

Intro: Inferring a rhetorical relation between two discourse units (DUs) is non-monotonic: given a discourse context C and two DUs π_1, π_2 to be related by a relation R , it may be that C makes $R(\pi_1, \pi_2)$ the most plausible inference, but an extension of C may make it more plausible that a distinct $R'(\pi_1, \pi_2)$ is preferred (Asher and Lascarides 2003). Since rhetorical relations often entail temporal constraints, anaphoric connections between eventualities often undergo revision. This is especially apparent in the French novella, *Sylvie*, where, famously, the reader chooses a resolution strategy that she later finds to be wrong. Modeling this revision raises the following question: What semantics should we posit for temporal anaphors and cataphors found in *Sylvie* such that we could model their resolution as being provisional? We think this question is essential to the understanding of compositional interpretation at the semantics/pragmatic interface. The goal of the talk is to take important strides in providing an answer.

SDRT analysis of discourse structure: We analyze a key ambiguity in *Sylvie* that arises during the transition from Chapters 3-4, and maintained until Chapter 7. For sake of space, we provide a grossly simplified and translated version of the text in (1). The *while*-clause in (1b) aids in the inference that the sentence *elaborates* on (1a). In (1c), the pluperfect describes a state, which enters into a *Background* relation. But with what? Either (1c) provides a background to (1b), or it functions as a scene setter for (1d), in which case the reference is resolved cataphorically. Moreover, (1d) serves an argument of *Narration*. However, it's unclear what the other argument is. One possibility is that (1d) carries the story forward from (1a): the narrator is on his way to Loisy and now he has arrived. In this case, the events in (1d)-(1e) take place after the journey to Loisy in (1a). This would be compatible with both the aforementioned anaphoric and cataphoric resolution of (1c), giving us the two structures in (2)-(3). As it turns out, however, both are wrong! This is clear in (1f), where it transpires that the carriage is about to pass by Orry, which is on the way to Loisy. This means that the events narrated in (1c)-(1e) must precede the journey. As shown in (4), (1c)-(1e) actually form a CDU in the scope of the memory report in (1b).

- (1) a. (Ch. 3). . . *I'm on a carriage going to Loisy.*
 b. *While the carriage is climbing, I will put in order my memories of the times when I was there* (End of Ch. 3)
 c. (Beginning of Ch. 4) *It had been a while since I met Adrienne.*
 d. *I found myself once again at the annual festival in Loisy . . .*
 e. . . . *We pretended to be married that morning.* (End of Ch. 6)
 f. (Beginning of Ch. 7) *The carriage will pass by Orry.*

(2) $Elaboration(\pi_a, \pi_b); Background(\pi_c, \pi_d); Narration(\pi_a, \pi_d); Narration(\pi_d, \pi_e)$

(3) $Elaboration(\pi_a, \pi_b); Background(\pi_b, \pi_c); Narration(\pi_a, \pi_d); Narration(\pi_d, \pi_e)$

(4) $Elaboration(\pi_a, \pi_b); Background(\pi_c, \pi_d); Narration(\pi_d, \pi_e); Attribution(\pi_b, [\pi_c - \pi_e]); Narration(\pi_a, \pi_e)$

Semantic representation of DUs: We represent (1a)-(1f) as DRSs in (5a)-(5f) below. For simplicity, we only employ variables over states and events, where capitalized versions are anaphoric *drefs* yet-to-be resolved. We motivate these DRSs in the talk, showing how resolving $S_4 E_3 S_7$ in light of (2) and (3) lead to inconsistent interpretations once we proceed to resolve S_9 and S_{11} . Then, we show a consistent interpretation is possible with (4).

- (5a) $[s_1 s_2 \mid \text{be.on.carriage.going.to.be.in}(s_1, s_2), \text{be.in.Loisy}(s_2)] ;$
 b. $[e_1 s_3 S_4 s_5 \mid \text{invitation.to.remember}(e_1, s_3), \text{be.in.Loisy}(s_3), \tau(s_3) < \tau(e_1), \tau(e_1) \subseteq \tau(S_4), \text{result}(e_1) = s_5] ;$
 c. $[e_2 s_6 E_3 \mid \text{met.adrienne}(e_2), \text{result}(e_2) = s_6, \tau(e_3) \subseteq \tau(s_6)] ;$
 d. $[e_4 S_7 s_8 \mid \text{found.myself}(e_4), \tau(e_4) \subseteq \tau(S_7), \text{result}(e_4) = s_8] ;$
 e. $[e_5 S_9 s_{10} \mid \text{pretended.to.be.married}(e_5), \tau(e_5) \subseteq \tau(S_9), \text{result}(e_5) = s_{10}] ;$
 f. $[e_6 S_{11} s_{12} \mid \text{carriage.will.pass.by.Orry}(e_6), \tau(e_6) \subseteq \tau(S_{11}), \text{result}(e_6) = s_{12}]$

A PCDRT analysis of anaphors: PCDRT is a development of CDRT (Muskens 1996) that keeps the compositionality of the latter approach, while developing a clean interface between semantics and pragmatics by offering a compositional analysis of unresolved anaphora, as opposed to coindexation strategies, which do not offer a place for the pragmatics to resolve anaphora, since coindexation presupposes resolution (Beaver 1999, Bittner 2007). To achieve this, PCDRT makes use of *ordered drefs*, i.e. the indices on $s_1 s_2$ are significant and reflect the order in which the *drefs* are introduced in the discourse. Further, anaphoric expressions introduce *drefs* and are typed as anaphoric. Being marked in this way, they are therefore revisable.¹ Consider the capitalization of the variables in (5). This abbreviates the semantic requirement that there be a coreferent antecedent, $A(x) = x$, where A is the anaphoric resolution that is supplied by non-monotonic reasoning over the semantic contents of the discourse. Like CDRT, PCDRT uses an abbreviation language which ‘hides’ the distinction between *drefs* and their real-world referents. While the equality in $A(x) = x$ is a relation between individuals (and in our analysis, it can also serve to relate events and states), the precedence in $A(x) < x$ is a relation between *drefs*.²

Extending to cataphors: This latter requirement that the antecedent precede the anaphor is, of course, too strong since it blocks cataphoric resolution. We therefore propose to give up $A(x) < x$ as a monotonic constraint on anaphoric resolution. Instead we treat it as a non-monotonic preference constraint that can be given up in various contexts, notably with backgrounded (and possibly other subordinate) structures where a discourse segment serves as a scene-setter for the subsequent discourse. In this way, we extend Haug’s system to cataphoric expressions, where the benefits of the logic are even clearer: We can now give a denotation for the discourse (1a-c) even on the reading where the interpreter suspends judgment on the correct resolution because she takes the chapter-initial pluperfect to attach rightwards. This is especially attractive because the semantics of (1a-c) can now form the basis for (non-monotonic) reasoning about where to attach the next discourse segment (1d), as we now show.

Putting it all together: Let us assume that anaphoric resolution is categorical at each stage of the discourse. On the monotonic side, the interpretation is simply successive conjunction (;) of (5a)-(5f). Interpretation (3) of (1a)-(1e) then gives us the interpretation in (6) (a pair of monotonic and non-monotonic content):

(6) $\langle (5a) ; (5b) ; (5c) ; (5d) ; (5e), A = \{S_4 \rightarrow s_1, E_3 \rightarrow e_4, S_7 \rightarrow s_2, S_9 \rightarrow s_8\} \rangle$

Given the resolution $S_7 \rightarrow s_2$ we can conclude $\tau(e_4) \subseteq \tau(s_2)$ from (5d) and hence $\tau(s_1) < \tau(e_4)$ by the semantics of the predicate in (5a). Given the resolution of $S_9 \rightarrow s_8$ we can conclude $\tau(e_5) \subseteq \text{post}(e_4)$ from (5e) and hence $\tau(e_4) < \tau(e_5)$. If we now attach (5f) to (5e) via *Narration*, and therefore resolve S_{11} to s_{10} , we get $\tau(e_5) < \tau(e_6)$ by similar reasoning and hence the timeline $\tau(s_1) < \tau(e_4) < \tau(e_5) < \tau(e_6)$; but this is impossible given world knowledge that Orry is on the way to Loisy, which entails $\tau(e_6) \subseteq \tau(s_1)$. To resolve the contradiction, the interpreter must non-monotonically update the resolution so that $S_7 \rightarrow s_3$ and $S_{11} \rightarrow s_5$, making (5c)-(5e) an extended flashback, while (5f) continues the narration from (5b) and provides further information on (5a).

Conclusion: We acknowledge that what we have offered is a very long shot from what the systematic analysis of texts like *Sylvie* requires. Nevertheless, we think that our attempt is both instructive for seeing how big the gap is and an important first step towards closing it. We also think that continuing to fill the gap in the manner presented here is essential to the understanding of compositional interpretation at the semantics/pragmatic interface.

¹ Note that the monotonic semantics of PCDRT can enforce anaphoric connections when they are not revisable (see Haug 2013) for details.

² $A(x) < x$ is a simplifying assumption in Haug 2013, essentially reducing accessibility (within a DRS) to linear precedence. It is vital for us that PCDRT can be combined with more sophisticated accessibility constraints, which we will discuss in the talk.

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