

Another Perfect Puzzle

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1. The Puzzle Illustrated

The interaction of the perfect with temporal adverbials is the domain of the well-known *present perfect puzzle* (Klein 1992) – the fact that certain adverbials are prohibited with the present perfect in English (though not some other languages) while acceptable with non-present perfects. As is generally agreed, the prohibition is against past specific adverbials (cf. Heny 1982, Klein 1992, Giorgi and Pianesi 1998, a.o.).¹

This paper adds yet another puzzle to the area of perfect–adverbial interactions. It establishes a new generalization regarding the modification of perfects by both past and non-past specific temporal adverbials. The puzzling facts are illustrated in (1).

- (1) a. ?? We saw John last night. He had arrived *yesterday*...
b. We saw John this morning. He had arrived *yesterday*...
c. We saw John last night. He had arrived *the same day*...

Adverbials like *yesterday* are allowed in past perfects, and they may specify the time of the event, as in (1b). However, their presence is restricted, depending on what the reference time in the past perfect is. The reference time is the interval which tenses relate to the speech time, and which the event time is situated relative to. In the case of the past perfects in (1), the reference time is a past interval anaphoric to the reference time of the preceding past sentences: *last night* in (1a) vs. *this morning* in (1b). The choice of a reference time contained in the interval denoted by the adverbial

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1. Stating the class of adverbials that are prohibited from the present perfect in English does not in itself solve the present perfect puzzle. There have been many attempts at resolving this rather difficult problem; for the latest approach, and for references to the previous ones, see Pancheva and von Stechow (2004).

modifying the perfect (*last night* \subset *yesterday*) results in degraded acceptability, as in (1a). When the reference time in the past perfect is not contained in the denotation of the adverbial modifying the perfect (*this morning* $\not\subset$ *yesterday*), the result is an acceptable sentence, as in (1b).

It is not clear why there should be this difference in acceptability between (1a) and (1b). In both cases, the time of John's arrival could be part of the time interval denoted by *yesterday*, while still preceding the time of us seeing John, thus satisfying the condition on the use of the past perfect. This point is underscored by the acceptability of *the same day* in (1c), which ends up denoting the same time interval as *yesterday* in (1a). Thus we can conclude that the reason for the unacceptability of *yesterday* in (1a) is the linguistic description of the temporal interval rather than the interval's identity.

The new puzzle can be explained if a weak meaning for the perfect is adopted, as will be argued here. The weak meaning can resolve the present perfect puzzle as well. The new puzzle also has implications beyond the theory of the perfect. It suggests that constraints akin to those of Binding Theory govern temporal reference.

2. The Adverbials

Yesterday is not the only adverbial that exhibits the puzzling behavior in (1). Other temporal adverbials, such as *on Monday*, *on December 31*, and *in 2003*, behave the same, as shown in (2). Moreover, the phenomenon is not limited to adverbials interpreted as past². Present and future adverbials can also render perfects unacceptable, see (3). It needs to be said that the judgments become more subtle, as the calculation of the identity of the intervals gets more involved. That is, it is easy to see that *last night* \subset *yesterday*, in (1), but it takes more time to figure out that *in December*, in a past tense sentence and when the speech time is in 2004, means *in December 2003*, and then that *December 2003* \subset *2003* (as in (2c)).

- (2) a. ?? We saw Anna Monday night. She had performed at the Walt Disney Center *on Monday*...
- b. ?? We met them on New Year's Eve. They had gotten married *on December 31*...
- c. ?? We met John in December. He had moved to LA *in 2003*...
(when the speech time is in 2004)

2. The adverbials in (2) are not lexically specified as past, unlike *yesterday* in (1). For instance, *on Monday* is interpreted as a time before the speech time in the context in (2a), but after the speech time in the context of (3b).

- (3) a. ?? We saw John this evening. He had arrived *today*...
- b. ?? We will see Anna Monday night. She will have performed at the Walt Disney Center *on Monday*...
- c. ?? We are going out with John next Friday. He will have finished his paper *next week*...

Again, as in the case of (1), the events described by the perfects in (2) and (3) could have obtained prior to the events in the preceding sentences, and still fall within the time of the temporal adverbial modifying the perfect. The unacceptability of the perfects in (2) and (3) is thus puzzling.

Other temporal adverbials, such as *since 2003*, *every Monday*, or *on a Monday* do not result in unacceptability. As in (1)-(3), the reference time in the past perfect (which is anaphoric to the reference time in the preceding sentence) is contained in the denotation of the adverbial modifying the perfect. However, we do not get the pattern in (1)-(3):

- (4) a. We first met John this January. He had lived in LA *since 2003* (and he was already eager to move).
- b. We will see Anna Monday night. By then, she will have performed at the Walt Disney Center *every Monday*...
- c. We will see Anna at her performance on Monday night. Finally, she will have performed *on a Monday*...

We would want an answer to the question of why some adverbials are not acceptable, whereas others are, in past and future perfects. The next two subsections identify the relevant semantic properties of the adverbials that are responsible for the distinction.

2.1. Referential vs. Quantificational Adverbials

Adverbials such as *yesterday*, *today*, *next week*, *on Monday*, *on December 31*, *in 2003* are often called ‘positional’ because they make reference to a specific time interval (i.e., an interval with a specified position on our imaginary time line). The interval may be constant, as in the case of *in 2003*, or its location on the time line may vary, as with the remaining examples of adverbials. But regardless of this difference, the positional adverbials play essentially the same role – when modifying time intervals, they attribute to them the property of being contained in a particular time. Thus, *in 2003* places time intervals as subsets of the interval with the name of “2003”; *yesterday* is a predicate of intervals contained in the day preceding the day of the speech time.

In this respect, positional adverbials are like temporal PPs with specific DP arguments³. More formally, we can express the common meaning of positional adverbials as in (4), where an abstract preposition is posited (written in small caps), and where T is a specific time interval (cf. Dowty 1979: 324, Pratt and Francez 2001, a.o.).

$$(5) \llbracket \text{ON } T_{\text{specific DP}} \rrbracket = \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq T \ \& \ p(t)]$$

To illustrate, the DPs have meanings as in (5); when they combine with the (abstract) P, the resulting meanings are as in (6); t_c is the speech time:

- (6) a. $\llbracket \text{yesterday}_{\text{DP}} \rrbracket = \textit{the day before the day of } t_c$
 b. $\llbracket \text{today}_{\text{DP}} \rrbracket = \textit{the day of } t_c$
 c. $\llbracket \text{next week}_{\text{DP}} \rrbracket = \textit{the week following the week of } t_c$
 d. $\llbracket \text{THIS Monday}_{\text{DP}} \rrbracket^4 = \textit{the Monday closest to } t_c$
 e. $\llbracket 2003_{\text{DP}} \rrbracket = \textit{the year 2003}$
- (7) a. $\llbracket \text{yesterday}_{\text{ADV}} \rrbracket = \llbracket \text{ON yesterday}_{\text{DP}} \rrbracket =$
 $= \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq \textit{the day before the day of } t_c \ \& \ p(t)]$
 b. $\llbracket \text{today}_{\text{ADV}} \rrbracket = \llbracket \text{ON today}_{\text{DP}} \rrbracket = \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq \textit{the day of } t_c \ \& \ p(t)]$
 c. $\llbracket \text{next week}_{\text{ADV}} \rrbracket = \llbracket \text{ON next week}_{\text{DP}} \rrbracket =$
 $= \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq \textit{the week following the week of } t_c \ \& \ p(t)]$
 d. $\llbracket \text{on THIS Monday} \rrbracket =$
 $= \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq \textit{the Monday closest to } t_c \ \& \ p(t)]$
 e. $\llbracket \text{in 2003} \rrbracket = \lambda p_{\langle i, t \rangle} \cdot \lambda t_i. [t \subseteq \textit{the year 2003} \ \& \ p(t)]$

While positional adverbials denote (functions from propositions to) predicates of intervals that are contained in a specific time, non-positional temporal adverbials are (functions from propositions to) predicates of intervals that contain quantifiers over intervals (cf. Pratt and Francez 2001, Mittwoch 1988, Iatridou, Anagnostopoulou and Izvorski 2001, a.o.) In

3. In the case of the adverbials mentioned above, the DP complement of the (sometimes abstract) temporal preposition is definite. Specific indefinites too can form positional adverbials, e.g., *on a certain day in May*. These behave similarly to the definite-based adverbials, both with respect to the present perfect puzzle and the new puzzle discussed here.

4. *Monday* is normally interpreted as “this Monday”, where it is anaphoric to the speech time, but it also can be interpreted as “the Monday of that week”, where it is anaphoric to another time, as in (i) and (ii).

(i) We visited John for a week in May. On Monday, he took us whale watching, on Tuesday, we went horseback riding...

(ii) Last week, I stayed home on Monday.

other words, they are temporal PPs whose argument is a quantificational, rather than a referential, DP. Again, as in the case of referential adverbials, sometimes the preposition is abstract.

- (8) a. $\llbracket \text{since}^E 2003 \rrbracket^5 =$
 $= \lambda p_{\langle i, t \rangle}. \lambda t_i. \exists t'_i [t' \subseteq t \ \& \ \text{LB}(\text{the year } 2003, t) \ \& \ t_c \subseteq t \ \& \ p(t')]$
 b. $\llbracket \text{since}^U 2003 \rrbracket =$
 $= \lambda p_{\langle i, t \rangle}. \lambda t_i. \forall t'_i [t' \subseteq t \ \& \ \text{LB}(\text{the year } 2003, t) \ \& \ t_c \subseteq t \ \rightarrow \ p(t')]$
 c. $\llbracket \text{on a Monday} \rrbracket = \lambda p_{\langle i, t \rangle}. \lambda t_i. \exists t'_i [t' \subseteq t \ \& \ \text{Monday}(t') \ \& \ p(t')]$
 d. $\llbracket \text{ON every Monday} \rrbracket = \lambda p_{\langle i, t \rangle}. \lambda t_i. \forall t'_i [t' \subseteq t \ \& \ \text{Monday}(t') \ \rightarrow \ p(t')]$

So far, we have a semantic characterization of the adverbials which are prohibited from perfects, under the condition of inclusion of the reference time, and of some of the adverbials which are not prohibited (we still need to say something about the acceptability of *the same day* in (1c)). Moreover, the two types of adverbials – referential⁶ and quantificational – are also distinguished in the present perfect puzzle. The past referential adverbials (as in (2)/(7a,d,e)) are not acceptable in the present perfect in English. (For the non-past referential adverbials, as in (3)/(7b,c), the question does not arise.) The quantificational adverbials (as in (4)/(8)), on the other hand, are acceptable in the present perfect.

- (9) a. *Anna has been to LA *on Monday/yesterday/on December 31/in 2003...*
 b. Anna has been to LA *since 2003/on a Monday/every Monday...*

Thus, the two puzzles divide the temporal adverbials the same way, at this general level, and we can, therefore, expect a similar explanation for the role of the quantificational-referential adverbial distinction in the puzzles.

2.2. Types of Referential Adverbials

Let us now look more closely at the class of referential adverbials. These include three types of adverbials – context-independent, indexical and anaphoric. The context-independent adverbials contain reference to the

5. *Since*-adverbials are assumed to be ambiguous, as in Mittwoch (1988), Iatridou et al. (2001). $\text{LB}(t, t')$ stands for “ t is the left boundary of t' ”.

6. As is standard in the literature on Binding Theory, the term “referential DP” covers anaphors, non-reflexive pronouns and R-expressions alike, and thus does not imply that the DP in question has independent reference. Similarly here, the term “referential” is meant to cover positional adverbials like *the same day*, *two days earlier*, which are clearly anaphoric.

same interval, regardless of the speech time or any other interval evoked in the context of utterance. An example is *in 2003*, where the temporal DP refers to the interval with the name of “2003”, which always has the same identity (location on the time line), whether or not the speech time falls before or after it, or is contained in it. Another example is *on the day John was born*. This type of adverbials mirrors the R-expressions in the domain of individual-denoting DPs, e.g., *John*, or *the student*.

In the case of both indexical and anaphoric adverbials, the interval to which a reference is made varies in identity. The indexicals, e.g., *yesterday*, *today*, *next week*, *this Monday*, *two days ago* are dependent on the speech time. Adverbials like *on Monday* and *on December 31* determine reference either relative to the speech time, e.g., *this Monday*, *this December 31*, or with respect to another time interval, e.g., *on Monday of that week*, *on December 31 of that year*. On the former interpretation they are indexicals; on the latter they are anaphors. Other examples of anaphoric adverbials are *that week*, *the same day*, *two days earlier*. The anaphoric adverbials are the temporal counterpart of reflexive pronouns such as *myself* or *himself*. The indexical adverbials are similar to non-reflexive pronouns, e.g., *me*, in that they are context-dependent yet may establish reference without the mediation of a linguistic antecedent.

As it turns out, *indexicals* and *R-expressions* pattern together, and unlike the anaphoric adverbials, with respect to the new puzzle. In (1), we already saw a minimal pair with an indexical and an anaphoric adverbial; (10), (11) and (12) are further examples. Note that in (12) the adverbial *on Monday* is interpreted as *this Monday*, i.e., it is indexical. (13) illustrates the contrast for an R-expression and an anaphoric adverbial.

- (10) a. ?? We ran into John Friday night. He had arrived in town *two days ago*... (said on Sunday)
 b. We ran into John Friday night. He had arrived in town *that day*...
- (11) a. ?? We are going out with John next Friday. He will have finished his paper *next week*. (= ex. (3c))
 b. We are going out with John next Friday. He will have finished his paper *that week*.
- (12) a. ?? We will see Anna Monday night. She will have performed at the Walt Disney Center *on Monday*... (= ex. (3b))
 b. We will see Anna Monday night. She will have performed at the Walt Disney Center *that (same) day*...
- (13) a. ?? We met John in December. He had moved to LA *in 2003*... (when the speech time is in 2004) (= ex. (2c))
 b. We met John in December. He had moved to LA *that year*...

In sum, the adverbials responsible for the newly identified puzzling co-occurrence restriction in perfect sentences, are the non-anaphoric positional adverbials. The next section looks more closely at the interval-inclusion part of the puzzle, i.e., the fact that the perfect-adverbial co-occurrence restriction is dependent on whether the reference time in the perfect is contained in the denotation of the adverbial modifying the perfect.

2.3. The Inclusion Restriction

As we saw in (1a,b), non-anaphoric positional adverbials are prohibited from perfects only when the reference time is included in the interval referred to by the adverbial. Minimal pairs can be constructed for the other unacceptable examples considered so far:

- (14) a. ?? We ran into John *Friday night*. He had arrived in town *two days ago...* (said on Sunday)
 c. We ran into John *this morning*. He had arrived in town *two days ago...*
- (15) a. ?? We are going out with John *next Friday*. He will have finished his paper *next week*. (= ex. (3c))
 c. We are going out with John *in two weeks*. He will have finished his paper *next week*.
- (16) a. ?? We will see Anna *Monday night*. She will have performed at the Walt Disney Center *on Monday...* (= ex. (3b))
 b. We will see Anna *Monday night*. She will have performed at the Walt Disney Center *Monday morning...*
- (17) a. ?? We met John *in December*. He had moved to LA *in 2003...* (when the speech time is in 2004) (= ex. (2c))
 b. We met John *in January*. He had moved to LA *in 2003...* (when the speech time is in 2004)

It is also not possible to partially include the reference time in the denotation of the perfect-modifying adverbial, as the following example illustrates:

- (18) ?? John and I spent *last winter* together in Quebec *from Thanksgiving to Valentine's Day*. He had moved there *last year...*

Finally, the adverbial restriction is not symmetrical. When the interval referred to by the adverbial in the simple past or future sentence is a

superset, rather than a subset, of the interval referred to by the adverbial in the perfect, the sentences are acceptable⁷:

- (19) a. We ran into John *yesterday*. He had arrived in town *last night*...
 b. We saw Anna *on Monday*. She had performed at the Walt Disney Center *Monday morning*...

Presumably, this is so because this adverbial relation allows for the reference time in the perfects to not be included in the interval referred to by the adverbial in the perfect. That is, (19a) sets up the reference time as being contained in *yesterday*, leaving open the possibility that it still might follow the interval contained in *last night*. This point is even easier to see in (19b).

The following is a summary of the adverbial modification facts discussed in section 2:

- (20) a. ?? *last night* \subset *yesterday* (indexical)
 b. ?? *from Thanksgiving to VDay last winter* \cap *last year* (indexical)
 c. \surd *this morning* $\not\subset$ *yesterday* (indexical)
 d. \surd *yesterday* $\not\subset$ *last night* (indexical)
 e. \surd *next Friday* \subset *that week* (anaphoric)
 f. ?? *in December* (said in 2004, past tense) \subset *in 2003* (R-expression)
 g. \surd *in January* (said in 2004) $\not\subset$ *in 2003* (R-expression)

The descriptive generalization in (21) emerges.

- (21) No part of the reference time may be included in a positional adverbial modifying a perfect, unless the positional adverbial is anaphoric to the reference time.

3. The Perfect

This section examines the implications of the generalization in (21) for the proper analysis of the perfect. The conclusion is that none of the standard analysis can account for the facts. What appears to be needed is a semantics for the perfect as the one recently proposed in Pancheva and von Stechow (2004), which can accommodate (21). An additional advantage is that this semantics also accounts for the role of positional adverbials in the present perfect puzzle, in a way consistent with their role in the new puzzle.

7. Examples such as (i) are not useful in illustrating this point, as *in January* here is anaphoric, and hence not subject to the restriction in the first place.

(i) We met John *in 2003*. He had moved to LA *in January*...

3.1. The Best Theory of the Perfect, So Far

There are three main general theories of the perfect: *Extended Now (XN)* theory (McCoard 1978, Dowty 1979, a.o.), Anteriority theory (e.g., Reichenbach 1947, Inoue 1989, Klein 1992, 1994, a.o.), and *Result State* theory (e.g., Parsons 1990, Kamp and Ryle 1993, Giorgi and Pianesi 1998, a.o.) The Anteriority and Result State theories are particularly problematic. We cannot discuss their shortcomings in any details here but see, e.g., McCoard 1978, Iatridou et al. 2001, for some critical remarks. Of particular importance for us is that these two types of theories, as they are, have nothing to say about the present perfect puzzle. Further clauses, with no natural link to the core theory, have to be added to handle the puzzle. The XN theory too has some problematic aspects, but they can be fixed, while keeping the general spirit of the theory. Thus adapted, the XN theory has the best shot a natural account of the present perfect puzzle (However, as we will see, even the XN theory cannot give a complete account for the present perfect puzzle).

According to the XN theory, the perfect introduces an interval that extends back from the reference time and affirms that the untensed proposition that it takes in its scope is true at that interval, as in (22).

$$(22) \llbracket \text{PERFECT} \rrbracket = \lambda p_{\langle t, t \rangle} . \lambda t_i . \exists t' [\text{XN}(t', t) \ \& \ p(t')]$$

where $\text{XN}(t', t)$ iff t is a final subinterval of t'

The XN theory can be easily augmented to take into account aspectual distinctions in the perfect (cf. Iatridou et al. 2001, Pancheva 2003). The needed modification is that the event time (the time during which the underlying eventuality obtains) is situated relative to the XN, depending on the viewpoint aspect embedded in the perfect. This modification follows naturally from the standard meanings in (23) and an architecture/composition as in (24).

$$(23) \text{ a. } \llbracket \text{PERFECTIVE} \rrbracket = \lambda P_{\langle v, t \rangle} . \lambda t_i . \exists e_v [\tau(e) \subset t \ \& \ P(e)]$$

$$\text{ b. } \llbracket \text{IMPERFECTIVE} \rrbracket = \lambda P_{\langle v, t \rangle} . \lambda t_i . \exists e_v [t \subseteq \tau(e) \ \& \ P(e)]$$

$$\text{ c. } \llbracket vP \rrbracket = \lambda e_v . P(e)$$

$$(24) \text{ a. } \llbracket \text{PERFECT} \llbracket_{\text{AspP}} \text{PERFECTIVE} \llbracket_{vP} \text{Anna dance} \rrbracket \rrbracket =$$

$$= \lambda t_i . \exists t' [\text{XN}(t', t) \ \& \ \exists e_v [\tau(e) \subset t' \ \& \ P(e)]]$$

$$\text{ b. } \llbracket \text{PERFECT} \llbracket_{\text{AspP}} \text{IMPERFECTIVE} \llbracket_{vP} \text{Anna dance} \rrbracket \rrbracket =$$

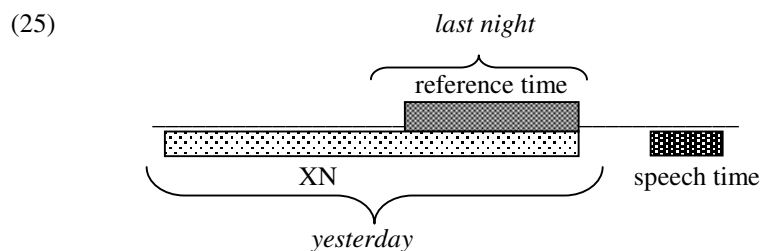
$$= \lambda t_i . \exists t' [\text{XN}(t', t) \ \& \ \exists e_v [t' \subseteq \tau(e) \ \& \ P(e)]]$$

Thus augmented, the XN theory by its very essence suggests why the present perfect puzzle obtains (as far as English is concerned). No

independent assumptions are necessary. Event time modification is not possible for type reasons, assuming (23). Reference time modification is restricted to present adverbials, given the present tense. XN modification by positional adverbials is restricted to the present ones. This is because positional adverbials include the XN (see the definition in (5)), and therefore the reference time as well, given that the reference time is a final subinterval of the XN. Quantificational adverbials are allowed as XN modifiers because they quantify over subintervals of the XN (see the meanings in (8)). Thus, *on a Monday* or *every Monday* in (9b) are acceptable despite the fact that they cover a past interval; the XN in these present perfects is still allowed to contain the reference time, and hence the speech time.

3.2. How the XN Theory Fares with Respect to the New Puzzle

Although the best theory of the perfect among the ones considered so far, the XN makes exactly the opposite prediction with respect to our new generalization in (21). The XN interval has the reference time as a final subinterval. Thus, adverbials that include the XN interval *should* include XN's final subinterval, as well. This is easily seen in (25).



The expected pattern according to the XN theory is the one in (26), which is precisely the opposite of what is actually the case (compare with (1a,b)).

- (26) a. [exp.[√]] We saw John *last night*. He had arrived *yesterday*...
 b. [exp.*] We saw John *this morning*. He had arrived *yesterday*...

At this point, we can note that although it is the best theory, the augmented XN theory is not without some problems. Among them is the fact that the acceptability of past positional adverbials with non-finite perfects under modals is not predicted (see (27)). These perfects are semantically present, with a reference time that includes the speech time, so the XN should not be modifiable by positional adverbials. The XN theory as it stands also cannot handle apparent violations of the present perfect

puzzle generalization as in (28) (from McCoard 1978). See Pancheva and von Stechow (2004) for more details on these points and a solution.

(27) Anna must have danced *on Monday/yesterday/on December 31*.

(28) How has he been occupying himself this week? Well, he's played golf *on Tuesday*, ridden horseback *on Wednesday*, and rested *on Thursday*.

Another meaning for the perfect, different from (22), is therefore needed.

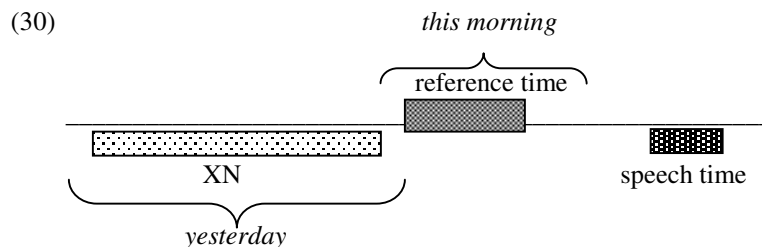
3.3. A New Meaning for the Perfect

Recently, Pancheva and von Stechow (2004) have proposed a modification to the XN semantics for the perfect. According to that proposal, the semantic contribution of PERFECT is to set up an interval, no part of which may be after the reference time (similarly to Musan's 2001 proposal for German). The new meaning for the perfect is given in (29):

(29) $[[\text{PERFECT}]] = \lambda p_{\langle i, t \rangle}. \lambda t_i. \exists t' [t' \leq t \ \& \ p(t')]$
 where $t' \leq t$ iff there is no $t'' \subset t'$ such that $t'' > t$

The meaning in (29) differs from the one in (22) in that the interval introduced by the perfect – which we will call the *Perfect Time Span (PTS)* (after Iatridou et al. 2001) – does not have to contain the reference time, though it may.

The meaning in (29) is clearly compatible with the facts of the new generalization. This meaning allows the reference time to follow the PTS, thus permitting patterns of adverbial relations such as *this morning* $\not\subset$ *yesterday*, *in January (of 2004)* $\not\subset$ *in 2003*. Again, a diagram makes this point immediately obvious.



The prohibition in (21) can then be added to the theory without contradicting the core semantics of the perfect. It is a natural addition in the sense that it regulates the relationship between the PTS and the reference time, which is what the theory itself is about. Furthermore, it complements

the approach to the present perfect puzzle in Pancheva and von Stechow 2004). Their account proposes a strengthening of the lexical meaning of the perfect in (29) in the context of present tense, with the result that the PTS is required to overlap with the reference time (in English, though not in German). The details of Pancheva and von Stechow's analysis are not of immediate relevance here; interested readers may consult that paper. What is important is that both the present perfect puzzle and the new puzzle identified in this paper can be accommodated in the same general way: (i) adopting a weak lexical semantics for the perfect that regulates the permissible relation between the PTS and the reference time, and (ii), augmenting the permissible relation to a requirement for overlap between the PTS and the reference time in one case (the present perfect puzzle), and a prohibition against such an overlap (the new puzzle).

The meaning for the perfect in (29) is fully compatible with the extension to the XN theory, proposed in Iatridou et al. (2001) and Pancheva (2003) to accommodate aspectual distinctions in the perfect. As discussed earlier, such an extension allows for a natural partial account to the present perfect puzzle (and as such it is adopted in Pancheva and von Stechow 2004). Specifically, that aspect of the solution explains why the source of the present perfect puzzle is PTS modification by past positional adverbials – event type modification is prohibited for type reasons, reference time modification is prohibited because of a temporal clash. PTS modification by positional adverbials is also what is involved in the new puzzle. In both cases, the semantics of positional adverbials is the basis for their unacceptability as PTS modifiers: they require PTS to be included in the interval to which they refer. Quantificational adverbials do not have this problem, and correspondingly, they are not prohibited in perfects.

The above discussion shows that, at a certain general level, the two puzzles have the same source. The ultimate explanation for the two puzzles, however, is different. In the case of the present perfect puzzle, Pancheva and von Stechow (2004) propose that a phenomenon beyond the perfect is responsible for the requirement that the PTS must overlap with the reference time in a present perfect. In particular, they argue that a general phenomenon of grammatical competition and strengthening of meaning together with a language-particular meaning for the present tense necessitate a modification to the PTS-reference time relation that would otherwise emerge based solely on the lexical meaning of present and perfect in English. The ultimate explanation for the new puzzle remains to be seen, but I believe that it too partially depends on a phenomenon beyond the perfect. Specifically, independent constraints that regulate the distribution of referential adverbials, interact with the perfect, and impose the requirement that in some cases the PTS may not overlap with the reference time.

4. Concluding Remarks

This paper shows that positional adverbials exhibit restrictions in their compatibility not just with present perfects, but also with past and future perfects. The generalization that emerges is that a PTS modified by a positional adverbial may not include (even part of) the reference time, unless the positional adverbial is anaphoric to the reference time. This new generalization forces us to rethink the XN theory of the perfect. The semantics for the perfect, proposed in Pancheva and von Stechow (2004) can accommodate both the present perfect puzzle and the new puzzle. This semantics has the sole requirement that no part of the PTS may be after the reference time. Additional manipulation of the PTS-reference time relation, under certain conditions, is responsible for the two puzzles. In the case of the present perfect puzzle, when the perfect is embedded under present tense in English, the PTS is required to overlap with the reference time. In the case of the new puzzle, when the PTS modifying adverbial is restricted in its distribution, the PTS may not overlap with the reference time.

Why would the non-anaphoric positional adverbials be restricted in their distribution? The referential nature of the DP contained in the positional adverbials is what is responsible, I submit. The referential temporal DPs are subject to a Binding Theory of sorts, much like their counterparts from the domain of individuals. Indeed, the inclusion constraint on adverbial modification of intervals extends beyond the perfect:

- (31) a. ?? Marry left *last night*. I spoke to her *yesterday*...
 b. Marry left *this morning*. I spoke to her *yesterday*...
 c. Marry left *last night*. I spoke to her earlier *that day*...
- (32) a. ?? Mary moved to LA *exactly a year ago*. I met her *in 2003*...
 b. Marry moved to LA *this January*. I met her *in 2003*...
 c. Marry moved to LA *last May*. I met her *that spring*...

The restriction appears to be as in (33), with ‘binding’ defined as in (34).

- (33) a. Anaphoric adverbials are bound by the local evaluation interval.
 b. Non-anaphoric adverbials may not be bound (by the local evaluation interval).
- (34) An evaluation interval even partially included in another interval binds that interval.

It remains to be seen to what extent (33)-(34) correctly capture the distribution of referential adverbials, and to what extent they can be reduced to general constraints on co-reference.

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