# POLARITY ITEMS IN *BEFORE* CLAUSES

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The aim of this paper is to propose a re-formulation of the uniform definition Beaver and Condoravdi (2003) proposed to account for the meaning of *before* and *after*, such that it can account also for the polarity items licensing behavior of the two temporal connectives.

## 1. Introduction

The temporal connectives *before* and *after* appear to be converses, on the one hand, but they also display different properties. In a recent paper, Beaver and Condoravdi (hereafter, B&C) proposed a uniform account of their meaning, with the intent of explaining their differences appealing to other factors – specifically, the asymmetric nature of time branching is meant to account for the different veridical properties. In that paper, nevertheless, the fact that only *before* licenses the occurrence of Polarity Items (PIs) is left unaccounted for. My aim is to show that it is possible to connect PIs licensing as well to the structure of time branching.

## 2. The data

It is well-known that *before* and *after* diverge in their logical, veridical, and licensing properties. *After* constitutes a veridical operator, inasmuch as from the truth of (1) we are entitled to infer the truth of the *after*-clause. As for *before*, it may receive a *factual* interpretation, as in (2), where the *before*-clause is implied to be true; a *non-committal* one, as in (3), where the *before*-clause is implied to have been likely when the event described in the main clause took place; and, finally, a *counterfactual* reading, as in (4), in which the *before*-clause is implied to be false:

1) Fred came home after Wilma left.
2) Fred bought a Toyota before the price went up.
3) Fred left the country before anything happened.
4) Fred died before he saw his grandchildren.

As for licensing properties, Polarity Items are licensed in *before*-clauses; and normally lead to ungrammaticality in *after*-clauses:

5) * Fred left the party after *anyone* else did.
6) Fred left the party before *anyone* else did.

## 3. Beaver and Condoravdi (2003)

Beaver and Condoravdi defend a unified account for *before* and *after*: their plot is to propose a single lexical schema and to attribute their diverging behavior to other factors. Their first step is to introduce a coercion operator, *earliest*, that ranges over times that verify a clause, and that picks up the earliest amongst them. *Before* and *after* are defined as connectives ordering a time *t* that verifies the main clause *A* with respect to the earliest time verifying the subordinated clause *B*:

> **B&C – *A after/before B* (first shot)**
> *A before/after B* is true in $t_0$ iff there is an *A*-time *t* that precedes/follows the *earliest* time that verifies the *B* clause.

As it stands, this preliminary definition cannot account for non-veridical instances of *before*-clauses, since for the truth of *A before B*, the *A*-time must precede *the earliest B-time*. B&C's solution is to exploit the definedness requirement associated with the coercion operator *earliest*: *earliest* must pick up the left boundary of an interval of times verifying the *B*-clause. If there are *no B*-times at all in the evaluation world, alternative worlds are taken into consideration.
These alternative worlds are defined as the *historical alternatives* to the evaluation world w at a time t – *alt*(w,t) – those worlds that coincide with w up to t, and from that moment may diverge only in reasonable ways, i.e., the normal future continuations of w after t. *Earliest* is thus defined relatively to this expanded domain of worlds.

> **B&C – Historical alternatives**
> *alt*(w,t) = λw'. w' is indistinguishable from w for all times t' < t; and w' is a normal continuation of w after t.

> **B&C – *A after/before B***
> $[[A \text{ after [before] } B]]^w = 1$ iff
> $(\exists t: \langle w,t\rangle \in A)\ t > [<]\ earliest.\ \lambda t'.\ (\exists w' \in alt(w,t))\ \langle w',t'\rangle \in B$

According to B&C, then, the difference between *before* and *after*'s veridical properties derives from the asymmetry of time branching: once we establish a time t (i.e., the time in which the main clause *A* holds), what is past with respect to t is fixed – and thus the set of historical alternatives to w at t is in fact reduced to the evaluation world w itself, whereas what is future with respect to t may involve different future branches, i.e., it calls for a set of historical alternative worlds.

Somehow more formally, in evaluating *A after B*, since the historical alternatives by definition coincide with w for all times t' that precede t, and since the earliest *B*-time is to be located before the *A*-time t, the set *alt*(w,t) is in fact reduced to the evaluation world alone: alt(w,t) = {w}. Thus the definition can be simplified:

**B&C – *A after B* simplified definition:**
$[[\text{A after B}]]^{w} = 1$ iff $(\exists t: \langle w,t\rangle \in A)\ t > \textit{earliest}.\ \lambda t'.\langle \mathbf{w},t'\rangle \in B$

For the sentence to be true, there must be an *A*-time t that follows the earliest amongst the times t' that verify *B in the evaluation world w*. Thus, for the sentence to be true, the subordinated clause *B* has to be instantiated in the evaluation world.
In the assessment of a *before*-sentences, the situation is different. Since the event in the *B*-clause is future with respect to the *A*-time t, historical alternatives (i.e., future branches) of w after t are activated: *B* is to be instantiated in at least one of these branches – not necessarily in the evaluation world. For instance, the sentence in (3) is predicted to be true only if something happens in one of the future continuations of the evaluation world w after the time t in which Fred left the country – and Fred's leaving must precede the earliest time in which this is the case.

## 4. The proposal

The evaluation of a *before*-clause may require considering alternative worlds; an *after*-clause is assessed with respect to the evaluation world. I propose to connect the licensing of polarity items precisely to this difference.

With a rough simplification, *A before/after B* is true if and only if there is an *A*-time *t* that precedes/follows the earliest *B*-time *t'*. My plot is to order the *A*-time t with respect to *all* the left-boundaries of intervals verifying the *B*-clause relatively to the different branches that may be activated.

***A after/before B***
$[[A \text{ after [before] } B]]^{w} = 1$ iff $\exists t\ [\langle w,t\rangle \in A\ \&$
$\forall t'\ [(t' = \textit{earliest}.\ \lambda t''.\ (\exists w' \in \text{alt}(w,t))\ \langle w',t''\rangle \in B) \rightarrow t\ >\ [<]\ t']]$

With this move, the initial definition of *before* and *after* renders the temporal subordinated clause a downward entailing context, i.e., a PIs licensing environment. The asymmetric nature of time branching ensures that in the assessment of *before*-clauses there may be various future branches activated, and thus different *B*-intervals to take into account – and this allows the occurrence of Polarity Items; and that the evaluation of an *after*-clause, on the other hand, is restricted to a single evaluation world, and therefore there is no need for a universal quantification over *earliest B*-times – and thus Polarity Items are not licensed.

More precisely, when *A before B* is assessed, the event in the *B*-clause follows the event in the *A*-clause, and this amounts to saying that there might be many branches in which *B* is instantiated (thus, many earliest *B*-times). In order to evaluate *A before B*, we first take into consideration all the time-world pairs <w',t''> that verify *B*, for any world w' that belongs to the set of historical alternatives to w at t; and then we collect all the times t' that are the earliest amongst them. The sentence *A before B* is true in *w* iff there is an *A*-time *t* that precedes all the earliest times *t'*. In this reformulation of the definition, the temporal clause *B* constitutes a downward entailing context:

***A before B***
$[[A \text{ before } B]]^w = 1$ iff $\exists t\, [\langle w,t\rangle \in A \,\&$
$\forall t'\, [(t' = \textit{earliest}.\ \lambda t''.\ (\exists w' \in \text{alt}(w,t))\ \langle w',t''\rangle \in B) \rightarrow t < t']]$

The initial definition for *after*-sentences mirrors the one for *before*, with only the direction of temporal ordering reversed.

***A after B* - def. 1:**
$[[A \text{ after } B]]^w = 1$ iff $\exists t\, [\langle w,t\rangle \in A \,\&$
$\forall t'\, [(t' = \textit{earliest}.\ \lambda t''.\ (\exists w' \in \text{alt}(w,t))\ \langle w',t''\rangle \in B) \rightarrow t > t']]$

But, as B&C argued, since the *B*-times t' precede the *A*-time t, the set of historical alternatives is reduced to the evaluation world, thus the definition can be simplified:

***A after B* - def. 2:**
$[[A \text{ after } B]]^w = 1$ iff $\exists t\, [\langle w,t\rangle \in A \,\&$
$\forall t'\, [(t' = \textit{earliest}.\ \lambda t''.\ \langle \mathbf{w},t''\rangle \in B) \rightarrow t > t']]$

Taking into consideration only a single world, if the *after*-clause is in fact instantiated in the evaluation world, there is a unique earliest time *t'*. Thus, there is no need to universally quantify over all the earliest *B*-times, and thus the definition can be further simplified to:

***A after B* - def. 3:**
$[[\text{A after B}]]^{w} = 1$ iff
$\exists t\ [\langle w,t\rangle \in A\ \&\ t > \textit{earliest}.\lambda t''.\langle w,t''\rangle \in B]$

In this last simplified definition, the *after*-clause does not constitute anymore a downward entailing context (since the initial universal quantification over earliest *B*-times is reduced to a statement about the unique earliest *B*-time, because of the reduction of *alt(w,t)* to {w} itself). Thus, Polarity Items are predicted to be ungrammatical in *after*-clauses.

### 4.1. Linebarger's counterexamples

Linebarger noticed how not all instances of Polarity Items in *after*-clauses lead to ungrammaticality:

7) He kept writing novels long after he had any reason to believe they would sell.

Sentences like (7) represent a counterexample to my claim that *after*-clauses do not constitute a downward entailing context, after all the simplifications took place. But my question is: does it exist a clear criterion to identify a class of *after*-clauses that license PIs? Notice that the presence of an adequate measure phrase (such as *long*) does not constitute neither a necessary nor a sufficient condition:

8) Some say the cuts were made after there was any real use for them.
9) * He kept writing novels long after he retired to *any* Caribbean island.

Let me also highlight how the more natural Italian translation of (7) would mark the subordinated clause with subjunctive mood (the mood selected by *before*) – even if in normal *after* clauses the indicative is the only viable option:

10) Ha continuato a scrivere racconti molto dopo che ci fosse alcuna speranza.
Lit.: Has continued to write novels long after that cl. $\text{was}_{\text{SUBJ}}$ any hope.

And subjunctive mood marking is related to the activation of alternative worlds. Thus, my answer is that, even if I do not have (yet) a clear explanation of the facts, it seems to me that these kinds of sentences require the consideration of alternative branches in which the subordinated clause gets realized – even if the subordinated clause is to be placed in the past of the main clause event.

### 4.2. Beaver and Condoravdi (2004)'s proposal

In a (2004) aggregate hand-out, Beaver and Condoravdi do have a proposal for the PIs licensing: PIs are licensed in contexts that warrant strengthening inferences, provided that presuppositions are met (cf. von Fintel's notion of Strawson-entailment). *Before* and *after* diverge because the former orders the *A*-time with respect to the whole interval in which the *B* clause took place, and this is not always the case with *after*.

My objection to this line of explanation is that not all cases in which the *A*-event is ordered with respect to the whole *B*-event license PIs. For instance, an achievement predicate in the *after*-clause does not license PIs.[1] Moreover, there is evidence that the Italian counterpart of *after* (*dopo che*) always orders the main clause event with respect to the whole, completed, *B*-event – nevertheless it does not license Polarity Items. More generally, I think that it is a more efficient and natural move to resort to the same kind of explanation (i.e., the asymmetric nature of time branching) to account for both veridical and licensing properties.

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[1] Notice that when achievement predicates appear in *before*-clauses, *any* is indeed grammatical – thus strengthening inferences ought to go true even if the event denoted by the predicate is punctual.