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Dorit Abusch  
*Umeå University*

Mats Rooth  
*AT&T Bells Labs*

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## Temporal Adverbs and the English Perfect

Dorit Abusch  
Umeå University  
Mats Rooth  
AT&T Bell Labs

This paper is about the perfect and time adverbs, in particular about sentences such as (1) which combine the present perfect with a durative temporal adverb.

(1) John has been in Boston for two weeks.

David Dowty, and following him Richards and Mittwoch have noted an ambiguity in such sentences combining the present perfect with a durative time adverb (Dowty 1979, Richards 1982, Mittwoch 1988). What we call the existential reading is roughly 'there is a two-week period in the past throughout which John is in Boston'. The other reading, sometimes called a universal reading, asserts that John is in Boston throughout the two-week period ending at the utterance time. We call this the 'up-to-now' reading.

Dowty and the others we mentioned maintain that the distinction is a matter of genuine ambiguity. The alternative is that situations where John is in Boston for the past two weeks are just a particular group of situations which make the existential reading true. Dowty's principal argument for ambiguity is that when the adverb is in initial position as in (2), only the up-to-now reading appears possible.

(2) For two weeks, John has been in Boston.

This suggests that there is a distinction between the two readings in the grammar, based for instance on structural, scope, or indexing differences. This is a conclusion we endorse.

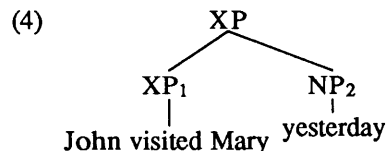
The next three sections review the background for our discussion of the perfect and time adverbs: the recursive structure of the perfect, the 'extended now' semantics for the perfect, and Dowty's semantics for temporal for adverbs.

### 1. Recursive Perfect

Previous work has shown that the perfect is semantically as well as syntactically complex, each verb having its complement of temporal parameters (Ejerhed-Braroe 1974, 1982; Hornstein 1977; Heny 1982; Zagana 1988; Mittwoch 1988). Frame adverb modification is one line of evidence for this. Frame adverbs such as **on Monday**, **yesterday**, or **now** provide a temporal frame for the event, process, or state described by a sentence. For instance, in a situation described by (3), the visiting takes place within the time period denoted by **yesterday**.

## (3) John visited Mary yesterday.

Most theories postulate a parameter at the clausal level which, among other things, mediates frame adverb modification. We will use the device of writing this parameter as an index on a clause.



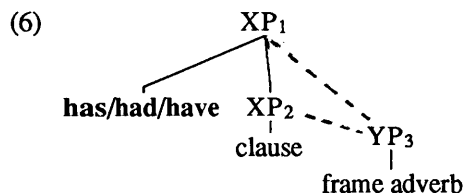
Thus in one theory, part of the semantics of the structure (4) is that the event corresponding to the index 1 is temporally included in the period corresponding to the index 2. Later on, we will be concerned with two interpretations of the clausal index. According to the interval semantics interpretation, in (4) the index 1 corresponds to an interval "at which" the clause **John visit Mary** is said to be true. As we have already seen, in an event semantics interpretation the index corresponds to a visiting event. We will mix the terminology of event semantics and interval semantics, calling the clausal index an eventuality index, and saying that some clause is true "at" its eventuality index. "eventuality" is a cover term for event, process, and state (Bach 1986).

(5) gives examples of frame adverbs modifying a clause in the perfect.

- (5) a. John has now visited Boston.  
 b. John has now visited Mary on a Monday.  
 c. John had left at 3:13  
 d. We expect John to have left at 3:13

The observation made about examples of this kind is that a frame adverb can modify a perfect clause in two ways, sometimes resulting in ambiguity. (5c) and (5d) have one reading implying that the departure time is 3:13, and another on implying that the departure time is earlier than 3:13.

The two modification possibilities are a straightforward consequence of a representation for the perfect which is recursive or embedded both at the syntactic and semantic level.

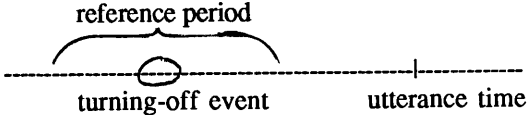


In the structure (6), there are two phrases, with their corresponding eventuality indices, available for modification by a frame adverb. For instance, in (5a) **now** can be held to modify the higher phrase  $XP_1$ . This is based on the premises that **now** denotes something like the utterance time, and that the index 1 in a present perfect sentence corresponds to an eventuality temporally identical to the utterance time, while the index 2 corresponds to an eventuality preceding the utterance time, possibly by a considerable span of time.

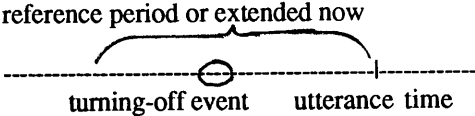
## 2. Extended Now Theory

The second idea about the perfect which we will be using is the 'extended now' theory discussed by McCoard (1978) and others. According to this theory, the semantics of the present perfect involves an 'extended now', which is a period stretching backwards from the utterance time in which the eventuality of the participial complement is included. McCoard draws an analogy with the familiar idea that a simple past tense sentence such as (7) involves a reference period in which, in this case, the turning-off-the-stove event is included.

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- (7) a. I turned off the stove 
- b. cf Partee (1973): I didn't turn off the stove.

The suggestion is that the present perfect works the same way, except that the reference period is a period stretching up to the utterance time, as indicated in (8).

- (8) I've turned off the stove 

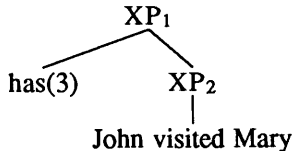
In deciding how to incorporate an extended now into the semantics, a consideration is the fact that it can be fixed contextually or pragmatically. For instance, in the office conversation (9), the extended now might be pragmatically reconstructed as the period between Bill's arrival at work and the present.

- (9) Mary: Is Sue here?  
Bill: I've seen her, but I don't know where she is right now.

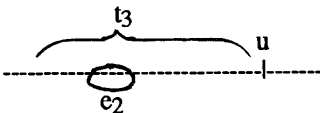
The usual way of dealing with this kind of contextual parameter is to make it a free variable in the semantics. This provides a semantic value which can be used in modeling the pragmatic component, and makes more sense than existentially quantifying the extended now as in (10a), since this formula is logically equivalent to (10b), a formula with no extended now variable.

- (10) a.  $\exists t_3 [x_{\text{now}}(t_3, u) \wedge \exists e_2 [e_2 \subseteq t_3 \wedge \text{AT}(e_2, \text{see}(b, s))]]$   
 $x_{\text{now}}(t_3, u)$  "t<sub>3</sub> is an extended now with respect to u"  
 $e_2 \subseteq t_3$  "e<sub>2</sub> is a temporal subpart of t<sub>3</sub>"  
 b.  $\exists e_2 [e_2 <_t u \wedge \text{AT}(e_2, \text{see}(b, s))]$   
 $e_2 <_t u$  "e<sub>2</sub> temporally precedes u"

(11) shows how we incorporate the extended now period in indexed trees. The extended now is represented by the index 3.

- (11) 

- (12) a.  $x_{\text{now}}(t_3, e_1) \wedge \exists e_2 [e_2 \subseteq t_3 \wedge \text{AT}(e_2, \text{visit}(j, m))] \wedge e_1 =_t u$   
 $e_1 =_t u$  "e<sub>1</sub> is temporally identical to u"

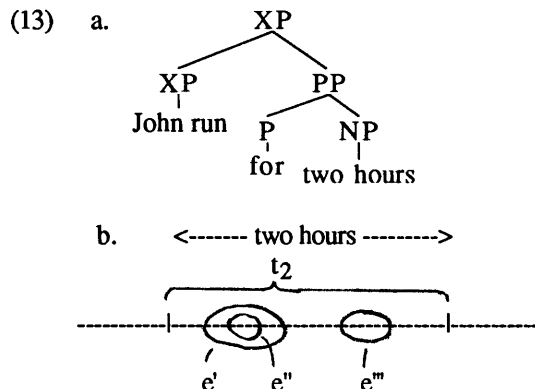
- b. 

(12a) gives as a formula the interpretation which we have already described.

3. Semantics of for adverb

Now we want to introduce the semantics for the **for** durational adverb. We will be concerned with the quantificational semantics introduced by Dowty, and several variants proposed by

Erhard Hinrichs. The basic idea about a sentence like (13) is that 'John run' is true within subintervals of an interval of duration two hours.



intervals or eventualities at which **John run** is true

Dowty's (1979) semantics requires that **John run** be true at all subintervals of the interval  $t_2$  in (13). This entails that it is true at nested families of intervals, such as  $e'$  and  $e''$  in the diagram. This provides a connection to the Taylor-Dowty theory of aspectual type, which says that truth at nested intervals is what characterizes state and process propositions in contrast to event propositions (Taylor 1977, Dowty 1979).

Hinrichs (1985), pursuing an observation of Dowty's, has argued that truth at all subintervals of  $t_2$  is too strong a requirement. For instance, in constructing concrete models, it is at least unclear whether one wants to say that a process proposition such as **John run** is true at very short intervals. Hinrichs shows that something somewhat weaker than the quantification Dowty specifies is sufficient for providing the right correlation with aspectual type, given the Taylor-Dowty theory. (14) is a modified version of his semantics.<sup>1</sup>

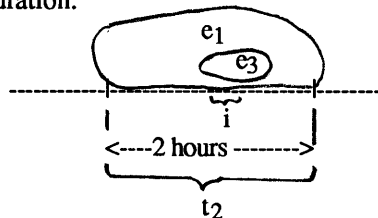
(14) Modified version of definition from Hinrichs (1985:235)

**John run for two hours** is true at the eventuality  $e_1$  iff:

There is an interval  $t_2$  such that:

- (i)  $t_2$  is of duration two hours,
- (ii)  $t_2$  is a temporal subpart of  $e_1$
- (iii) **John run** is true at  $e_1$
- (iv) for every subinterval  $i$  of  $t_2$ , there is an eventuality  $e_3$  such that:
  - (a)  $i$  is a temporal subpart of  $e_3$
  - (b)  $e_3$  is a proper subeventuality of  $e_1$
  - (c) **John run** is true at  $e_3$

Example configuration:

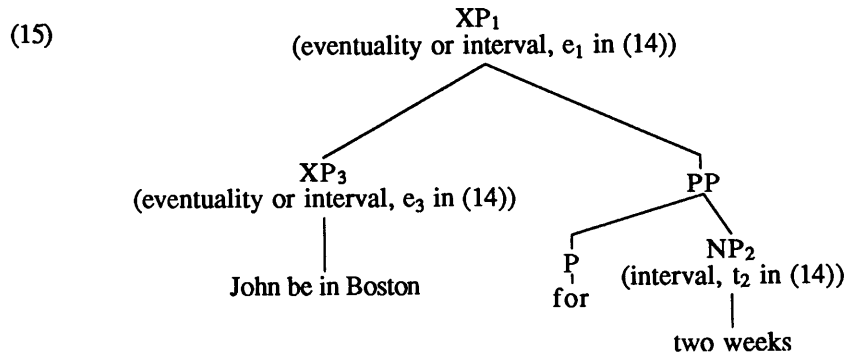


<sup>1</sup>The modifications are two-fold. First, we are ignoring Hinrichs' distinction between event individuals and event stages. Second, we introduce a type distinction between time intervals and event (stages) not found in Hinrich's definition.

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The difference from Dowty's definition is suggested by the diagram:  $e_3$ , which is an eventuality at which **John run** is required to be true, can be long even if  $i$  is a short. For us, the significant element of commonality in Dowty's and Hinrich's proposals is reference to an interval measured by the **for** adverb, the interval  $t_2$  in the formulas and diagrams above.

(15) shows how the variables in the definition (14) fit into the indexed trees which we have been using as a descriptive vocabulary. As suggested by the annotations, the representation is consistent with either event models or interval models.

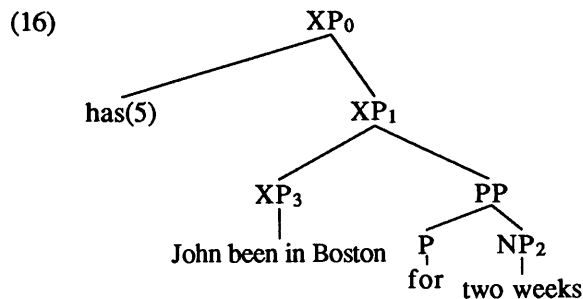


In an event model, the indices 1 and 3 correspond to eventualities at which **John be in Boston** holds. Notice that we are assuming that the index 2 corresponds to an interval variable, whether we are using event or interval models.

Concluding this introductory material, we point out that our semantic treatment is consistent with a number of syntactic approaches. In a raising structure, one can use the semantics we described directly. A non-raising recursive VP analysis can use the same semantics, by appealing to a semantic rule of functional composition. For simplicity, and since we are concerned mostly with semantics, we will continue to use a representation as in (11), which of course is not a surface tree in any theory.

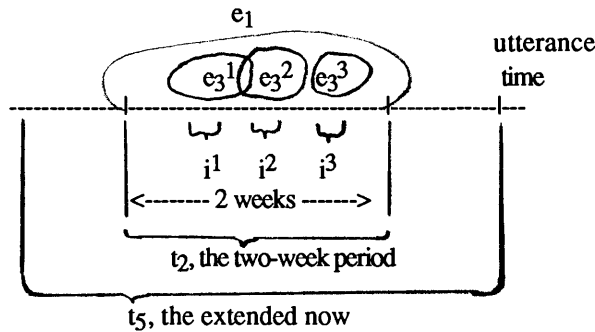
#### 4. Narrow Scope Derivation for the Existential Reading

We now return to the interaction of the **for** adverb with the perfect. Consider a structure such as (16) in which the **for** adverb has narrow scope relative to the perfect.



The resulting semantic value is indicated in (17). The interval measured by the **for** adverb is  $t_2$ , and this is located inside the extended now  $t_5$ . The quantified variables  $e_1$  and  $e_3$  are eventuality variables for being in Boston; the temporal projections of the values of  $e_3$  span the two-week period  $t_2$ . All of this describes the existential reading of the perfect-durative combination.

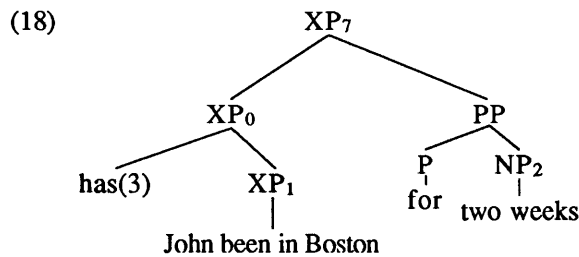
- (17)  $xnow(t_5, u) \wedge$   
 $\exists e_1 [ e_1 \subseteq t_5 \wedge$   
 $\exists t_2 [ two-weeks(t_2) \wedge t_2 \subseteq t_1 \wedge$   
 $AT(e_1, in(j, b)) \wedge$   
 $\forall i [ i \subseteq t_2 \rightarrow \exists e_3 [ e_3 \subseteq e_1 \wedge i \subseteq t_3 \wedge AT(e_3, in(j, b)) ] ] ] ]$



As far as we know, the existential reading has been derived in essentially this way by everyone who considered the problem, beginning with Dowty.

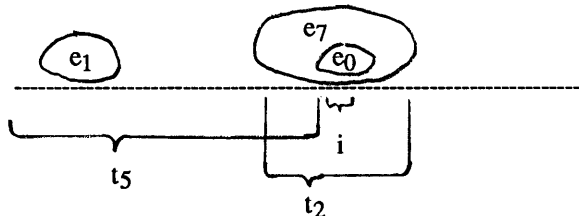
### 5. A Wide Scope Derivation for the Up-to-now Reading?

Does a structure with the opposite scope give the up to now reading? It is clear that it does not, given the semantics for *for* and for the perfect stated above. The problem is that in a structure such as (18) where the adverb has maximal scope, it in effect operates on the index 0, which corresponds to a state of having been in Boston, rather than one of being in Boston.



As a result, it is not the duration of John's stay in Boston which is measured, but if anything, the duration of a state of his having been in Boston. This is evident in (19), the formula expressing the universal quantification introduced by *for*.

- (19)  $\forall i [ i \subseteq t_2 \rightarrow \exists e_0 [ e_0 \subseteq e_7 \wedge i \subseteq t_0 \wedge xnow(t_5, e_0) \wedge \exists e_1 [ e_1 \subseteq t_5 \wedge AT(e_1, in(j, b)) ] ] ]$



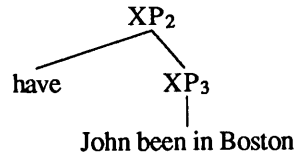
As you can see,  $e_1$ , the eventuality at which the formula 'in(j,b)' holds, can be temporally separated from the two-week period  $t_2$ .

Consequently, if one wants to have a wide-scope derivation of the up-to-now reading, one has to make different assumptions about the durational adverb, the perfect, or about the way they interact compositionally. The clearest articulation of a scope analysis in the literature is given in

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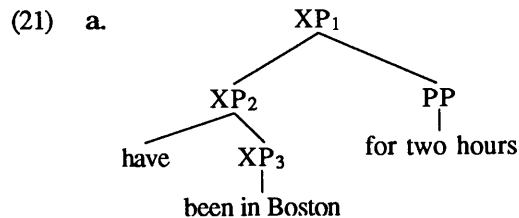
Richards (1982). In our terms, he proposes a different interpretation of the indices in a perfect clause, where the temporal or eventuality index of such a clause is the extended now period. This scheme is outlined in (20).

- (20) a. [have A] is true relative to  $t_2$  iff there is a subinterval  $t_3$  of  $t_2$  such that A is true relative to  $t_3$ . [Richards 1982:91]  
 b. In the indexed tree representation:



interpretation:  $\exists t_3[t_3 \subseteq t_2 \wedge AT(t_3, \text{in}(j,b))]$

If for **two hours** is given scope over this version of the perfect we obtain the interpretation in (21a), using Dowty's semantics for **for**.



$\text{two-hours}(t_1) \wedge \forall t_2[t_2 \subseteq t_1 \rightarrow \exists t_3[t_3 \subseteq t_2 \wedge AT(t_3, \text{in}(j,b))]]$

b.  $\text{two-hours}(t_1) \wedge \forall t_2[t_2 \subseteq t_1 \rightarrow AT(t_2, \text{in}(j,b))]$

One problem with this is that the semantics of the perfect has little impact on the outcome, which is logically equivalent to the semantics of **John be in Boston for two hours** given in (21b). A second problem has to do with the tensed version of this clause, where according to Richards' semantics  $t_1$  is identified with the utterance time. This leads to a complicated pragmatics, since it entails taking the utterance time to have a duration of two hours. In our view, this is an overly literal interpretation of the term 'extended now theory'.

Identifying the eventuality time of the perfect clause with the extended now period also makes it difficult to provide an adequate account of the frame adverb modification data we mentioned earlier. In (22), the duration of the semantic value of **now** would apparently have to be more than two weeks, in conflict with what is indicated by the appositive at 12:03.<sup>2</sup>

(22) John has now, at 12:03, been here for two weeks.

Another treatment of the up-to-now reading is the proposal from Dowty (1979:344) sketched in (23). In contrast to Richards' proposal, this is not a straightforward scope theory of the ambiguity: in (23b) the adverb is introduced together with the perfect auxiliary, so that the adverb does not have scope over the perfect in a derivational sense.

<sup>2</sup> See Heny (1982) and Mittwoch (1988) for related criticisms of a scope derivation of the up-to-now reading.



(23) a.  $TmAv$   $\lambda Q_i \exists t_1 [xnow(t_1) \wedge an-hour'(t_1) \wedge \forall t_2 [t_2 \subseteq t_1 \wedge xnow(t_2)] \rightarrow Q_i\{t_2\}]$   
 for an hour  
 ( $Q_i$  is a variable denoting a property of time intervals.)

b.  $\lambda x [\alpha' (\wedge t [xnow(t) \wedge AT(t, \beta'(x))])]$

c.  $\lambda x [\alpha' (\wedge t [xnow(t) \wedge AT(t, \beta'(x))])]$

$\lambda Q_i \exists t_1 [xnow(t_1) \wedge an-hour'(t_1) \wedge \forall t_2 [t_2 \subseteq t_1 \wedge xnow(t_2)] \rightarrow [xnow(t_2) \wedge AT(t_2, sleep'(x))]]$

d.  $\lambda x \exists t_1 [xnow(t_1) \wedge \exists t_2 [t_2 \subseteq t_1 \wedge AT(t_2, \beta'(x))]]$

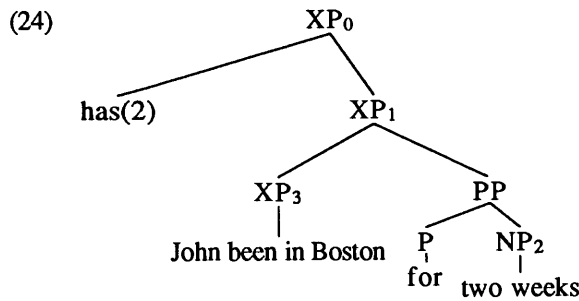
Further, while  $\alpha'$ , the translation of the adverb, does have scope over everything else in (23b), in this treatment the *for*-perfect ambiguity does not reduce simply to a difference in the semantic scope of operators. Rather, (23) involves novel meanings for both the *for*-adverb and the perfect. The reader can see this by comparing (23a) to the semantics for *for* which we reviewed earlier (which would still be involved in the existential reading, and in uses of temporal *for* not associated with the perfect), and comparing (23b) to (23d), Dowty's other semantic rule for the perfect. In fact, both (23a) and the material introduced syncategorematically in (23b) can be seen to stipulate truth at an extended-now interval. Thus, while this proposal is not open to the same objections as Richards' proposal, and produces a meaning which is defensible, the price for this semantic adequacy is fairly severe.

## 6. Anaphoricity Analysis

The conclusion we draw from the above discussion is that linking the up-to-now reading to a higher modification site is on the wrong track. Our alternative is based on the construal of the extended now theory stated earlier. Recall that there is motivation for considering the extended now period appearing in the semantics of the perfect a free parameter, the value of which is fixed by context. An important theme of work in semantics during the past decade is that such parameters can be a source of ambiguity at the intra-sentential level. In the present case, we suggest that the up-to-now reading results when the extended now period is fixed by material contributed by the *for* adverb.<sup>3</sup> The simplest possibility is that the extended now is anaphoric to the temporal nominal which is the object of *for*. This coreference relation is represented using indexing in (24):

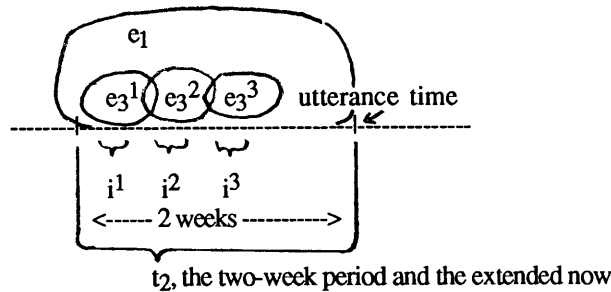
<sup>3</sup> Thus we are pursuing the suggestions in Bennett and Partee (1972), Dowty (1979), and Mittwoch (1988) that in the up-to-now reading, the *for*-adverb identifies the extended now. Our proposal aims to realize this idea without appeal to additional lexical items or rules.

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Let us look at the preliminary version of the semantics for (24) given in (25), and ignore some obvious problems having to do with the scope of quantifiers. We get to (25) by identifying  $t_2$  and  $t_5$  in (17). Note the formulas involving  $t_2$ : it is an extended now with respect to the utterance time, it is a period of duration two weeks, and it is covered by a family of eventualities at which **John be in Boston** holds. Taken together, these formulas characterize the up-to-now reading of **John has been in Boston for two weeks**.

$$(25) \quad \begin{aligned} & \text{xnow}(t_2, u) \quad \wedge \\ & \exists e_1 [ \quad e_1 \subseteq t_2 \wedge \\ & \quad \exists t_2 [ \quad \text{two-weeks}(t_2) \wedge t_2 \subseteq t e_1 \wedge \\ & \quad \quad \text{AT}(e_1, \text{in}(j, b)) \wedge \\ & \quad \quad \forall i [ i \subseteq t_2 \rightarrow \exists e_3 [ e_3 \subseteq e_1 \wedge i \subseteq t e_3 \wedge \text{AT}(e_3, \text{in}(j, b)) ] ] ] ] \end{aligned}$$

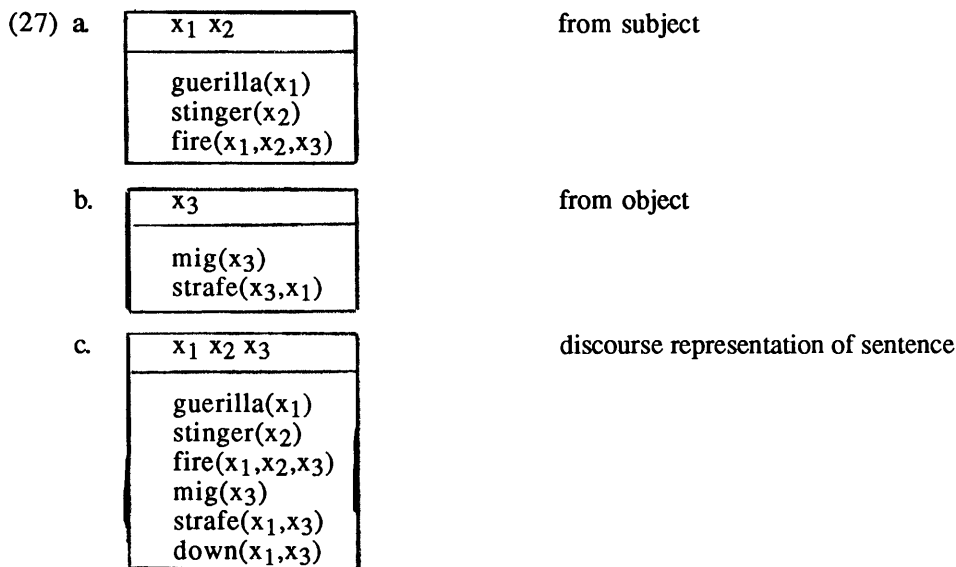


Now consider the scope of operators. We have treated the extended now as a semantic variable, and the temporal nominal [two weeks]<sub>2</sub> as an indefinite noun phrase. It follows that the temporal nominal should be considered the antecedent of the extended now. The potential problem with this is that the phrase two weeks might be in too inferior a position to capture the extended now variable. This problem is evident in the formula (25), where the topmost occurrences of  $t_2$  in the new formula are free, meaning that they are semantically independent of the bound occurrences of  $t_2$ .

There are at least two possible resolutions of this issue. One lies in the notion of the semantic scope of indefinites derived from discourse representation theory (Kamp 1981, Heim 1982). In one version of this theory, indefinites in a conjunctive context in a sentence achieve a wider scope than one might expect, essentially maximal scope. This effect has been applied to a class of Bach-Peters sentences, an example being the one in (26).

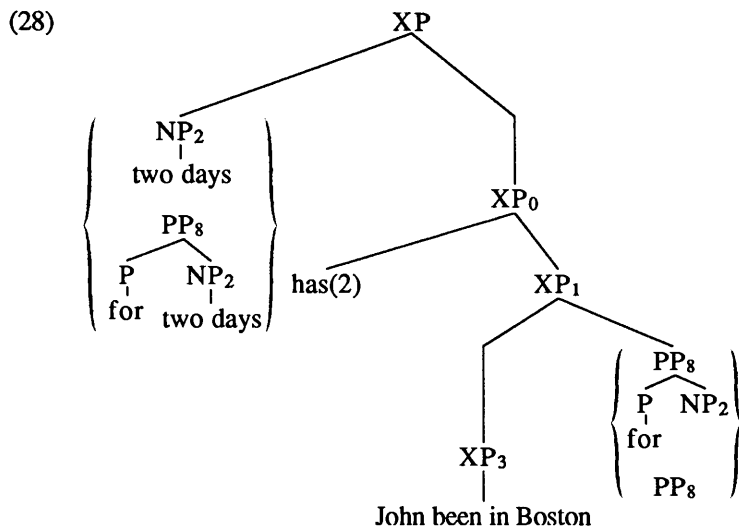
(26) A guerrilla<sub>1</sub> who fired a stinger<sub>2</sub> at it<sub>3</sub> downed a mig<sub>3</sub> which was strafing him<sub>1</sub>.

Part of the notation of discourse representation theory is the box notation in (27), which consists of a set of formulas and a set of variables. The formulas are interpreted as conjoined, and the variables can be thought of as existentially quantified, though they have somewhat different scope properties.



In a conjunctive context in a sentence, boxes are merged, so that in this example the scope of all three indefinites is maximal. This results in the semantic capture of the pronouns. Note that the formula (25) is conjunctive at the top few levels. Consequently, if we use the semantics just described, the indefinite quantifier coming from the temporal nominal gets maximal semantic scope, and the extended now variable is captured.

The other possibility is that the temporal nominal or the entire for-phrase is scoped in logical form (or by means of another scoping device), as indicated in (28).



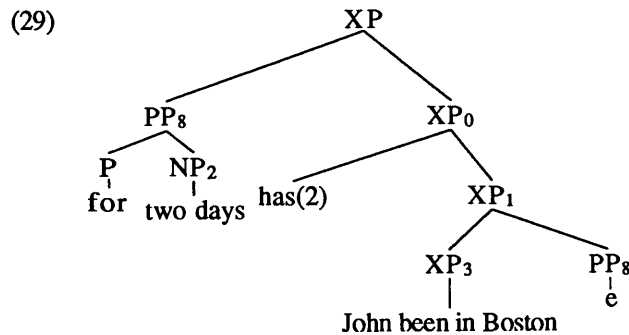
If the for-phrase is scoped, it is actually not immediate that the extended now gets bound, since 2 is not the index of the for-phrase itself.

### 7. Adverbs in Initial Position

Earlier, we mentioned Dowty's observation that putting the for adverb in initial position in a durational-perfect sentence disambiguates it in the direction of the up-to-now reading. Since we do not advocate a scope theory of the up-to-now reading, we can not explain this on straightforward structural grounds. In our theory, even a for-phrase in initial position is,

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semantically, a modifier of the embedded participial phrase, and we would postulate a surface structure along the lines of (29) for the up-to-now reading.



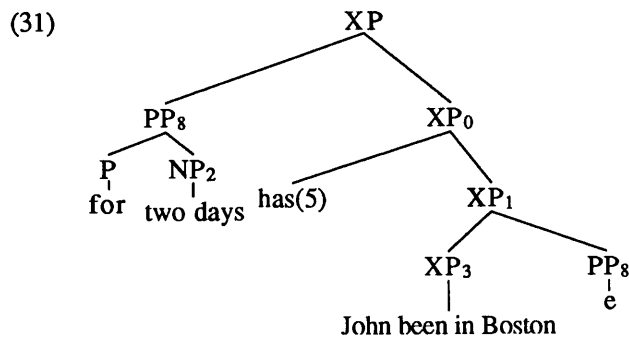
First, we need to verify that it is possible for an adverb which has temporal meaning and is in initial position to modify the embedded phrase. The affinity of a frame adverb in initial position is ambiguous; in (30a), the meaning associated with the embedded modification, where it is Mary's discovery which takes place on Monday, is probably pragmatically most plausible. (30b) is an example involving the adverb *again*. On semantic grounds, it is the embedded phrase which is being modified, for it is this phrase which, in a model where the sentence as a whole is true, is true at distinct intervals separated by intervals where it is not true.

- (30) a. On Monday, Mary had made a discovery.  
 b. Again Mary has made a discovery.  
 c. Twice Mary has made a discovery.

Similarly, in (30c) it is presumably the embedded phrase which is modified, since it is events of making a discovery which are counted, not states of having made a discovery.

The conclusion we drew about the frame adverb example (30a) can actually be challenged, since one could say that *on Monday* always operates at the level of the perfect auxiliary, restricting either the eventuality parameter or the reference period parameter. This is not a possible analysis of the other examples though.

We conclude that a temporal adverb in initial position can modify the embedded phrase in the perfect. This makes (29) a plausible structure for the up-to-now reading. In order to account for Dowty's observation that examples with a *for*-adverb in initial position lack the existential reading, we would have to explain why there is not another structure where the extended now has an index different from the index of the temporal nominal, as in (31), which given our story is the representation of an existential reading.



We actually want to challenge the claim that the correlation between preposing and the up-to-now reading is absolute. Regardless of the position of the *for*-phrase, one has to pay attention to the pragmatics for the existential reading which is entailed by the extended-now theory. This demands that a salient 'extended now' period be available. One such context in the case of (32) is an incomplete experiment in which John is isolated and his activities are recorded for the purpose

of studying his sleep patterns. In this case the extended now would be the period from the start of the experiment to the present.

(32) John has been asleep for two hours.

In this same context, an existential reading is at least fairly acceptable for an example sentences with a preposed *for*-phrase. If the experimenter is asked if anything significant has happened so far, the reply might be (33).

(33) For two hours, he has been asleep.

Or if the experimenter is asked to list what John's activities since the start of the experiment have been, the answer might be (34).

(34) For two hours, he has been asleep, and for ten hours, he has watched TV.

So the relation between a preposed *for*-adverb and the up-to-now reading seems to be more a strong tendency than an absolute correlation, one which is particularly compelling when examples are thought about in isolation. For this reason, we think a strictly grammatical explanation for Dowty's observation is inappropriate. Instead, we suggest that what is involved is an anaphora preference based on linear or hierarchical position: a preposed *for*-phrase is in a good position to donate an antecedent for the extended now, and this can have the effect of masking other possibilities. Another example involving temporal anaphora confirms the relevance of linearly or hierarchically determined anaphora preferences:

(35) On Friday, Mary started<sub>1</sub> teaching Bill syntax.  
Bill soon({1,2}) refuted several theories she presented<sub>2</sub>.

The semantic value of *soon* has a free variable: *soon* means 'soon after that'. In (35), the antecedent for this variable can be either the start of the lessons, suggesting that Bill is a very fast learner, or the time of Mary's presentation of the refuted theory, meaning that Bill refuted each of the several theories soon after it was presented.

In (36), the object NP in the second sentence has been preposed. In this case, the reading where the individual presentation is the antecedent, i.e. the reading where the variable takes the antecedent contributed by the element in initial position, is strongly preferred.

(36) On Friday, Mary started<sub>1</sub> teaching Bill syntax.  
Several theories Mary presented<sub>2</sub> Bill soon({?1,2}) refuted.

Thus the data for (35,36) are analogous to those for the *for/has* examples we are concerned with. In (35,36) a difference in locus of modification is not a possibility, lending support to our contention that a difference in locus of modification need not be involved in the *for/has* examples.

## 8. Incorporating Scattered Temporal Areas

As might have already occurred to the reader during the discussion of the sleep experiment example, our discussion of the semantics of the *for* adverb ignored the fact that the temporal area it measures can be non-continuous. (37a) might be true even if the length of each of John's individual visits to Boston was two days.

- (37) a. John was in Boston for forty-two days (last year).  
b. John was in Boston for a forty-two-day period.  
    ... a period of forty-two days.  
c. John was in Boston for a total of forty-two days.

The temporal nominals in (37b) headed by the word *period* do require a continuous temporal area. And the temporal nominal in (37c) suggests a non-continuous temporal area, though perhaps only by conversational implicature. This shows that the general semantics of durational

**for** is consistent with either continuous or non-continuous temporal areas, any further constraint being imposed by the temporal nominal which is the object of **for**.

While we did not mention this earlier, allowing for a non-continuous temporal area was an important part of Hinrichs' motivation for the semantics we reviewed. The required modification in the definition (14) is to make the variables range over sums of intervals or sums of eventualities, rather than simple intervals or eventualities. The appropriate definition is (38).

(38) **John run for two hours** is true at the sum of eventualities  $e_1$  iff:

There is a sum of intervals  $t_2$  such that:

- (i)  $t_2$  is of duration two hours
- (ii)  $t_2$  is a temporal subpart of  $e_1$
- (iii) **John run** is true at  $e_1$
- (iv) for every  $i \subseteq_t t_2$ , there is a sum of eventualities  $e_3$  such that:
  - (a)  $i \subseteq_t e_3$
  - (b)  $e_3 \subset e_1$
  - (c) **John run** is true at  $e_3$

The significant question for us is how this refinement in the semantics of **for** fits in with our derivation of the up-to-now reading. For us, this reading results from combining constraints coming from the perfect and from the **for**-adverb. An important point in this connection is that the notion 'sum of intervals' is defined so that ordinary, atomic intervals are included. It follows that an extended now, as previously defined, is a sum of intervals, and identifying the interval of the **for**-adverb with the extended now introduces no contradiction. Furthermore, if we continue to assume that an extended now is an interval rather than a non-atomic sum of intervals, the end result of such an identification will be exactly the same as before: the requirement that the temporal area corresponding to the index 2 in (24) be an interval, which before was redundantly supplied by the perfect auxiliary and the **for**-phrase, is now supplied only by the former.

This reasoning predicts that an up-to-now reading necessarily involves a continuous temporal area measured by the **for**-phrase. There is a compelling reason to think that this is right. If the temporal area in up-to-now readings was allowed to be non-continuous, the time specification in sentences like (39) involving states or processes which are typically regularly repeated would be almost irrelevant.

(39) For eleven hours, John has been asleep.

As long as John is asleep at the utterance time and has slept, throughout his life, for a total of more than eleven hours, there is a discontinuous sum of intervals, terminating at the utterance time, throughout which John is asleep. That is, a theory which allowed temporal areas in an up-to-now reading to be discontinuous would make the unwelcome prediction that (39) is, for practical purposes, synonymous with (40).

(40) John is asleep.

Another prediction is that (41) requires a context establishing an extended now interval within which the action takes place.

(41) John has been asleep for a total of eleven hours.

For on the assumption that the temporal nominal involving the word **total** is ineligible as an antecedent for the extended now, the reason being that it entails or implicates a scattered temporal area, this sentence has an existential reading. This in turn entails a free extended now, the value of which must be supplied by the context of use. We think this is right: when one tries to recover the intended meaning of (41), one asks oneself 'In what period? In the period of the sleep experiment or in his lifetime?' In this sense (41) is context-dependent in a way that the up-to-now reading of (42) is not.

(42) John has been asleep for eleven hours.

The difference in context-dependence is actually a novel argument that the existential and up-to-now readings are distinct.

## 9. Alternatives

According to the theory defended here, the durative-perfect ambiguity can be traced to the independently motivated semantics for the perfect (the extended now theory) and the general availability of intra-sentential anaphora. If our criticism of the attempt to derive the ambiguity from a difference in the scope of operators is compelling, one is led to ask whether there are any other genuine alternatives. As suggested above, the Dowty (1979:344) proposal is in fact an alternative of a third kind, in that it derives the ambiguity from essentially lexical differences. Another proposal along these lines is Mittwoch (1988:217), which states a distinct semantic rule for a universal (i.e. up-to-now) reading of the perfect:<sup>4</sup>

(43) For 20 minutes (Have<sup>U</sup> (A)) is true in M relative to (w, i) iff i is the final moment of an interval j such that j is of 20 minutes' duration and A is true in M relative to (w,j), where A is interpreted as a state.

One salient difference between these proposals and ours is that we have relied on the durational adverb to supply the element of meaning which implies truth throughout an interval. Mittwoch points out that in a theory which postulates a lexical ambiguity in the perfect, it is natural to provide a version of the rule or lexical entry for *have* which does not involve a *for*-phrase:

(44) Have<sup>U</sup> (A) is true in M relative to (w, i) iff i is the final moment of an interval j and A is true in M relative to (w,j), where A is interpreted as a state.

Mittwoch suggests that this indeed yields the desired interpretation for examples like (45).

(45) It's been hot.

We agree that (45) has a reading very similar or equivalent to (46), given a context for (45) which identifies the extended now as the past month.

(46) It's been hot for a month.

We wonder, however, whether such equivalences (or semi-equivalences) are systematic. (47b) seems to entail a continuous or relatively continuous rise, while (47a) -- at least on the most salient reading -- entails only a net rise.

(47) a. The value of Acme stock has increased.  
b. The value of Acme stock has increased for a month.

This is exactly what a theory which postulates universal quantification in (47b) but not in (47a) would predict.

It is worth pointing out that the problem which (45) poses is not limited to the perfect. The problem of the source of the universal or near-universal force evident in (48) is presumably

<sup>4</sup> This differs from Dowty's proposal in that it apparently assumes a non-quantificational semantics for the durational phrase, and stipulates the aspectual type of the complement. Thus one would like to clarify how (43) fits in with the general semantics for temporal *for*, and a general theory of aspectual type.

The notation in (43) and Mittwoch's text perhaps suggest that the *for*-phrase would have maximal scope in a more compositionally elaborated analysis. It is not clear to us how this could be achieved semantically.

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exactly the same problem. According to one analysis, the explanation lies in a variable relation between the eventuality time of a clause and its reference period, conditioned by aspectual type. This is the view taken in temporal discourse representation theory (see e.g. Hinrichs 1986).

(48) It was hot last month.

Another idea might be that the universal force derives from a quantity implicature.

Our conclusion is that our theory of the perfect-durative ambiguity, together with Dowty's and Mittwoch's, should be evaluated in the context of a broader investigation of the relation of eventuality time to reference period. At this point, we can not speculate what the results of such an evaluation might be.

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