

ON THE SEMANTICS OF TEMPORAL OPERATORS EXPRESSING ANTERIORITY AND POSTERIORITY^(*)

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0. Introduction

The purpose of this paper is to discuss the categorial-denotational status of *before* and *after* phrases, trying to assess whether they are better classified as temporal locating expressions, time-denoting expressions¹ or both. The conclusions to be drawn possibly apply to the counterparts of these expressions in other languages as well². I will concentrate on the occurrences of *before* and *after* in structures where they are not modified by predicates of amounts of time – e.g. in sequences like *John got married before Christmas*, but not *John got married two weeks before Christmas*. Unless otherwise stated, references to *before* and *after* and the claims to be made will concern only this type of occurrence. The structures where *before* and *after* combine with predicates of amounts of time – which pose specific problems – will be briefly discussed in section 3. The formal framework for analysis is the Discourse Representation Theory, as presented in Kamp and Reyle (1993).

1. Alternative analyses of *before* and *after* phrases

Sentences with adverbial *before* and *after* phrases – such as *John got married before Christmas* or *John got married before he graduated* – may have two seemingly equivalent analyses. One has three main ingredients: the event represented in the main clause (**e**), the interval represented by the complement of *before* or *after* (**t**₁) and the temporal relation of anteriority or posteriority that

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¹ Following a suggestion by Hans Kamp, I use *time-denoting expression* as a cover term for expressions that denote sets of intervals (i.e. predicates of times) and expressions that, arguably, directly represent intervals, such as *1980*. Although I argue here that *before* and *after* phrases are time-denoting expressions, I will not try to assess whether they are better analysed as expressions that denote sets of intervals or as expressions that directly represent intervals.

² At least in Portuguese – as I have checked – they do. This seems to indicate that the behaviour of this type of operators is cross-linguistically very stable with respect to the issues at stake.

connects them – cf. schema (1a) below. This first analysis takes the expressions with *before* and *after* as – basically – **temporal locating expressions**. It corresponds to the traditional view, according to which these two prepositions serve essentially to mark a value of anteriority or posteriority, between eventualities or between an interval and an eventuality – cf., for instance, the approaches of Heinämäki (1974), or Sinn (1992?), who says about the German counterpart of *before*: “There is general agreement in the literature that *bevor* is a purely locational (...) conjunction which expresses that the main clause situation is located prior to the complement clause situation (...).” (pp. 228-229).

An alternative analysis has four ingredients: **e** and **t₁** as above, plus the interval represented by the *before* or *after* phrase as a whole (**t₂**) and the temporal locating relation; this relation differs from that of the previous analysis: it connects **e** and **t₂** – not **e** and **t₁** as before – and is an inclusion (therefore, overlapping) relation – not an anteriority or posteriority relation; cf. schema (1b) below. This type of analysis has been advocated in the literature, for instance in Rohrer (1977), Hamann (1989) or Kamp and Reyle (1993). In these proposals, the expressions with *before* and *after* are taken simultaneously as **time-denoting expressions** and **temporal locating expressions**, i.e. expressions that represent intervals and locate eventualities relative to those intervals: “(...) we could say that in ‘John came before supper’ the temporal adverb ‘before supper’ specifies an interval in which the sentence ‘John came’ must be true. The same holds for the temporal clause ‘before Mary left’. Its sole function is to specify an interval in which the main clause occurs. (...) ‘yesterday’, ‘before supper’, ‘before Mary left’ (...) all belong to the same semantic category: they all denote intervals.” (Rohrer, 1977: 6)³; “What the phrase **after** α does is to divide the axis of time into two halves and to say of the described eventuality that it lies in the “upper half”. **Before**-phrases do much the same, except that they locate the eventuality in the “lower half”.” (Kamp and Reyle, 1993: 626-627).

- (1) a. [**e**: John get married]; [**Christmas** (**t₁**)] (or: [**e'**: he graduate]; [**t₁** = loc (**e'**)]); [**e** < **t₁**]⁴
 b. [**e**: John get married]; [**Christmas** (**t₁**)] (or: [**e'**: he graduate]; [**t₁** = loc (**e'**)]);
 [**t₂** \supset **t₁**]⁵; [**e** \subseteq **t₂**]

³ In this quotation, Rohrer highlights only the time predicate function of these expressions, but in his formalisation the temporal locating function is also considered (cf. definition (39), on page 6 of his paper).

⁴ For the sentence with a subordinate *before* clause, the analysis could in principle be made even simpler, involving just the two event discourse referents **e** and **e'**.

⁵ It may be discussed whether the relevant relation between **t₁** and **t₂** is abutment or simple precedence. I assume, in line with e.g. Rohrer (1977: 7), that the relevant relation is abutment. The interpretation of sentences or expressions like the following seems to favour this hypothesis (although for space reasons, I cannot argue for it here): (i) *John*

For the type of sentences presented above (but not for others that will be presented later), the differences between the two analyses at stake seem negligible. In fact, at first sight, not much seems to be gained or lost by analysing the sentence *John got married before Christmas*, for instance, as “the event of John getting married preceded Christmas” or, alternatively, as “it took place in a period that preceded Christmas”. If any of these analyses appears to be preferable – judging only by this data –, it is the first one, because of its relative simplicity: it accounts for the truth value of the sentences with one discourse referent less. In this paper, however, I will argue that the second analysis – or rather, one along its lines (that I will describe below) – is the most adequate. I will present linguistic evidence showing that the phrases headed by *before* and *after* behave as time-denoting expressions, and consequently that an independent time discourse referent (t_2 , in the examples above) is required in the DRS’s in order to correctly represent the semantic structure of the sentences in which they occur. Incidentally, it must be noted that this analysis provides by inferential means the information that the first explicitly states; thus, no information is lost by adopting it (cf. also (14)):

$$(2) [e \subseteq t_2] \wedge [t_2 \supset \subset t_1] \rightarrow [e < t_1]$$

Furthermore, I will argue that the most economic and revealing analysis of the phrases headed by *before* and *after* is the one that takes them as **mere time-denoting expressions**. This analysis implies postulating the existence of an obligatorily null temporal locating preposition – with a value close to that of *in* – to which the locating function is directly associated. A sentence like *John got married before Christmas* is thus interpreted as *John got married [in] before Christmas*. Under this analysis, *before* and *after* phrases are not temporal locating expressions, in the sense that the temporal relation involving the eventuality represented in the main clause – $[e \subseteq t_2]$, in the sentences above – is not directly associated with them, but with null *in*. An important consequence of this treatment is that it sets the operators *before* and *after* – taken as mere heads of time-denoting expressions – apart from other truly temporal locating operators, such as *in*, *on*, *at*, *during*, *throughout*, *while*, *since* or *until*. A similar analysis has been suggested in the literature – namely by Declerck (1991)⁶ –, but (to my knowledge) has not been elaborated upon.

left the house angry. Three months elapsed before Mary managed to see him again; (ii) the three hours before the trial; (iii) the three weekends before Christmas. Note, for instance, that there is an infinite number of three-hour periods before any trial, and an infinite number of weekends before any Christmas. However, the expressions in (ii) and (iii) can only pick out the relevant periods immediately preceding the time set by the complement of *before*.

⁶ The author hypothesises: “The adverbials *before the war* and *after breakfast* have the same meaning as *at some time before the war* and *at some time after breakfast*. (...) (Perhaps we can even consider *before/after the war* as a

Summarising, I advocate an analysis of sentences like *John got married before Christmas* or *John got married before he graduated* in which they are associated with the following DRS-conditions (NB: I change the subscripts of the time discourse referents for mnemonic reasons⁷, and incorporate some basic assumptions of Kamp and Reyle 1993 about temporal location – cf. note 8):

- (1) c. [e: John get married]; [Christmas (t_{cc})] (or: [e': he graduate]; [$t_{cc} = \text{loc}(e')$]);
 $[t_c \supset \supset t_{cc}]$; [$t = t_c$]⁸; [$e \subseteq t$]

Condition [$t_c \supset \supset t_{cc}$] is associated with *before*; conditions [$t = t_c$] and [$e \subseteq t$] are associated with the null locating operator [*in*]. Two main points – that I will try to argue for – are here at stake: (i) *before* and *after* phrases are time-denoting expressions; they introduce a discourse referent for an interval t_c , together with the condition (expressing minimal anteriority or posteriority) that defines it: [$t_c \supset \supset t_{cc}$] (for *before*), [$t_{cc} \supset \supset t_c$] (for *after*); (ii) *before* and *after* phrases are not (at the level of assertion) temporal locating expressions, i.e. the condition that defines the location time t (stating its equivalence with the subordinating interval t_c) – [$t = t_c$] – and the condition that locates the eventuality described in the matrix structure – e.g. [$e \subseteq t$] – are associated with the empty locating operator [*in*]⁹.

reduction from something like *at (a time) before/after the war*. This would be in keeping with the fact that some prepositions can appear overtly before *before/after*: *I stayed until after the game was over, I haven't seen him since before he left for America*.

Adverbial clauses introduced by conjunctions like *before* and *after* can be analysed in the same way. (...) the adverbial *after he had left* means 'at some time after he had left'." (pp.287-288).

⁷ t with no sub or superscript stands for the location time of the sentence; t_c stands for the time of the *complement* of a temporal locating preposition (e.g. *in, on, during, since* or *until*); t_{cc} stands for the time of a *complement* that is itself the *complement* of another operator (e.g. the time denoted by *Christmas* in the sequence *until after Christmas*).

⁸ I assume, in line with Kamp and Reyle (1993), that the temporal locating operator establishes a relationship between the location time and the time of the complement – $\mathbf{R}(t, t_c)$ –, which defines the former on the basis of the latter. t_c is therefore a **subordinating interval** relative to the location time. With respect to the relationship location time / time of the complement(s), temporal operators may be grouped into at least three different classes: (i) operators such as *in, on, at, during, throughout* or *while* are associated with a condition stating that the location time coincides with the interval represented by the complement of the temporal operator: [$t = t_c$] (cf. Kamp and Reyle 1993: 618); it is important to notice that, in some cases, this operator may be a null preposition \emptyset with a value close to that of *in* or *on* (according to some analyses proposed in the literature), as in *John got married \emptyset last Sunday* (analysis of Kamp and Reyle 1993: 623), or *John got married \emptyset yesterday* (analysis of Asher *et al.* 1995: 109, for the French counterpart of *yesterday*); (ii) operators such as *since, from* and *until* state that the location time either starts or ends – depending on the operator – in the interval represented by the complement of the operator: [$\text{beg}(t) \subseteq t_c$] (*since, from*), [$\text{end}(t) \subseteq t_c$] (*until*); (iii) operators such as *from...to/until* state that the location time stretches between the two intervals represented by the complements of the temporal operator: [$\text{beg}(t) \subseteq t_{c1} \wedge \text{end}(t) \subseteq t_{c2}$].

⁹ It may be a matter of debate whether this inclusive condition should be introduced by the rule processing the temporal locating operator itself (a rule that is sensitive to the aktionsart of the main clause) – as I assume – or by another rule (cf. e.g. the different procedures in Kamp and Reyle 1993: 543, 554). For space reasons, I side-step this issue here.

It must be clearly stated this analysis does not entail that *before* and *after* are not used in discourse mainly to convey an ordering of events and/or times. In fact, in many cases, as has been noted, the most salient and relevant information they convey seems to be precisely this ordering. What it simply states is that this ordering is not directly asserted via a condition “x precedes y” or “x follows y”, but rather that it is derived – or, more precisely, inferred – from a more complex formal process (sketched in (2); cf. also (14)), possibly together with some restrictions on the undefined bound of the interval represented by a *before* or *after* phrase¹⁰.

2. Analysis of *before* and *after* phrases as mere time-denoting expressions

In order to show the advantages of the above-proposed analysis, I will first present (in section 2.1) “indirect” evidence from the occurrence of *before* and *after* phrases in non-adverbial contexts and in adverbials headed by another temporal preposition (namely, *since* and *until*). The aim will be to show that only the proposed analysis allows a uniform treatment of the expressions at stake in all the contexts considered. In section 2.2, I will consider *before* and *after* phrases that surface as complete time adverbials and show the benefits of the analysis in question also for this type of structures.

2.1. A uniform analysis of different syntactic occurrences of *before* and *after* phrases

Before and *after* phrases can occur in contexts where they clearly behave as time-denoting expressions and where they seem not to have (if we ignore inferentially supplied information) a temporal locating function. I will refer to three of these contexts. Two of them involve structures where *before* and *after* phrases are verb arguments (therefore, not part of a temporal locating adverbial). These will be superficially dealt with. The third context – which has to do with the combination of *before* and *after* with *since* and *until* – will be explored in more detail, because it is especially revealing for the hypotheses under discussion in this text.

¹⁰ As has been pointed out by many authors (e.g. Heinämäki 1974, Rohrer 1977, or Kamp and Reyle 1993), the undefined bound of the interval represented by a *before* or an *after* phrase – i.e. **beg** (t_2) and **end** (t_2), respectively – can be restricted in several ways (i.e. these phrases do not normally represent completely unbounded intervals). Among the restrictions noted in the literature are: (i) restrictions that result from the interaction with other temporal locating adverbials, with the tense of the matrix clause or with the tense of the subordinate clause, and (ii) (pragmatic) restrictions having to do with the (normally short) distance between the eventualities represented in the main clause and the eventualities/times represented in the subordinate structure. For space reasons, it is not possible to analyse this issue here.

Temporal prepositions *before* and *after* occur as the head of verb arguments in, for instance, constructions with verb *to be* expressing identity that have a time-denoting expression as one term of the equation and a *before* or an *after* phrase as the second term:

- (3) a. The period of my life in which I felt happiest was before I quit studying.
b. The worst period in the History of Europe was after 1939.

The grammaticality of these constructions (with the intended meaning¹¹) seems to indicate that the phrases headed by *before* and *after* can represent intervals of time. Note that other typical time-denoting expressions can also occur in this context: *the period of my life in which I felt happiest was* {*the summer of 1980 / the seventies / the period when I was studying in the University*}. This context is somehow peculiar, however. In fact, at least some of the expressions that clearly behave as temporal locating adverbials (in most of the contexts in which they occur) can also be used in this type of identity construction: cf. *the period of my life in which I felt happiest was* {*while I went to the University / during my school days / ??in 1980 / ??until two years ago*}¹². Thus, this context does not reveal – contrary to others that will be presented in this section 2.1 – the special status of the *before* and *after* phrases, when compared with (some of) the “typical” temporal locating operators. In fact, what it seems to show is that the phrases headed by operators such as *while* or *during* can also behave as mere time-denoting expressions in certain cases, namely those exemplified above. These cases are however much more limited than those where *before* and *after* phrases – uncontroversially – have this property, as we will gather from the remaining examples of this section. I will not explore here the possible questions raised by these structures.

In a second type of construction where *before* and *after* phrases occur in a non-adverbial context, they are used as temporal arguments of predicates (that do not express an identity relation):

- (4) a. The president rescheduled the meeting for after the elections.
b. The unemployment problem dates from before the war.

¹¹ The relevant interpretation is the one in which *to be* is a verb asserting identity, not the one in which this verb means something like ‘happen’, ‘occur’, ‘take place’. If the order of the arguments in (3) is reversed, only the relevant meaning is preserved (although the sentences may appear somewhat less natural):

- (i) Before I quit studying was the period of my life in which I felt happiest.
(ii) After 1939 was the worst period in the History of Europe.

¹² The Portuguese counterpart of the sentence with *in* is used in informal speech with the intended meaning; the Portuguese counterpart of the sentence with *until* is slightly odd, although acceptable.

Again, *before* and *after* phrases are on a par with typical time-denoting expressions – cf. *the president rescheduled the meeting for {January / next week}* – and in contrast with typical temporal locating adverbials – cf. **the president rescheduled the meeting for {while the elections are taking place / during the elections / until the elections}*.

Before and *after* phrases can also be the complement of another temporal (locating) preposition, such as *since* or *until*¹³, a characteristic context of time-denoting expressions:

(5) John has been a teacher since before {1980 / he graduated}.

(6) John worked in this company until after 1980.

Once more, these phrases are in contrast with typical temporal locating adverbials – **John has been a teacher since {during 1980 / in 1980 / while he was in his fourth year at University}*.

Let us concentrate on the analysis of sentences like (5) or (6), where *before* and *after* phrases are dependent on other explicit temporal prepositions. For the sake of simplicity, I will only comment on example (5), with *since* and *before*, but the observations apply – with the relevant changes – to examples like (6), with *until* and *after*. The relevant DRS-conditions associated with this sentence are (ignoring the contribution of the Perfect): (i) [s: John be a teacher]; (ii) [t \subseteq s] (durative location); (iii) [beg (t) \subseteq t_c] and [end (t) = n]; (iv) [t_c \supset t_{cc}]; (v) [1980 (t_{cc})], or [e': he graduate] and [t_{cc} = loc (e')]. In this type of sentences, it seems rather uncontroversial that the *before* phrase is merely the designation of an interval (t_c) that marks the lower bound of the location time (t) for the eventuality described in the matrix structure ([beg (t) \subseteq t_c]). Clearly, it is the *since* adverbial and not the *before* adverbial that directly defines this location time t (conditions in (iii) above) and has the temporal location function (condition in (ii)). So, in this sentence, three distinct hierarchical levels of intervals are distinguished: the location time t, the “subordinating interval” t_c and the “super-subordinating interval” t_{cc}; these are (interdependently) defined by *since* – **R** (t, t) – *before* – **R**ĉ (t_c, t_{cc}) – and the complement of *before* – [**COMPL** (t_{cc})], respectively. In sum, in sentences with *since* or *until* – as well as in those where they head an argumental phrase –, *before* and *after* clearly seem to denote functions from intervals to intervals.

At this point, a question naturally arises, concerning the sentences in which *before* and *after* occur in adverbial position and where there is no explicit preposition before these operators, like *John got*

¹³ For a reference on the possibility of combining *since* with *before*, and *until* with *after*, see D.C. Bennett (1970: 280-281) or Declerck (1991: 288), for instance.

married before 1980. Can an account of this type of sentences be given, which results in a **uniform treatment** of the operators at stake? As I stated before, I think yes, provided we assume that these structures contain a null preposition with a value close to that of *in*, i.e. one that introduces a condition stating the equivalence between the location time and the time of the complement ($[t = t_c]$). Accordingly, the analysis of the sentence *John got married before 1980* would also involve the same three hierarchical levels of intervals: \mathbf{t} (such that $[t = t_c]$), \mathbf{t}_c (such that $[t_c \supset \subset t_{cc}]$) and \mathbf{t}_{cc} (such that $[1980 (t_{cc})]$). The location relation, given the presence of [*in*] and the aktionsart of the main clause, is expressed by the inclusive condition $[e \subseteq t]$. Briefly, resorting to an empty preposition in sentences like this has the advantage of allowing a **uniform treatment of the operators *before* and *after***. By introducing it, *before* and *after* can be taken to only denote – in all contexts so far considered – functions from intervals to intervals, i.e. they can always be regarded as mere heads of time-denoting expressions. Without resort to the empty locating operator, the *before* and *after* phrases would have to simultaneously play, in the relevant contexts, the two roles of time-denoting expressions and temporal locating expressions.

2.2. Motivation for an analysis of *before* and *after* phrases as mere time-denoting expressions in adverbial contexts

The uniform treatment of *before* and *after* phrases that I suggested in the previous section was motivated by the multiple categorial behaviour of the adverbials under analysis. In this section, I will claim that independent motivation exists for the two components of such treatment: (i) the assignment of the categorial-denotational status of time-denoting expressions to the relevant expressions – section 2.2.1; (ii) the postulation of a higher invisible temporal locating operator – section 2.2.2. I will focus here on the occurrence of *before* and *after* phrases in “full adverbial contexts”, i.e. in adverbial position and not depending on any explicit preposition.

2.2.1. Association of a time discourse referent with *before* and *after* phrases in adverbial contexts

A first argument in favour of an analysis in which *before* and *after* phrases are taken to represent intervals of time (t_c) in full adverbial contexts concerns the possibility of anaphoric reference to such intervals. Observe the following examples¹⁴:

- (7) a. This painting does not date from [before 1300]_{t'}.
 There were no paintings like this [then]_{t'} / at [that time]_{t'} / in [that period]_{t'}
- b. Every student who graduated [before the stock market crashed]_{t'} is presently employed.
 It was not so difficult to get a job [then]_{t'}

A second argument in favour of the analysis under discussion concerns the similar behaviour of the *before* and *after* phrases and the typical temporal locators within sequences that (arguably exclusively) express temporal location. As claimed in the literature, in such sequences of two or more temporal locating adverbials, the intervals associated with each adverbial are related by an inclusion relation¹⁵:

- (8) a. John was born at three o'clock on Christmas Day, 1967.
 AT [three o'clock]_{t'} ON [Christmas Day]_{t''} [1967]_{t'''}: [$t' \subseteq t'' \subseteq t'''$]

In these sequences, if any two relevant intervals are disjunct, there is no (intersecting) interval that may work as the location time, which causes ungrammaticality, as in the following example: **John was born at three o'clock on Christmas Day, last summer*. The sentences below show that *before* and *after* phrases can also occur in sequences with other frame adverbials, representing smaller or bigger (location) intervals:

- (9) a. John visited his mother on a Sunday before Christmas.
 ON [a Sunday]_{t'} [before Christmas]_{t''}: [$t' \subseteq t''$]

¹⁴ These examples also show that the time discourse referent associated with a *before* or an *after* phrase may be inserted in a DRS which is higher than the one in which that phrase is processed. Note that the *before* phrase of these examples is processed in a sub-DRS, dependent on the negation operator or on *every*, but the discourse referent t_c is accessible for anaphoric reference in the subsequent discourse. I will not pursue this issue here.

¹⁵ Cf., for instance, Declerck (1991: 284-285): "In some sentences there is more than one time adverbial, and hence more than one TE ["time established"]. In that case the (...) relationship of inclusion will (...) hold between the different TEs. (...) in *John was born at three o'clock in the morning on Christmas Day, 1967* there are four TEs, which are related in terms of inclusion (...). This appears to be a general rule in connection with the use of time adverbials (...)."

- b. John presented his paper on the first day of the conference in the afternoon before the break¹⁶.

ON [the first day of the conference]_{t''} IN [the afternoon]_{t'} [before the break]_t:

[t' ⊆ t'' ⊆ t''']

Now, in order for the above-mentioned principle of inclusion to apply also to these sentences, it is necessary to consider that *before* and *after* phrases represent intervals (ending or beginning, according to the preposition, in the moment nailed down by the complement of the preposition).

A third argument in favour of the hypothesis under discussion concerns the fact that adverbials with *before* and *after* can be the suppliers of a TPpt in the same terms as “typical” temporal locators. This can be seen combining the Portuguese counterpart of *before* with the *pretérito imperfeito* (equivalent to the French *imparfait*) in the main sentence. The *pretérito imperfeito* (or the *imparfait*) expresses overlapping of the described eventuality *ev*¹⁷ to a past TPpt: [ev ○ TPpt < n]; this past TPpt has to be defined in the discourse context, and a very common way of fixing it is to associate it with the interval denoted by a temporal adverbial: *o John vivia em Paris {em 1980 / nessa altura / quando a guerra começou}*; *John habitait à Paris {en 1980 / a ce moment là / quand la guerre est commencée}*¹⁸. The adverbial that fixes the TPpt can also be (the counterpart of) a *before* or *after* phrase:

(10) O John vivia em Paris *antes de 1940*. / John habitait à Paris *avant 1940*.

By associating *before* and *after* phrases (and their counterparts) to a discourse referent *t_c*, the relationship between TPpt and the time set by the temporal adverbial can always be considered as inclusive; in other words, the time adverbial always constitutes a frame for the TPpt: [TPpt ⊆ t]. Without the discourse referent *t_c*, the TPpt cannot be defined by an inclusion condition in structures with (the counterparts of) *before* and *after*; instead, an anteriority or posteriority condition, respectively, has to apply. See the following schemes:

¹⁶ This example shows the need to define a lower bound for the interval denoted by the *before* (and, for that matter, *after*) phrases. In this case, this boundary has to be within the afternoon, so that the inclusion relation holds between all intervals.

¹⁷ I will henceforth use *ev* as a discourse referent for eventualities (of any aktionsart type).

¹⁸ The simple sentences *o John vivia em Paris* and *John habitait à Paris* are odd, if decontextualised.

- (11) a. o John vivia em Paris em 1980 (*John lived_{IMPERF} in Paris in 1980*)
 [1980 (t_c)], [$t_c = t$], [$ev \circ t$] [TPpt < n], [TPpt \hat{I} t] [$ev \circ$ TPpt]
- b. o John vivia em Paris antes de 1940 (*John lived_{IMPERF} in Paris before 1940*)
 [before 1940 (t_c)], [$t_c = t$], [$ev \circ t$] [TPpt < n], [TPpt \hat{I} t] [$ev \circ$ TPpt]
 vs. without the discourse referent t_c (i.e. with only t_{cc}):
 [1940 (t_{cc})], [$ev < t_{cc}$]¹⁹ [TPpt < n], [TPpt < t_{cc}] [$ev \circ$ TPpt]

A fourth argument involves a property of time-denoting expressions exhibited by *before* and *after* phrases, namely the possibility of paraphrasing these expressions (in many cases) with a temporal NP – *the period before..., the period after...:*

- (12) a. John was a teacher before 1980. \Leftrightarrow
 b. John was a teacher in the period before 1980.
- (13) a. This painting dates back from before the Ist World War. \Leftrightarrow
 b. This painting dates back from the period before the Ist World War.

This contrasts with the oddity or ungrammaticality of expressions with *the period* in combination with (most) temporal locating operators: *??the period while I was in Brazil, *the period in 1980, *the period during the war.*

An additional motivation for introducing an independent time discourse referent for *before* and *after* phrases comes from the fact that this procedure allows a simpler and more uniform treatment of temporal location relations, namely one that integrates the following two generalisations: (i) events are always associated with an inclusive relation – [$e \subseteq t$]; (ii) atelic eventualities are always associated with an overlapping relation – [$s \circ t$] (the contrast durative / non-durative location being easily stated²⁰). In

¹⁹ This condition seems too strong (if we take the discourse referent ev to refer to the whole state or activity described in the main clause). A sentence like *John was in the house before Mary arrived* does not entail that John was no longer in the house when Mary arrived. A weaker condition [$beg(ev) < t_{cc}$] seems to be the relevant one. In the analysis I propose, this is exactly the condition inferred in these cases: [$ev \circ t$] \rightarrow [$beg(ev) < t_{cc}$] (cf. (14)).

²⁰ For a sentence like *John was happy before 1980*, these two types of location can be paraphrased as “John was always happy before 1980” or “John was happy during the whole period that preceded 1980” (durative), and “John was happy sometime before 1980” (non-durative). The contrast durative / non-durative location of atelic eventualities can be easily expressed, in the analysis advocated here, by the following opposition (which can be used for other time adverbials as well): [$t \subseteq s$] (durative location) vs. [$s \circ t$] \wedge [$\neg[t \subseteq s]$] (non-durative location). In the analysis involving directly an anteriority relation, there is only (possibly) [$s < t_{cc}$]; therefore, no distinction between durative and non-durative reading seems possible. Note that in examples such as *John was happy before 1980*, the non-durative reading seems preferential; however, there are structures where a durative reading is clearly preferred; this occurs particularly in sentences in which a causal or implicational link is established between the main and the subordinate clause: *John was a world-class athlete before he had the accident; John lived in Lisbon before*

other words, temporal location by means of time adverbials (at least those that were considered in this paper) always involves overlapping relations between described eventualities and location intervals, no other type of relations – namely anteriority or posteriority – being required, at least as far as assertion goes. It is important to note that – as I said in section 1 – in the overlapping analysis, the anteriority or posteriority relation between the eventuality described in the main clause and the time/eventuality expressed in the complement of *before* or *after* is also obtained, although via inference rather than via assertion:

(14) structures with [*in before*] (same, with the relevant changes, for [*in after*]):

$[t = t_c] [t_c \supset \subset t_{cc}], [\text{COMPL}(t_{cc})]$ (or $[ev' : \text{COMPL}] \wedge [t_{cc} = \text{loc}(ev')]$ ²¹)

<u>location</u>	<u>assertion</u>	<u>inferences</u>
inclusive	$[ev \subseteq t]$	$[ev < t_{cc}]$ and $[ev < ev']$
durative	$[t \subseteq ev]$	$[\text{beg}(ev) < t_{cc}]$ and $[\text{beg}(ev) < ev']$
non-durative	$[[t \circ ev] \wedge [\neg[t \subseteq ev]]]$	$[\text{beg}(ev) < t_{cc}]$ and $[\text{beg}(ev) < ev']$

To finish this subsection, I will briefly refer to a possible counter-argument to the time-denoting analysis of (some) *before*-phrases that has been presented (and refuted) in the literature by Heinämäki (1974). The author states: “Non-factual *before*-clauses fail to nail down any interval, since the event mentioned in the clause never took place.” (p. 60) – cf. *Max died before he saw his grandchildren, the bomb exploded before it hit the target, John ate the apple before Bill did* (Heinämäki, 1974: 52, 56, 58). However, she also says: “We can use possible worlds explanation for the fact that non-factual *before* is temporal, too. The non-factual *before*-clause expresses something that would have happened had the main clause not become true. The non-factual *before*-clause describes one of the possible futures, which, however, did not become the real one, because something that happened earlier prevented that course of events.” (p. 60). Besides, as the author points out, “non-factual *before*-

he emigrated to Brazil. Given the diversity of possible locations – durative and non-durative –, the proposed analysis seems a better representational choice. The existence of both durative and non-durative readings – in the terminology I adopt – in sentences with descriptions of atelic situations and *before* and *after* phrases has been acknowledged in the literature (cf. e.g. Heinämäki 1978: 107, who discusses Kroch 1972, or Declerck 1991: 287, fn. 62).

²¹ In some cases, it is not **loc** (**ev**) that is relevant to define t_{cc} , but rather **beg** (**ev**) or **end** (**ev**) (obviously, in these cases, the inferences may be different from those presented here); for instance, the sequence *after John was a Ph.D.* normally picks out an interval starting at the beginning of the described state, i.e. $[t_{cc} = \text{beg}(ev')]$. This phenomenon, often described in the literature, is not specific to *before* and *after* phrases, but affects other temporal connectives in combination with subordinate clauses as well (e.g. *since* and *until*). It involves mainly the aktionsart of the described eventualities, probably in interaction with the temporal operator (but is not a fact dependent on the temporal operator alone). I ignore this question here. Note, however, that this fact seems responsible for some

clauses” occur in structures unequivocally temporal, namely with *the time at which* and with temporal measure phrases: *the bomb exploded before the time at which it would have hit the target*, *Granny died a month before she would have been 90* (*ibid.*). As far as I can see it, the problem these *before*-phrases pose – the non-veridicality of the eventualities described in the subordinate clauses (cf. e.g. Valencia, van der Wouden and Zwarts 1993) – seems orthogonal to the problem under discussion here. The status of the eventuality/time expressed by the subordinate clause is a problem for any analysis, independently of the status of *before* and *after* phrases as time-denoting expressions or as temporal locating expressions.

2.2.2. Presence of an empty locating preposition in sentences with *before* and *after* phrases in adverbial contexts

As we have seen, in the analysis I advocate, the temporal location relation of the sentences with *before* and *after* phrases in full adverbial contexts is overlapping/inclusion and not – directly – anteriority or posteriority. In this respect, the relevant sentences behave like those with e.g. *in*, *during* or *while* operators. Once we assume this analysis, two possibilities are open: either associating the overlapping/inclusion relation directly to the operators *before* and *after* (the same for both!), or considering the existence of a null preposition with a value close to that of *in*, to which the locating function is directly related²². The first possibility has various drawbacks. First and foremost, it does not allow a uniform treatment of the operators at stake: in adverbial contexts, phrases headed by *before* and *after* have to be attributed the two categorial-denotational statuses of temporal locators (of the eventuality described in the main clause) and interval designators, while in other contexts, these phrases only have the second status. Secondly, the temporal location relation associated with *before* and *after* (in full adverbial contexts) would be – rather counter-intuitively, I think – overlapping or inclusion and not anteriority/posteriority. Thirdly, the location relation is the very same for *before* and *after*, i.e. these operators are not distinguished with respect to temporal location (only with respect to interval denotation). The second possibility seems preferable, inasmuch as it has none of the above-mentioned shortcomings: (i) *before* and *after* are uniformly treated as mere time-denoting expressions; (ii) the

asymmetries noted between *before* and *after*: *Bill was a boy scout after John was* -/→ *John was a boy scout before Bill was* (Heinämäki 1974: 74).

²² I assume that, when temporal locating adverbials occur, the location conditions are not associated directly with aktionsart features (at the *S'* or *VP'* level), independently of the adverbials (Kamp and Reyle 1993: 543, 544); cf. note 9.

relation of overlapping or inclusion is associated with an operator that normally has this value – *in*; (iii) the non-distinction of sentences with *before* and *after* with respect to temporal location is due to the fact that the temporal operator is the same: null *in*²³.

The postulation of the null locating operator has some other advantages. Firstly, it allows a uniform treatment of semantically equivalent structures like the following:

- (15) a. That happened before {Christmas / I quit studying}.
b. That happened in the period before {Christmas / I quit studying}.

Note that these differ only in that, when *before* and *after* phrases are preceded by a nominal expression like the *period*, the preposition *in* has to be obligatorily made explicit.

Secondly, and quite importantly, the postulation of null operators seems to be required for other types of time-denoting expressions as well, not just for *before* and *after*. As was already said, the presence of a null temporal preposition has been proposed – for other type of time adverbials, like *last Sunday*, *yesterday*, or *now* – by several authors (cf. observations in note 7). However, there are more revealing cases. I think that an analysis along the lines advocated here for *before* and *after* is also advantageous for other (structurally complex) expressions that – as *before* and *after* phrases – are normally treated as temporal locating. This is, for instance, the case of English expressions with *ago*, *between* and possibly also *when* – and their counterparts in languages such as Portuguese –, which can occur (with different idiosyncratic restrictions) in the same type of environments as *before* and *after* phrases.

- (16) a. The unemployment problem dates from two years ago.
b. John was the president of this company until two years ago.
c. John got married $\emptyset_{in/at}$ two years ago.
- (17) a. This painting dates from between 1100 and 1300.
b. John has been in the airport since between 2 and 3 p.m.
c. Europe was at war \emptyset_{in} between 1914 and 1918.

²³ Note, by the way, that suppression appears to be an idiosyncratic property of preposition *in*, or similar. In fact, “bare” *before* and *after* phrases can occur in arguments typically headed by preposition *in*: *the Battle of Aljubarrota occurred before the end of the 14th century* (cf. *the Battle of Aljubarrota occurred in 1385*). Other argumental prepositions, however, are not omitted: *by government decision, elections were postponed from before the summer to after Christmas* (cf. *by government decision, elections were postponed from May to September*), *the meetings that were scheduled for before the end of the year...* (cf. *the meetings that were scheduled for November and December...*).

In a broader perspective then, the analysis under discussion – interestingly – entails a partition of the class of operators that are traditionally classified as temporal locating: (i) (strictly) temporal locating operators, such as *in*, *since* or *until*; (ii) heads of structurally complex time-denoting expressions, such as *before*, *after*, *ago* or *between*. I leave a more detailed study of this issue for further research²⁴.

3. Some notes on the combination of temporal operators *before* and *after* with predicates of amounts of time

So far, I have considered only the occurrence of *before* and *after* in structures where they are not combined with predicates of amounts of time. The reason was that these structures pose special problems, and ultimately (some of them) seem to indicate that *before* and *after* do not have the same behaviour in every context they occur in. I will proceed now to an analysis of these structures, which – for space reasons – will be relatively superficial.

Before and *after* may occur in combination with predicates of amounts of time in two different types of construction, exemplified in the following sentences:

- (18) a. The two weeks before the elections were particularly hectic.
b. Two weeks before the elections this candidate was still leading in the polls.

I believe that the sequences *two weeks before the elections* that occur in these two sentences have different syntactic structures and different semantic interpretations. I assume (skipping any syntactic argumentation) that: in sentence *a*, the predicate of amounts of time *two weeks* is the nuclear element of the NP (*the two weeks before the elections*) that has the *before*-phrase as a modifier (on the surface); in sentence *b*, the predicate of amounts of time *two weeks* is a kind of modifier of the connective *before*²⁵, and the sequence *before the elections* is not a constituent of the sentence. The semantic analysis of the operators *before* and *after* in sentences like *a* is basically as presented in section 2: these operators denote functions from intervals to intervals and are preceded by a null

²⁴ Note, however, that a further argument in favour of this partition is the possibility or recursion (given the appropriate conditions) of the operators that I classify here as heads of structurally complex time-denoting expressions (contrary to what happens with “true” temporal locators): *before two months ago*, *between two years ago and six months ago*, *between two months before the start of the war and the second week of the fighting*, [*more than three months elapsed*] *between when the bridge was built and when the first vehicles crossed it*.

²⁵ In this respect, *before* and *after* parallel a large group of expressions that include, for instance, comparative temporal expressions like *later* (*two months later*) or *earlier*, and spatial expressions like *into* (*six feet into*) or *behind* (*two metres behind*). Note that, though I use the term modifier here, I do not want to take a stand on the exact syntactic structure of these expressions.

locating operator *[in]* – *the two weeks [in] before the elections were particularly hectic*; in sentences like *b*, the semantics of *before* and *after* is quite different, no empty locating operator preceding the connective *before* and *after*.

I will consider these two uses of *before* and *after* separately in the following two subsections.

3.1. *Before* and *after* phrases surfacing as modifiers of predicates of amounts of time

In sentences like (18a) – *the two weeks before the elections were particularly hectic* –, *before* and *after* surface as modifiers of a predicate of amounts of time. In this context, this predicate represents the extent of an interval $t\mathfrak{C}$ that abuts the time nailed down by the complement of *before* or *after* (the sentence being equivalent to *the two-week period before the elections was particularly hectic*). In order to explain why I consider that the analysis proposed in section 2 can also be applied to these structures, I will first observe some general facts about temporal location and then consider some structures comparable with these. We should note that: (i) normally, the temporal adverbials that are used to locate eventualities described through main clauses (as e.g. *in 1980*) can also be used adnominally to locate eventualities described through nominal expressions – (a) *a wedding in 1980* – or to locate intervals – (b) *a Sunday in 1980*; (ii) in plural nominal expressions like *weddings in 1980* or *Sundays in 1980*, the described eventualities or intervals P are the **supremum** of the eventualities or times of the type mentioned that are contained in the locating time t : $[\Pi = \Sigma\pi \text{ [[wedding/Sunday } (\pi)] \wedge [\pi \subseteq t]]_{\mathbf{K}}]^{26}$; this becomes particularly evident in universally quantified NPs: *(all) the weddings in 1980*, *(all) the Sundays in 1980*, *(all) the 52 Sundays in 1980* (cf. **the three Sundays in 1980*). Now, we observe that *before* and *after* phrases may occur in the same type of environments as *in*-adverbials: (a) *a wedding before 1980*, (b) *a Sunday before 1980* (cf. *John got married before 1980*). For the uniformity reasons pointed out in section 2, I will postulate a null locating preposition *[in]* also for these structures: (a) *a wedding [in] before 1980*, (b) *a Sunday [in] before 1980*. Structures with plural nouns involve the type of maximal sums mentioned above: *(all) the weddings [in] before 1980*, *(all) the Sundays [in] before 1980*. Definite structures with specified cardinality – as e.g. *the three Sundays [in] before the elections* – have a further interesting characteristic: given the requirement (possibly associated with the use of the definite) that the supremum of Sundays contained in the referred interval that abuts the elections is formed only by three Sundays, they pose on the non-

²⁶ \mathbf{K} is sub-DRS whose universe contains the discourse referent p and the two conditions in square brackets.

explicitly defined bound of the *before*-phrase the constraint that it lies after the beginning of fourth Sunday in the past of the elections. I think that structures with predicates of amounts of times such as *the three weeks/hours before the elections* can have a similar analysis: *the three weeks/hours [in] before the elections*; the use of the definite entails, in this case, that the amount of time expressed by *three weeks/hours* coincides with the size of the interval represented by the *before*-phrase as a whole (i.e. the phrase represents an interval that stretches backwards from the elections exactly three weeks/hours). In this case, the *[in]* locator expresses the limit case of inclusion, i.e. coincidence (of the two relevant intervals: one represented by the predicate of amounts of time, the other by the *before*-phrase).

3.2. *Before and after modified by predicates of amounts of time*

The analysis of structures like (18b) – *two weeks before the elections this candidate was still leading in the polls* –, where *before* and *after* phrases are modified by predicates of amounts of time, is far too complex to be tackled within the limits of this paper. The reason to consider them here (though superficially) is that the analysis proposed so far does not seem to apply to these occurrences of *before* and *after*. The question of the ambiguity of these temporal operators is therefore raised.

First, let us observe that *before* and *after* phrases modified by a predicate of amounts of time can occur in the same three types of environments of simple *before* and *after* phrases, namely: (i) in non-adverbial position (*the president rescheduled the meeting for two days after the general assembly of stockholders*); (ii) as part of an adverbial introduced by an explicit temporal preposition such as *since* or *until* (*Igor lived in Russia until two months after his mother's death*), or (iii) as a complete temporal locating adverbial on the surface (*John got married two months after he graduated*). Thus, an analysis similar to the one sketched for simple *before* and *after* phrases in section 2 seems possible, i.e. we can consider that the expression “X-TIME before/after COMPL” is a mere time-denoting expression and that the locating function in full adverbial contexts is associated with an empty preposition. However, the crucial difference to note about this expression is that (arguably) the sequence “before/after COMPL” it contains does not represent an interval. In fact, it is even doubtful that this sequence is a constituent of the structure. One possible analysis – that seems plausible to me (though I cannot argue for it here) – is that “X-TIME before/after” is a complex operator that can take an NP or a sentence as a complement. In this view, it is the whole phrase “X-TIME before/after COMPL” that represents an interval t_c , which – as conveyed by *before* or *after* – lies a given amount of time

(referred to by “X-TIME”) in the past or in the future of the interval represented by COMPL (t_{cc})²⁷. A sentence like *John got married [in] two months before he graduated* can be associated with the following DRS-conditions: $[e: \text{John get married}]$, $[e \subseteq t]$, $[t = t_c]$, $[\text{dur}(t') = \text{mt}]$, $[2 \text{ months}(\text{mt})]$, $[\text{beg}(t') = t_c]$ ²⁸, $[\text{end}(t') = t_{cc}]$, $[e': \text{he graduate}]$, $[t_{cc} = \text{loc}(e')]$. The sole function of *before* and *after* in these structures seems to be the indication of the direction from t_{cc} in which the measurement must be made (in the formalisation above, via the “auxiliary” interval t), in order to define t_c : *before* indicates anteriority (by contributing the condition $[\text{end}(t') = t_{cc}]$), while *after* indicates posteriority (by contributing the condition $[\text{beg}(t') = t_{cc}]$).

By adopting this analysis, the operators *before* and *after* are assumed to have two different values each, thus being genuine examples of homonymous expressions. In structures without modifying predicates of amounts of time, they denote functions from intervals to – preceding or following – intervals. In structures with modifying predicates of amounts of time, they are markers that merely indicate the direction – backwards or forwards in time – for an operation of temporal measurement from a given point²⁹. A uniform semantic treatment of *before* and *after* in both types of structures is possible, though its complexity seems – at least at first sight – uncompensating. This uniform analysis consists of postulating an empty predicate of amounts of time – with an indeterminate value close to that of *some time* or *some amount of time* – in structures that do not exhibit these predicates. A sentence like *John got married before Christmas* would thus include two null operators: *John got married [in] [X-TIME] before Christmas*. The operators *before* and *after* would then act – in all cases – as direction markers (for an operation of time measurement), in the way defined above. I set a more thorough discussion of this hypothesis aside, for further investigation.

²⁷ Note the difference between “two months before COMPL” (represents the interval that precedes the time set by COMPL by an amount of time of two months) and “the two months before COMPL” (represents the interval of duration two months that precedes the time set by COMPL).

²⁸ The condition $[\text{beg}(t') = t_c]$ is too strong in many cases – cf. e.g. *John was in the hospital for two days six weeks after returning from Africa*; cases like this seem to indicate that these adverbials are not punctual (at least, not in every context). The condition $[\text{beg}(t') \subseteq t_c]$, however, is too weak, and needs to be complemented with further restrictions, defining the extent of t_c . I will not pursue this question here.

²⁹ An operation of counting of ordered entities (intervals, eventualities or objects) – instead of time measurement – may apply in structures with *before* and *after*: e.g. *three Sundays before the elections [Mary decided not to vote]*, *three classes before the examination [the teacher started to discuss a new book]*. This is valid for other temporal expressions, such as those with *ago*, for instance: *three Sundays ago*, *three classes ago*. Note that structures with this type of predicates – as *three Sundays before the elections* – may be ambiguous between an interpretation of the type under discussion – *three Sundays before the elections [Mary decided not to vote]* – and an interpretation involving temporal location of intervals, of the type discussed in 3.1 – *three Sundays before the elections [were particularly hectic]*.

4. Conclusions

In this paper, I tried to argue for the two following interrelated hypotheses: (i) *before* and *after* phrases are essentially – in every context in which they occur (except when modified by predicates of amounts of time) – **time-denoting expressions**; in DRT terms, this means the *before* or *after* phrase (as a whole) is associated with a time discourse referent (t_c) which is distinct from the one associated with the complement of the preposition (t_{cc}); (ii) in sentences where the interval associated with the *before* or *after* phrase coincides with the location time for the eventuality described in the main clause, there is an empty temporal locating preposition – [*in*] – to which the temporal location function is directly associated; accordingly, *before* and *after* phrases are never, in a direct way, **temporal locating expressions**. As a consequence of these hypotheses, the location relation associated with *before* and *after* phrases in (full) adverbial contexts is not conceived of as an anteriority or posteriority relation between the eventuality described in the main clause (ev) and the interval represented in the complement of *before* or *after*. Rather, it is conceived of, in line with several proposals in the literature, as an **overlapping relation** established between ev and the interval represented by the *before* or *after* phrase as a whole (t_c , or rather t such that $[t = t_c]$). In this overlapping analysis, the anteriority or posteriority relation (between ev and the time – or eventuality – expressed in the complement of *before* or *after*) is also obtained, although via inference rather than via assertion.

An interesting consequence of the analysis proposed in this paper is – as was noted at the end of section 2 – that it seems to favour a division of the class of operators that are traditionally classified as temporal locating into two different classes: (strictly) temporal locating operators, such as *in*, *since* or *until*, and heads of structurally complex time-denoting expressions, such as *before* or *after*.

In a nutshell, the analysis of *before* and *after* phrases as mere time-denoting expressions that in some contexts are preceded by an empty temporal operator ([*in*]) seems preferable when compared to the simple anteriority/posteriority analysis, insofar as it can be given motivation that cannot be found for the latter, while still being able to account – via inference – for the anteriority/posteriority relation. The most relevant piece of motivation is given by the uniform semantic treatment of the relevant operators.

REFERENCES

- ASHER, Nicholas, Michel Aurnague, Myriam Bras and Laure Vieu: 1995, "Spatial, Temporal and Spatio-temporal Locating Adverbials in Discourse", in Pascal Amsili, Mario Borillo and Laure Vieu (eds.), *Workshop Notes of the 5th International Workshop on Time, Space and Movement TSM'95*, pp. 101-119
- BENNETT, David Curtis: 1970, *Spatial and Temporal Uses of English Prepositions*, Ph.D. Dissertation, Yale University (published by University Microfilms, A Xerox Company, Ann Arbor, Michigan, 1974).
- DECLERCK, Renaat: 1991, *Tense in English. Its Structure and Use in Discourse*, Routledge, London/New York.
- HAMANN, Cornelia: 1989, "English Temporal Clauses in a Reference Frame Model", in Alfred Schopf (ed.), *Essays on Tensing in English, vol. II: Time, Text and Modality*, Max Niemeyer Verlag, Tübingen, pp. 31-154.
- HEINÄMÄKI, Orvokki: 1974, *Semantics of English Temporal Connectives*, PhD Thesis, University of Texas, Austin (reproduced by Indiana University Linguistics Club, 1978)
- KAMP, Hans and Uwe Reyle: 1993, *From Discourse to Logic. Introduction to Modeltheoretic Semantics of Natural Language, Formal Logic and Discourse Representation Theory*, Kluwer, Dordrecht.
- KROCH, Anthony: 1972, "Lexical and Inferred Meanings for Some Time Adverbs", *Quarterly Progress Report n° 104*, MIT Research Laboratory of Electronics, pp. 260-267.
- ROHRER, Christian: 1977, "How to Define Temporal Conjunctions", *Linguistische Berichte* 51.
- SINN, Heidi: 1992?, *Situational Focusing: The Generation of German Temporal Conjunctions (Lemma Access)*, PhD dissertation, University of Freiburg i. Br.
- VALENCIA, Victor Sánchez, Ton van der Wouden and F. Zwarts: 1993, "Polarity, Veridicality, and Temporal Connectives", in Paul Dekker and Martin Stokhof (eds.) *Proceedings of the 9th Amsterdam Colloquium*, University of Amsterdam.