers. We propose that it is a reflection of a more basic sensitivity to the type of inference *rules* that are used to substantiate the consequence connection. Some discourse markers, which seem to select the types of the entities they connect (content versus epistemic state) actually select types of rules.

In Jayez and Rossari (1998), we proposed an account of consequence discourse markers in which the dynamics of discourse and the inference rules can be combined. The adoption of a dynamic perspective was motivated by problems with nonassertive speech acts (mainly imperatives).

For space reasons, we will not recapitulate this analysis here; however, we will take care to couch the present proposal in dynamic terms to ensure compatibility with our general framework. In addition to the treatment of nonassertive speech acts, another advantage of using a dynamic approach is that various notions of information states can be defined and compared in this framework in a natural and flexible way (see, for instance, Groeneveld 1995; Gerbrandy 1998).

Following the majority of recent frameworks (Fauconnier's [1984, 1997] *mental spaces*, DRT [Kamp and Reyle 1993], SDRT [Asher 1993], and dynamic semantics [Stalnaker 1978; Heim 1982; Veltman 1996]), we assume that discourse units (sentences or segments in our examples) correspond to moves in an information space, rather than just static descriptions of states of affairs. Specifically, we consider the contribution of an assertive sentence to be an *update*, in Stalnaker's (1978) or Veltman's (1996) sense, i.e., the elimination of all epistemic alternatives which are incompatible with the content of the sentence. For instance, the contribution of *Jean a raté son train* 'John missed his train' is to eliminate all the epistemic alternatives where John did not miss his train. For space reasons, we ignore here the contributions of other types of speech acts, such as commands or requests (see Jayez and Rossari 1998), and we simply assume that they are transitions between information states (but not necessarily updates).

A consequence discourse marker has a general semantic format $s \rightarrow s'$ DM $s' \rightarrow s''$, where $s_i \rightarrow s_j$ notes a transition from the information state s_i to the information state s_j . The update operation is noted by a plus sign, e.g., $s_i + \phi = s_j$ means that, updating s_i with ϕ leads to a state s_j . We say that a transition *succeeds* when the resulting state does not contain contradictory information. For instance, an update of form $+ \phi + \sim \phi$ may not succeed since it introduces ϕ and $\sim \phi$. Semantically, a consequence discourse marker is a constraint on the two transitions corresponding to the two discourse segments which are related.

(11) *Consequence discourse markers*

A discourse of the form X DM Y, where DM is a consequence discourse marker, is appropriate with respect to a set of inference rules R only if, when the transition corresponding to X succeeds and the update of the resulting state with R succeeds, we are in a state where the transition corresponding to Y necessarily succeeds.²

Definition (11) entails that, whenever X (typically, a sentence) corresponds to a transition $s_i \rightarrow s_j$, the update of s_j with R (i.e. $s_j + R$) is a state s_k such that the transition $s_k \rightarrow s_l$, where s_l is the result of the transition based on Y, always succeeds. For instance, in (10) we have the following

sequence: $s_i + \text{"John was late"} = s_j$, $R = \{\text{"If John was late, he must have missed his train"}\}$, so $s_j + R = s_k$ contains "John was late" and "If John was late, he must have missed his train". Therefore, by *modus ponens*, s_k contains "John must have missed his train" and the update with "John must have missed his train" necessarily succeeds, unless one of the intermediate states, s_j or s_k , is inconsistent, which means that at least one of the intermediate updates failed.

Note that the definition is conditional; it does not require that there be any actual update but only that a certain sequence of possible updates be successful. Rule sets are not in general so simple as this. They can have internal structure (rule hierarchy, defaults, etc.) and give rise to complex interactions (see Pollock 1995). Ignoring such details, we just assume for the moment that they are sets of *typed* premise(s)–conclusion pairs, of the form $\phi_1 \dots \phi_n \Rightarrow_{\text{CAUSE}} \psi$ OR $\phi_1 \dots \phi_n \Rightarrow_{\text{ABD}} \psi$. The label CAUSE/ABD indicates the type of rule, causal or abductive.

Returning to consequence discourse markers, we propose that they are sensitive to the type of rule(s) on which they ground the dynamic connection. *Donc* and *alors* accept causal and abductive rules, while *de ce fait* and *du coup* accept only causal rules. Does this follow from the semantic properties of *fait* 'fact'? It has been noted in the relevant literature (Vendler 1967, 1972; Asher 1993; Jayez and Godard 1999) that the words *fait* and *fact* refer to the world "as it is". To this extent, one might propose that relations involving facts are not constructed by cognitive agents, but only *observed* by them. This would be the reason why *fait* and *fact* resist abductive inference, which relies on perspectives:

- (12) *Le fait qu'il a le bras dans le plâtre ?entraîne le fait qu'il a eu un accident.*

'The fact that he has a plastered arm ?causes the fact that he had an accident.'

Since the word *coup* denotes a factual event (something which is the case and is an event, not a state), it would also resist abductive inference. However there are reasons not to adopt this hypothesis. First, there are modal facts:

- (13) *Le fait que Jean a dû rater son train nous incite a retarder la réunion.*

'The fact that John must have missed his train invites us to delay the meeting.'

So, facts are not entirely alien to the perspectives of agents. Second, example (12) is misleading. The verb *entraîner* has a strong causal flavor which is in itself incompatible with abduction. If we replace it with *impliquer* 'to entail', the incompatibility with abduction disappears.

- (14) *Le fait que Jean a le bras dans le plâtre implique qu'il a eu / a dû avoir un accident.*

'The fact that John has a plastered arm entails that he had/must have had an accident.'

So, whatever the influence of *fait* and *coup* might be, the observed constraint is not a simple reflection of the lexical meaning of the noun occurring in those two discourse markers.

We noted that *de ce fait* and *du coup* can introduce sentences with *devoir*, which do not describe states of affairs, as evidenced by their incompatibility with *à cause de* (examples [9a], [9b]). We must streamline our constraints in order to allow *de ce fait* and *du coup* to use causal rules without turning them into causation markers which connect only contents.

2.4. Rules and perspectives

The Stalnaker/Veltmann notion of information state does not allow one to make a clear distinction between states of affairs in the world and epistemic states, since, in a sense, everything is epistemic in such models. Our first task is to enrich the notion of information state.

- (15) *Information states of an agent*

Let Σ be a set of propositions, and I a set of atoms, a *perspective* π on Σ is a pair $\langle i, \Sigma \rangle$, where $i \in I$; i is called the viewpoint of the perspective. Let a be an agent, the *information state* of a is a pair $\langle \Phi, \Pi \rangle$, where Φ is a set of propositions and Π is a set of perspectives.

Φ represents what an agent "knows" (actually, what she takes for certain). The viewpoints i provide sets of indices for the different accessibility relations. For instance, we might have a set of viewpoints $\{i_1 \dots i_n\}$ which enumerates all the plausible epistemic alternatives of a given agent. Mind the fact that, in theory, two different viewpoints i_j and i_k may be associated with the same set of propositions Σ , for instance if i_j and i_k measure degrees of plausibility or correspond to different hypothetical events ("What would plausibly be the case if ...?") that do not distinguish among plausible propositions. This definition is an adaptation to the finite case (of depth 1) of the more general notion introduced in Gerbrandy (1998).³ It allows us to distinguish more precisely between the causal and abductive rule types. Abductive rules are *modal* in the sense of traditional modal logic. Well-known modal operators are possibility (**P**) and necessity (**N**). Let $\langle \Phi, \Pi \rangle$ be an information state. A possible definition for **P** and **N** is that **P** ϕ is true in Φ iff ϕ is true in some perspectives of Π , while **N** ϕ is true in Φ iff ϕ is true in every perspective of Π .⁴ More generally, a modal

operator \mathbf{M} selects a subset of Π (the relevant perspectives) and requires that ϕ be true in some or all the members of this subset for $\mathbf{M}\phi$ to be true in Φ . Let a proposition be *ordinary* if no modal operator occurs in it. Ordinary propositions correspond to states of affairs. It is perfectly possible that the same sentence denotes a fact f (an ordinary proposition) and an epistemic state of believing f , in which case all the perspectives representing the plausible epistemic alternatives of the agent contain the proposition (this is analogous to the Stalnaker/Veltmann definition).

(16) *Types of rules*

Let $\langle \Phi, \Pi \rangle$ be the information state of some agent a . A *causal* rule on $\langle \Phi, \Pi \rangle$ is a rule of the form $\phi \Rightarrow_{\text{CAUSE}} \psi$ or $\mathbf{M}\phi \Rightarrow_{\text{CAUSE}} \mathbf{M}'\psi$, where ϕ and ψ are ordinary and ϕ expresses a possible cause of ψ . An *abductive* rule on $\langle \Phi, \Pi \rangle$ is a rule of the form $\mathbf{M}\phi \Rightarrow_{\text{ABD}} \mathbf{M}'\psi$, where ϕ and ψ are ordinary and ψ expresses a possible cause of ϕ .

The meaning of this definition is that the distinction between cause and abduction pertains to the realm of contents. Note that, in contrast to a causal rule, the conclusion of an abductive rule is always modal. This reflects the intuition that abduction makes use of perspectives.⁵ The definition of updates must be modified to take perspectives into account. We define the update of $\langle i, \Sigma \rangle$ with ϕ , $\langle i, \Sigma \rangle + \phi$ in symbols, to be $\langle i, \Sigma + \phi \rangle$. Updates with modal expressions of the form $\mathbf{M}\phi$ entail updates of the corresponding perspectives. For instance, if \mathbf{M} is universal, an update of Φ with $\mathbf{M}\phi$ entails an update of all perspectives selected by \mathbf{M} with ϕ . This extends to *devoir* and non-modal updates. One usually considers *devoir* to correspond to an operator which selects those perspectives that represent the agent's reasonable epistemic alternatives. Such alternatives encompass what an agent does not know for sure but simply considers possible or plausible, given what she knows. In particular, all reasonable alternatives contain what the agent knows for sure (since this is certainly possible and plausible for the agent). This entails that any update of Φ with ϕ is echoed by an update of every reasonable alternative with ϕ . As argued in Jayez and Rossari (1998), this is also true for imperatives, when they are interpreted as commands or invitations.

The difference between *donc* and *alors*, on one side, and *de ce fait* and *du coup*, on the other, can be expressed by saying that *de ce fait* and *du coup* forbid the use of abductive rules. However they do not forbid the use of causal rules of the form $\mathbf{M}\phi \Rightarrow_{\text{CAUSE}} \mathbf{M}\psi$. This allows us to explain why example (10) makes sense. Starting with $\langle \Phi, \Pi \rangle$, we update Φ with "John was late" and get $\langle \Phi' = \Phi + \text{late}, \Pi' \rangle$, where Π' is the result of updating all the reasonable alternatives in Π with *late*. Next, we update $\langle \Phi', \Pi' \rangle$ with the rule *late* \Rightarrow *must* (*miss train*), which gives $\langle \Phi'', \Pi'' \rangle$. At this stage,

Φ' contains *must* (*miss train*) and every reasonable alternative in Π' contains *miss train*. So the update with *must* (*miss train*) is trivial.

What is the difference between *de ce fait / du coup* and *à cause de*? *À cause de* selects causal rules, but, in addition, it requires that they relate states of affairs in the world, that is—in our simplified model for rules—causal rules between ordinary (non-modal) propositions. Thus, the difference between the consequence discourse markers and *à cause de* can be reflected by the following constraint.

(17) *Rule types*

Donc and *alors* are compatible with causal and abductive rules. *De ce fait*, *du coup*, and *à cause de* are only compatible with causal rules. *À cause de* is only compatible with causal rules relating ordinary propositions.

This proposal has three main features. First, it is consistent with the intuition that *de ce fait* and *du coup* are “more” causal than *donc* and *alors* and “less” causal than *à cause de*. Second, it does not require that we change in any essential way the basic update mechanism; the only significant change concerns the rules, which receive types (not just labels) and can be exploited by discourse markers in various ways. As a result, for the discourse markers we considered, the sensitivity to discourse level is not directly coded in the lexical instructions of the lexical items, but rather emerges through the constraints they put on rule type and rule use. Third, our proposal leaves room for the difference between content and epistemic states, as in the (by now) traditional approach of discourse levels.

3. Speech acts and *parce que*

3.1. *The problem*

Examples like (18) suggest that *parce que* may connect speech acts to other discourse entities. The proposition that I have to fix the shelf is offered as a possible explanation/justification for the question.

(18) *Tu peux me trouver le marteau? Parce qu'il faut que je répare l'étagère.*

‘Can you find the hammer? Because I have to fix the shelf.’

In contrast, (19) is very strange, although the proposition that the speaker wants to spare the addressee some troubles can be viewed as a possible justification for the assertion (interpreted as a warning).

(19) *Jean est très violent. ?Parce que je ne veux pas que tu aies d'ennuis.*

‘John is very violent. ?Because I don't want you to get into trouble.’

Making the warning value more explicit does not redeem the sentence:

- (20) *Attention, Jean est très violent, ?parce que je ne veux pas que tu aies d'ennui.*
'Be careful, John is very violent, ?because I don't want you to get into trouble.'

Knott (1996) proposes that, for X *because* Y structures, the belief that Y may be, for the addressee, a reason for doing ϕ , where ϕ is the goal of the speech act X (obeying a command, answering a question, etc.). It is not clear that this accounts for (19). Believing that the speaker is trying to protect the addressee might be a reason for taking the warning into account. However, the spirit of Knott's proposal can be retained by introducing some modification. We propose that, in monologues, *parce que* is sensitive to the *illocutionary goal* or *point* of the primary act (for a direct speech act) or secondary act (for an indirect speech act). According to Searle (1969), the illocutionary goal of a representative act like the assertion *John is very violent* is to commit the speaker to the truth of the proposition expressed. Example (19) is strange because, for the addressee, believing that the speaker wants to protect her may not explain why the speaker would have to commit herself to the truth of *John is very violent*.

Note that it is important, in this respect, to distinguish between the illocutionary goal and a parallel goal which is to inform the addressee that John is very violent. In general, illocutionary goals do not count as assertions, that is, as updates. They constitute preconditions of the act, which live in the background, like presuppositions. However, it has been observed by Ducrot (1972) that discourse markers do not connect presuppositions. For instance, in (21), the presupposition that Mary has been studying French cannot be used with the discourse markers *parce que* and *because*.

- (21) *Marie a arrêté le français, #parce qu'elle voulait aller en France.*
'Mary stopped studying French, #because she wanted to go to France.'

This is not unexpected, since presuppositions are not asserted, do not give rise to updates (in a Stalnakerian framework), and are rather "anaphoric" (in van der Sandt's [1992] approach). So, if our hypothesis leads us to consider illocutionary goals as presuppositions of some kind, we have to forbid most discourse marker-based connection involving speech acts!

3.2. Illocutionary goal information state

Where are we? First, we can reasonably assume that illocutionary goals are not propositions introduced by updates, because in that case they would license consequence connections exactly like any proposition. For instance, we should have *What time is it? So run and fetch your watch* in parallel with *I want you to answer my question*, (the illocutionary goal of *What time is it?*) *so run and fetch your watch*. This is in agreement with Jayez and Rossari (1998), where it is shown that consequence discourse markers are only sensitive to the update/test operations associated with imperatives and questions. Second, illocutionary goals are clearly not presuppositions since they do not give rise to effects of the sort observed in example (21).

We propose that they are propositions in a special type of information state. Updates associated with assertions modify the standard information state, $\langle \Phi, \Pi \rangle$. Illocutionary goals modify the information in an alternative type of information state, which we term Γ . For simplicity, we merge our two information states to obtain $\langle \Gamma, \Phi, \Pi \rangle$. The semantic profiles of discourse markers determine which kind of updated information they “see”. Any assertive update has the following general properties (\mathbf{M} is supposed to be universal).

(22) *Assertive updates*

An assertive update with ϕ is a function defined by $\langle \Gamma, \Phi, \Pi \rangle + \phi = \langle \Gamma', \Phi', \Pi' \rangle$, where $\Gamma' = \Gamma +$ illocutionary goal of the assertion that ϕ , $\Phi' = \Phi + \phi$, and (i) if ϕ is an ordinary proposition, Π' is the result of updating every reasonable alternative in Π with ϕ ; (ii) if $\phi = \mathbf{M}\psi$, Π' is the result of updating every reasonable alternative in Π with ϕ and of updating every perspective selected by \mathbf{M} with ψ .

The consequence discourse markers reviewed in section 2 “see” only Φ for assertive updates:

- (23) Condition (11) applies only to Φ for consequence discourse markers and assertive updates.

In contrast, *parce que* can “see” Φ or Γ . In a monologue, it is appropriate only if it indicates the cause of a proposition introduced in Φ or Γ . There are important differences between these two cases, as shown in Groupe λ -1 (1975). When *parce que* exploits Φ , it behaves as a subordinating conjunction combining two sentences into a complex sentence. When it exploits Γ , it behaves semantically like adverbial discourse markers and syntactically like a conjunction (it has a fixed position at the beginning of the sentence).⁶ Semantically, that is, in terms of update, there is

a parallel distinction. We assign to *parce que* the condition (24), which is the counterpart of (11).

(24) *Parce que*

A discourse of the form ϕ *parce que* ψ is appropriate in a monologue with respect to a set of rules R and an information state $\langle \Gamma, \Phi, \Pi \rangle$ of a iff

1. (i) ϕ and ψ are ordinary propositions; (ii) whenever the update of Φ with ϕ succeeds and the update of the resulting state with R succeeds, the update with $\psi \Rightarrow_{\text{CAUSE}} \phi$ necessarily succeeds; (iii) The resulting state is updated with $\psi \Rightarrow_{\text{CAUSE}} \phi$ and ψ , or
2. If the update of Γ with the illocutionary goal of ϕ , say $ig(\phi)$, succeeds and the update of the resulting state with R succeeds, the update with $\psi \Rightarrow_{\text{CAUSE}} ig(\phi)$ necessarily succeeds.

Condition 1 corresponds to the assertion of a causal link between two ordinary propositions; when *parce que* is licensed via this condition it is analogous to *à cause de*. Condition 2 is based on Γ . It applies to (18), for instance. If the rules (R) we can access entail that the fact that the speaker wants to know whether the hearer can find the hammer (in other terms, the illocutionary goal of the right-hand sentence) can be caused by the fact that he wants to fix something (and needs the hammer), the corresponding update will trivially succeed. Note that, by definition (22), the only real updates concern ϕ , ψ , and $ig(\phi)$. The other ones are virtual and check the deducibility of a causal relation. A more interesting case is the justification of modal judgments. Here, *parce que* is not a subordinating conjunction, since, for instance, no *it*-cleft transformation is possible:

(25) *C'est parce que Jean était en retard qu'il ?doit avoir raté son train.*

'It is because John was late that he must have missed his train.'

This shows that a sentence like *Jean doit avoir raté son train(,) parce qu'il était en retard* does not connect two propositions in a simple assertive way, whence the difference between the two conditions: the actual update of Φ with $\psi \Rightarrow_{\text{CAUSE}} \phi$ takes place only in the first case. Moreover, in contrast with condition (23), condition (24.2) allows the discourse marker to "see" illocutionary goals, a feature which is responsible for its "speech-act" sensitivity.

4. Conclusion

The proposed analysis reconstructs the discourse-level sensitivity of discourse markers as a sensitivity to information *type*. To this aim, we assume that discourse markers can select inference rules as well as the

arguments of updates (or, more generally, transitions), that is, different sets of propositions. Lack of space precludes the discussion of many interesting points, upon which we intend to elaborate in subsequent work. Let us simply mention the status of the *common ground* (Stalnaker 1978), or, more generally, the status of inference rules, the comparison of the rule/type combination used in our approach with the conceptual/procedural distinction familiar from relevance theory (Rouchota 1998), and with the *speaker-involvement* and *subjectivity* approaches of Pander Maat and Degand and Pander Maat and Sanders (this issue), where the causal relations can depend on the speaker to various degrees.

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Notes

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1. In such cases we assume that the right clause describes a content and an epistemic state (believing that the content is true).
 2. As duly pointed out by one of our reviewers, this definition is not really dynamic. Actually, we should resort to a more complex definition based on abduction. Roughly speaking, in this case, we have first the X update, then the Y update and a final set of updates with every set of rules R which allows one to deduce Y from $\{X\} \cup R$ (this is a form of dynamic rule abduction). We kept our partially static approach for simplicity, dynamic abduction being a notoriously difficult problem (Gabbay and Woods 2000).
 3. It does not lead us out of the dynamic framework, since Gerbrandy integrates the treatment of updates.
 4. Let $\pi = \langle i, \Sigma \rangle$ be a perspective, we say that ϕ is true in π if ϕ is in Σ .
 5. As pointed out by a reviewer, this does not entail that the rules themselves cannot be given a modal treatment; this is typically the case for causal operators (see Dowty 1979).
 6. A similar well-known difference exists in English with *because*. See Blakemore (1987) and Rouchota (1998) for a presentation.

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