

# On the stativity of the English perfect

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## 1. Introduction

In this paper we will be concerned with the aspectual class of perfect predicates. In particular we will try to answer the following question: Are English perfect predicates stative predicates? Stative predicates, such as *love coffee*, *know French*, and *be hungry*, are clearly distinguished in a number of ways from event predicates, such as *eat breakfast* or *learn French* (Vendler 1967; Dowty 1979). Concretely, then, the question is what the verb phrase (1a) has in common with (1b) that it doesn't share with (1c).

- (1) a. *have eaten breakfast*
- b. *like breakfast*
- c. *eat breakfast*

The answer will be “quite a lot.”

Just to take one clear case, one of the most well known contrasts between state verbs and non-state verbs in English is that state verbs cannot appear in the progressive:

- (2) a. *\*John is loving Mary.*
- b. *John is kissing Mary.*

This is a fact which has had many accounts over the years (Bennett and Partee 1978; Taylor 1977; Vlach 1993). It is equally well known that perfects don't form progressives either:

- (3) *\*John is having kissed Mary.*

While this has, since Chomsky (1957), been taken to be a syntactic fact about English auxiliaries, we will see that once the stativity of perfect predicates is recognized, we can derive the infelicity of both (2a) and (3) from the same source. As we will see below, incompatibility with the progressive is just one of the properties that show that perfects are stative.

In the first part of the paper we will catalog the basic similarities between perfects and statives, and note a few differences. In the second part we will provide an analysis of the perfect in the context of a particular treatment of grammatical and lexical aspect and apply it to explaining the stativity of the perfect. Here we will assume that the constellation of the auxiliary *have* combined with the participial morphology (the *+en*) can be viewed as a single operator that takes typical verb-phrase meanings as its input and returns perfect verb-phrase meanings as its output. We will not be concerned with which part of the perfect contributes what to the meaning (but see Klein (1999) and Musan (2000)). We will, rather, be asking what the perfect as a whole contributes to the meaning of the sentence. We will also adopt the null hypothesis that all occurrences of perfects have the same semantic analysis, in contrast to the tradition of McCawley (1971) and McCoard (1978). It should be noted that while the stativity of the perfect has often been often commented upon (Mittwoch 1988; Parsons 1990; Vlach 1993), it has rarely been the subject of direct investigation.

## 2. **Parallels between statives and perfects**

Of the “aspectual” classes that Vendler (1967) describes, the stative class is the most homogeneous, with the clearest distinguishing features. The contrasts which distinguish stative verbs from eventive verbs have been discussed extensively in the literature (Sag 1973; Dowty 1979; Hinrichs 1985).<sup>1</sup> The classical “tests” for stativity, which originated with Lakoff (1966), involve contexts in which non-stative predicates are acceptable and stative predicates are not. These tests are sensitive to a number of different features of the meaning of predicates: Agentivity, temporal homogeneity and present orientation being the major factors. In contrast to event predicates, state predicates are always non-agentive, temporally homogenous and have a present orientation.

## 2.1. Agentivity tests

Intuitively a predicate is agentive if it can only be truly used to describe a situation if this situation is caused by an agent – typically a person. The contrast is evident in (4).

- (4) a. *John hit the wall.*  
b. *The hammer hit the wall.*

Typically (4a) is used to describe an action that John carried out intentionally, while (4b) is used to describe an event that had no intentional component to it. (4a) might be used “non-agentively” as well (perhaps in the context of an accident report) to describing what happened to John’s body. Adverbs such as *accidentally* and *intentionally* select for agentive uses of a verb:

- (5) a. *John hit the wall intentionally.*  
b. ??*The hammer hit the wall intentionally.*

While most eventive verbs can be used both agentively and non-agentively, a small set, including *fall* and *collapse*, have no agentive use:

- (6) a. ??*Steven fell down intentionally.*  
b. ??*Mary collapsed from the heat accidentally.*

Similarly, stative verbs also cannot be used agentively:

- (7) a. ??*Anke is intentionally hungry.*  
b. ??*Peter knows French by accident.*

Many of Lakoff’s original stativity tests – the adverbial tests among them – were, in fact, tests for the non-agentivity of a predicate.

To support the claim that perfects are stative we would like to show that perfect predicates are also non-agentive. There are some difficulties involved, however. Since the perfect is a complex predicate, it is the case that when the embedded predicate is agentive the whole complex might look to be agentive. In (8), for example, the adverb *intentionally* is perfectly acceptable.

(8) *Hans has kissed Lin intentionally.*

But the adverb here appears to modify *kiss Lin* and not *have kissed Lin*. The data in (9) certainly appear to show this, if we can assume that adverbs apply directly to the phrase that they modify (cf. Cinque (1999)).

- (9) a. *Hans has intentionally kissed Lin.*  
 b. *??Hans intentionally has kissed Lin.*  
 (cf. *Hans intentionally kissed Lin.*)

The contrast in (9) might merely illustrate a fact about English syntax, however. Fortunately there appears to be an agentivity test that allows us to test for the agentivity of pieces of complex predicates directly. This is the *wh*-cleft test.

*Wh*-clefts clearly distinguish stative predicates from non-stative predicates. Only non-statives are acceptable in this construction:

- (10) a. *What John did was kiss Mary.*  
 b. *??What John did was love Mary.*

That the relevant factor is the predicate's agentivity is illustrated in (11).

(11) *??What the hammer did was hit the wall.*

The *wh*-cleft, then, appears only to be felicitous if the clefted predicate describes an agentive event. Applying the *wh*-cleft test to perfect predicates is quite revealing, in that it appears that when the perfect operator is part of the *wh*-clause and not part of the matrix, as in (12a), the sentence is acceptable, while if it is not part of the matrix, as in (12b) it is not.

- (12) a. *What Hans had done was kiss Lin.*  
 b. *??What Hans did was have kissed Lin.*

Again, of course, we might merely have uncovered a syntactic fact about the *wh*-cleft construction. Fortunately, not only perfect predicates provide evidence for this contrast: negated predicates do as well. Only if the negation is also fronted is the *wh*-cleft of a negated predicate acceptable.

(13) a. *What Hans didn't do was leave.*

- b. ??*What Hans did was not leave.*

Since negation is often taken to be a “stativizer” (Dowty 1979; Krifka 1989; Parsons 1990), the natural generalization seems to be that only agentive (and therefore non-stative) predicates can appear post-copularly in the *wh*-cleft construction. We will review the stativizing effects of negation below. The *wh*-cleft construction, then, appears to allow us to test for the agentivity of a part of a complex predicate, and the complex perfect predicate appears to be nonagentive. In the next section we will explore some further semantic properties that statives and perfects share.

## 2.2. Present orientation

The “present orientation” of state predicates is contrasted with the “past orientation” of event predicates. This is most clearly seen in the semantic analysis of “tenseless” languages (Dechaine 1991). In languages such as Haitian, bare stative sentences typically have present interpretations while bare eventive sentences have past interpretations. As noted by Stowell (1982), this contrast is also evident in the interpretation of “Headline English”. Although both (14a) and (14b) are in the simple present tense, when interpreted as newspaper headlines, (14a) has a past interpretation, while (14b) has a present interpretation.

- (14) a. *Pipeline explodes.*  
b. *Experts fear shortages.*

It is a past explosion, but a present fear of shortages. In more normal narrative or conversational contexts, simple present tense uses of event sentences are pragmatically quite limited. (15a) can only be used in a present tense narrative or to describe ongoing events to a remote audience (Ejerhed 1974) – the so-called “sports reporter’s present”. Statives appear quite naturally in the present tense, of course.

- (15) a. ??*Hans kisses Lin.*  
b. *Hans loves Lin.*

That this apparently banal fact reflects something semantically significant, and not just a surface curiosity of English morpho-syntax, is indicated by

the consistency with which this contrast extends to a number of other contexts in which there is no overt present tense, but in which the interpretation of a clause is in some way present-like. The most well known of these is the complement clause of attitude verbs.

It can be shown that the complement clauses of such verbs as *believe* and *think* must be interpreted with respect to a “local now” – a subjective present (von Stechow 1995; Ogiwara 1996; Abusch 1997). While this holds for tensed complements as well, infinitival complements provide particularly good illustrations. In (16) we see that stative predicates appear quite naturally as infinitival complements of *believe*, but eventive predicates do not (again, setting aside generic/habitual readings):

- (16) a.        ??*Thelma believed Hans to kiss Lin.*  
           b.        *Thelma believed Hans to love Lin.*

While the belief described is a past belief, the content of the belief is present, and this appears to be crucial to the contrast.

A second context in which present-orientation appears to play a role is in the complement of modal verbs. The modal verb *must* is often noted to be ambiguous between an epistemic reading and a deontic reading. It is also often footnoted (Giorgi and Pianesi 1998) that if the complement of *must* is stative – as in (17a) – then the sentence typically has an epistemic interpretation, whereas if the complement is non-stative – as in (17b) – then it only has a deontic interpretation.

- (17) a.        *You must love Lin.*  
           b.        *You must kiss Lin.*

(17a) means that given what is known, it follows that you love Lin, while (17b) means that you won’t be in line with requirements if you don’t kiss Lin, i.e., it is imperative that you kiss Lin. Note that the temporal interpretation of the complement in (17a) is present-like, while (17b) is future-like. (17a) means that given what we know **now** it follows that you love Lin **now**, while (17b) means that to be in line with requirements you need to kiss Lin sometime in the future. It appears that epistemic modals are present-oriented, while deontic modals are future oriented.

We might relate this contrast to the well-known “imperative” test for nonstativity. Since Lakoff (1966) we have known that stative predicates do not usually appear felicitously in imperatives:

- (18) a. ??*Love Lin!*  
b. *Kiss Lin!*

It seems clear that, in light of the interpretive contrast in (17), whatever it is that makes it infelicitous to use a stative to give a command indirectly in the form of a deontic modal is the same thing that makes it infelicitous to do so directly in the form of an imperative. There appears to be a conflict between the preference that stative predicates have for a present interpretation and the semantic futurity associated with imperatives and deontics. When we introduce a temporal adverbial such as *tomorrow morning* to alleviate this present/future conflict (and shift to predicates that can more easily be altered by directed action), we find that stative predicates are perfect in both deontic and imperative sentences:

- (19) a. *You must be at home tomorrow morning.*  
b. *Be at home tomorrow morning!*

Note also that the epistemic reading disappears in (19a), again underlining the correlation between a present interpretation and an epistemic interpretation.

The punch line, of course, is that perfect predicates appear to exhibit the same behavior as state predicates in all these contexts. They appear quite naturally in the simple present tense, as well as in infinitival complements of attitude verbs like *believe*:

- (20) a. *Hans has kissed Lin.*  
b. *Thelma believed Hans to have kissed Lin.*

Unmodified, they induce an epistemic interpretation for modal sentences, don't appear to have a deontic interpretation, and are somewhat strange as imperatives:

- (21) a. *You must have kissed Mary.*  
b. ?*Have kissed Mary!*

Furthermore, when they are modified by a future temporal adverbial they lose the epistemic interpretation, gain a deontic interpretation, and become felicitous as imperatives:

- (22) a. *You must have kissed Mary by the time I call.*  
 b. *Have kissed Mary by the time I call!*

We see, then, that perfect predicates and stative predicates have essentially the same range of distribution, contrast with eventive predicates in essentially the same ways, and alter their meanings in the same ways when modified by temporal adverbials. This striking parallel certainly calls for an explanation. Before giving one, however, let us turn to some sentence-external – discourse-related – parallels between stative predicates and perfect predicates that further underline this similarity.

### 2.3. Temporal interpretation of discourse

One of the most well known differences between state sentences and event sentences in discourse is that state sentences don't appear to 'move' narrative time, but event sentences do (Dry 1983). In the discourse in (23a) a single moment is described, the moment at which John wakes up, whereas in (23b) an extended period of time is described that involved an awakening, a clearing of the sky, and a hanging-up of clothes.

- (23) a. *John woke up. The sky was clear and the washing was on the line.*  
 b. *John woke up. The sky cleared and he put the wash out to dry.*

This contrast has been the subject of much research, and there are a number of competing accounts (Partee 1984; Hinrichs 1986; Dowty 1986; Kamp and Reyle 1993; Sandström 1993; ter Meulen 1995). Looking for a parallel with perfect predicates is difficult, because the interpretation of such predicates in discourse is a complex issue. One of the clear facts, however, is that a perfect predicate, embedded in a sequence of simple eventives, does not move narrative time. The contrast between the sensible discourse (24a) and the senseless (24b) makes this fact clear. (24a) is about a single point in time, although the events that lead up to this point are described using perfect sentences. In (24b) however, the time moves, and this makes the narrative inconsistent on its most natural interpretation.

- (24) a. *The sky was clear. Mary had left quietly. The washing was on the line. She had hung it up to dry.*  
b. *The sky was clear. Mary left quietly. The washing was on the line. She hung it up to dry.*

Another way of thinking of this is that both statives and perfects provide background information (Glasbey 1998), while event sentences are foregrounded.

A related issue concerns the “out of the blue” interpretation. As Sandstrøm (1993) noted, there are presuppositions associated with statives and perfectives (and progressives) that are not evident with simple eventives. In particular, “out of the blue” perfects and statives are infelicitous. When we read (25a) or (25b) we are left to wonder what time is being talked about.

- (25) a. *John had eaten all of the toast.*  
b. *The bread was on the shelf near the door.*

These sentences seem to require a pre-established time to anchor them. When a text begins with such a sentence, we feel as if we are starting in the middle of the action, much as when a definite NP or pronoun is used at the start of a text. In more natural discourses, this time is specified by the surrounding text, as in (26).

- (26) a. *Mary walked into the kitchen. John had eaten all of the toast.*  
b. *Mary walked into a store. The bread was on a shelf near the door.*

Note that simple eventive sentences don’t exhibit this infelicity when they are used at the start of a text. The initial sentences in (26a) and (26b) are perfectly natural. To push the analogy, such event sentences appear to be like indefinite NPs. They naturally introduce new events and times into the discourse, which can serve as antecedents for subsequent expressions. This parallel between state sentences and perfect sentences is interesting in that an “anaphoric” aspect to the meaning of perfect sentences is widely accepted. Since Reichenbach (1947) we have known that perfect sentences appear to require a given reference time or temporal perspective point to be interpreted felicitously. What the above examples seem to show is that the same holds for state sentences.

Let us now turn to temporal adverbial modification. Temporal adverbials have traditionally been the primary means of classifying predicates as to their aspectual class (Vendler 1967; Dowty 1979). As we will see, they present something of a challenge for us here, however. Scope difficulties and deeper semantic issues stand in the way of a direct application of the traditional temporal adverbial “tests” for stativity.

#### 2.4. Adverbial modification

It is well known that adverbs such as *in an hour* are incompatible with stative and activity predicates, while adverbs such as *for an hour* are incompatible with accomplishments predicates:

- (27) a. *He was away from home for an hour.*  
 b. *??He was away from home in an hour.*
- (28) a. *He pushed a cart for an hour.*  
 b. *??He pushed a cart in an hour.*
- (29) a. *??He ate lunch for an hour.*  
 b. *He ate lunch in an hour.*

Applying these criteria directly to perfect predicates yields somewhat uninteresting results. At first blush it seems that the aspectual class of the embedded predicate is what determines the acceptability of these adverbs:

- (30) a. *He has eaten lunch in an hour.*  
 b. *??He has pushed a cart in an hour*
- (31) a. *??He has eaten lunch for an hour.*  
 b. *He has pushed a cart for an hour*

Again, however, it would appear that these adverbs apply simply to the embedded event predicates. We would like to test their applicability to the perfect predicate as a whole. This appears to present a problem.

Fortunately, there is a context in which we can use *for*-adverbials to distinguish state predicates from event predicates which is not susceptible to

this difficulty. It appears that only stative sentences can appear in the complement clause in sentences such as those in (32).

- (32) a. *It was true for many days that John loved Lin.*  
b. *??It was true for many days that John kissed Lin.*  
c. *??It was true for many days that John pushed cart.*

Similarly, the adverbs *still* and *no longer* can only be used with state verbs and are incompatible with event verbs (Katz 2000), as illustrated in (33).

- (33) a. *Lin still loved Bill.*  
b. *??Lin still kissed Bill.*

Here we have two contexts in which scope issues cannot cause a problem. Unfortunately, however, it appears that perfect predicates are somewhat odd in both of these contexts:

- (34) a. *??It was true for many years that John had kissed Mary.*  
b. *??John has still kissed Mary.*

This may seem damning, showing that the perfect is fundamentally not stative. Giorgi and Pianesi (1998) note, however, that what this might show us is something else entirely. They suggest that perfect predicates are not only state predicates but “individual level” state predicates, in the sense of Carlson (1977). The incompatibility evidenced in (34) is, they suggest, of a type with that evidenced in (35).

- (35) *??The number two was prime for many years.*

Certainly the predicate *be prime* is stative. Nevertheless there is a pragmatic oddity to adding a temporal adverbial in such cases of timeless predication. Perhaps perfect predicates are timeless as well. We will return to this once we have discussed the semantics of perfects more thoroughly.

In summary, the distribution of perfect predicates appears to parallel the distribution of stative predicates in a number of different ways. Although the parallels are not always straightforward, many of the similarities are quite striking. In the next section, we introduce a semantics for the perfect in the context of a particular framework for treating the event/state contrast that we will then use to account for the parallels.

### 3. A stative semantics for perfects

The most widely adopted type of analysis of the perfect is the Reichenbachian (Reichenbach 1947; Hornstein 1990; Kamp and Reyle 1993; Klein 1994) analysis, in which the crucial semantic component of the perfect is the relationship between the described event and a temporal perspective point – the “reference time.” Typically this reference time is fixed by temporal adverbials or tenses; the present tense would fix the reference time to the time of speech and the past tense to a time before the time of speech. The great advantage of this kind of analysis is the account for discourse behavior of the perfect.

In discourse, the reference time is taken to be fixed by surrounding text. In (36) the time of Mary’s arrival fixes the reference point for the perfect in the second sentence.

(36) *Mary arrived late. Peter had eaten breakfast.*

Furthermore the Reichenbachian account provides a basis for explaining the contrast between the perfect and the past evident in (37).

- (37) a.        \**Peter has left yesterday.*  
      b.        *Peter left yesterday.*

On a Reichenbachian analysis we can simply say that the temporal adverbial *yesterday* must be associated with the reference time (see Hitzeman (1995)). This yields inconsistency in (37a) because the reference time is the speech time, but not in (37b) because the reference time must be located before the speech time.

While appealing, the Reichenbachian account doesn’t appear to say anything about the stativity of the perfect. Tenses relate speech time, reference time and event time, and the perfect is taken to be a kind of tense. An alternative to the Reichenbachian approach that does provide an account of the stativity of the perfect is the “result states” analysis (Parsons 1990; Kamp and Reyle 1993). On this account, perfect predicates denote the state that comes into being when an event occurs. Here I will adopt a result state analysis, integrating it into a more general theory of tense and aspect in the style of Kratzer (1998) and von Stechow (2001).

### 3.1. The basic tense/aspect framework

The basic idea of the current proposal is to treat the perfect as a Priorian time-shifting operator that operates on predicates of times. Tenses are treated referentially and event verbs are treated as Davidsonian predicates (Davidson 1967; Parsons 1990). Adopting the insights of Galton (1984), Löbner (1988) and Herweg (1991), I will distinguish event predicates from state predicates as follows. State predicates are properties of times and event predicates are properties of events. Tenses must combine with temporal properties to form propositional meanings. I assume, following much recent work (Kratzer 1998; Iatridou, Anagnostopoulou, and Izvorski 2001; von Stechow 2001) that the aspectual operators defined in (38) are part of the non-lexical vocabulary of English, and apply to event properties to yield temporal properties.

- (38) a. PERFECTIVE:  $\lambda P \lambda t \exists e [P(e) \ \& \ \text{time-of}(e) \subset t]$   
 b. PROGRESSIVE:  $\lambda P \lambda t \exists e [P(e) \ \& \ t \subset \text{time-of}(e)]$

These operators are, in a natural sense, inverses, one being the inclusion operator and one being the included-by operator (here I have ignored the familiar modality of PROGRESSIVE (Dowty 1977)). They are taken to head the Aspect Phrase and appear in English only with nonstative verbs. Progressive morphology indicates the presence of the progressive operator; otherwise the presence of the perfective operator is indicated.

I adopt a straightforward referential analysis of tense. Tenses are taken to be anaphoric elements – i.e., they are indexed – with presuppositions restricting their felicitous use, much like pronouns (Heim 1994; Kratzer 1998).

- (39) a. PAST<sub>t</sub>:  $g(t)$ ;  $g(t)$  is a time before the time of speech  
 b. PRES<sub>t</sub>:  $g(t)$ ;  $g(t)$  is a time identical with the time of speech

(The presupposition is given to the right of the “;”). We can illustrate by contrasting the analysis of the event sentence in (40a) with that of the state sentence in (40b):

- (40) a. *Sandy kissed Kim.*  
 b. [<sub>TP</sub> Sandy<sub>1</sub> [<sub>T</sub> PAST<sub>2</sub> [<sub>AspP</sub> PERFECTIVE [<sub>VP</sub> t<sub>1</sub> kiss Kim ]]]]

- c.  $\exists e$  [kiss(e,Sandy,Kim) & time-of(e)  $\subset$  g(2)]; g(2) is before the speech time

- (41) a. *Sandy liked Kim.*  
 b. [<sub>TP</sub> Sandy<sub>1</sub> [<sub>T</sub> PAST<sub>2</sub> [VP t<sub>1</sub> like Kim ]]]  
 c. like(g(2),Sandy,Kim); g(2) is before the speech time

In (40) the PERFECTIVE must apply to turn the property of events denoted by the VP into a property of times, which can then combine with the tense. In (41), however, there is no need for either the PERFECTIVE or the PROGRESSIVE operator to be introduced. Since the interpretation of a stative VP is already a property of times this can apply directly to the tense. We might note that the agentivity of perfective and progressive event predicates might well be attributable to properties of the AspectP (Kratzer 1994; Harley 1995), and that lack of this projection might be taken to account for the inherent non-agentivity of simple state sentences.

### 3.2. The treatment of the perfect

As mentioned, we adopt a very simple Priorian analysis of the perfect operator:

- (42) PERFECT:  $\lambda P \lambda t' \exists t$  [P(t) & t < t']

Perfect predicates are here interpreted as predicates of times subsequent to a time at which another predicate of times holds. Note that the perfect operator is not a stativizing operator itself. It must apply to a predicate of times, but this might be a lexically stative predicate or a predicate of times formed by applying an aspectual operator to an event predicate. The notion that the perfect is, in a sense, a second aspectual operator is to be found in Iatridou, Anagnostopoulou, and Izvorski (2001) and Pancheva (this volume). The analysis of the simplest type of perfect sentence, a perfect of a stative, is illustrated in (43).

- (43) a. *John has lived in Amsterdam.*  
 b. [John [PRES<sub>1</sub> [PERFECT [live in Amsterdam]]]]  
 c.  $\exists t$  [t < g(1) & live-in(t,John,Amsterdam)] ; g(1) is the time of speech.

In other words (43a) is true of there was a time at the past at which John was a resident of Amsterdam. Somewhat more complex is the treatment of perfect eventive sentences, in which in addition to the perfect operator, another aspectual operator applies. The two types of perfects of eventives are illustrated, with their analyses, in (44) and (45).

- (44) a. *John has eaten lunch.*  
 b. [John [PRES<sub>1</sub> [PERFECT [PERFECTIVE [eat lunch]]]]]  
 c.  $\exists t [t < g(1) \ \& \ \text{time-of}(e) \subset t \ \& \ \text{eat}(e, \text{John}, \text{lunch})]$  ;  $g(1)$  is the time of speech.
- (45) a. *John has been eating lunch.*  
 b. [John [PRES<sub>1</sub> [PERFECT [PROGRESSIVE [eat lunch]]]]]  
 c.  $\exists t [t < g(1) \ \& \ t \subset \text{time-of}(e) \ \& \ \text{eat}(e, \text{John}, \text{lunch})]$  ;  $g(1)$  is the time of speech.

(44a) is true if there is a past time interval contained an event of eating of lunch by John, while (45) is true if there was a time in the past during which John was engaged in eating lunch, i.e., a time that was temporally included in a lunch-eating event. (44a) has the so-called existential reading, while (45a) has the so-called universal reading (McCawley 1971; McCoard 1978). As Iatridou, Anagnostopoulou, and Izvorski (2001) show, in languages such as Greek where the participle only has the perfective form, only the existential reading is available. We will discuss these readings in conjunction with the interpretation of *since*-adverbials below.

Note in passing that the non-agentivity of perfect predicates, might be taken to follow from this extra syntactic projection. This reflects the intuition that while in (46) *left town* is an agentive phrase *have left town* is not:

- (46) *The boys (\*intentionally) had (intentionally) left town.*

With respect to the temporal semantics, the crucial feature of the analysis is that the perfect, as defined in (42), has the sub-interval property. The sub-interval property, given in (47), is the defining temporal property of lexical statives.

- (47) P has the sub-interval property iff if  $P(t)=1$  then  $\forall t' \subseteq t \rightarrow P(t')=1$

Given any reasonable axiomatization of times (e.g. Landman (1991)), (48) is valid, showing that all perfect predicates have the sub-interval property.

$$(48) \forall P, t', t'' \exists t [P(t) \ \& \ t < t' \ \& \ t'' \subseteq t'] \rightarrow \forall t [P(t) \ \& \ t < t'']$$

This is a property that Extended Now theories (Dowty 1979; Rathert 2001) typically do not attribute to perfect predicates.<sup>2</sup> It might be useful to note the parallel with the well-known stativizing effect of negation (Bennett and Partee 1978; Dowty 1979). Presumably sentence negation applies after the aspectual operators (i.e., to properties of times) yielding a property of times at which such-and-such is not the case:

$$(49) \text{NEG: } \lambda P \lambda t [\neg P(t)]$$

For example, the treatment of (50a):

- (50) a. *Sandy did not kiss Kim.*  
 b.  $[\text{TP Sandy}_1 [\text{T PASTt} [\text{NegP NEG}[\text{AspP PERFECTIVE} [\text{VP } t_1 \text{ kiss Kim } ]]]]]$   
 c.  $\neg \exists e [\text{kiss}(e, \text{Sandy}, \text{Kim}) \ \& \ \text{time-of}(e) \subset g(t)]; \ g(t) \text{ is before the speech time}$

Note that the perfect and sentence negation have the same logical type. In principle this means they should be able to apply to each other's output. Semantically, however, only if negation takes scope outside of the perfect does the sentence have non-trivial truth conditions. Consider (51).

- (51) *John has not eaten lunch.*

The scoping PERFECT>NEG, indicated in (52), provides trivial truth conditions. So long as there is some time in the past which does not contain an eating lunch event, it is true.

$$(52) \text{PERFECT} > \text{NEG: } \exists t \neg \exists e [t < g(1) \ \& \ \text{time-of}(e) \subset t \ \& \ \text{eat}(e, \text{John}, \text{lunch})]; \ g(1) \text{ is the time of speech.}$$

The reverse scoping gives us the intuitively correct truth conditions, namely that no time in the past contains such an event.

- (53) NEG>PERFECT:  $\neg\exists t\exists e[t < g(1) \& \text{time-of}(e) \subset t \& \text{eat}(e, \text{John}, \text{lunch})]$ ;  
 $g(1)$  is the time of speech

Again, given any reasonable interpretation of event durations and their relations to times, negated predicates also have the sub-interval property.

As we noted above, the contrast between “universal” perfects – associated with perfects of statives and perfects of progressives – and “existential” perfects – associated with perfects of perfectives (McCawley 1971; Rathert 2000) – is a natural consequence of this analysis. The contrast is most clearly evident when the perfect is modified by a *since*-adverbial:

- (54) a. *John has lived in Amsterdam since last Thursday.*  
 b. *?John has eaten lunch since last Thursday.*

Intuitively (54a) means that for the whole of an interval starting last Thursday and extending up to the time of speech, John lived in Amsterdam, and (54b), while awkward, means that at some time in the interval since last Thursday there was a lunch eating.<sup>3</sup> While there is some controversy over the treatment of *since* (Mittwoch 1988; Musan 2000), I take the position that *since*-adverbials modify temporal predicates in general, not only perfect predicates. Some nonperfect, *since*-modified clauses are given in (55).<sup>4</sup>

- (55) a. *In Boston since June, Mary will return to England soon.*  
 b. *Steve and his ex-wife, alienated since their divorce, are finally talking again.*  
 c. *Today John and Bill played tennis for the first time since September.*

Essentially the *since* modifier provides an interval to which a temporal predicate applies, this is an interval up to (but not including) the time denoted by the tense of the sentence (the symbol  $\supset$  means up to but not overlapping).

- (56)  $[[ \textit{since}_t ]] = \lambda t' \lambda P \lambda t'' [\text{begin}(t') \subset t' \& \text{end}(t') \supset g(t) \& P(t'')]$

Here *since* is also taken to be indexed, with a structural binding requirement that it be co-indexed with the main-clause tense.<sup>5</sup> The analysis of (54a), then, is as in (57).

- (57)  $\exists t [t < g(1) \ \& \ \text{begin}(t) \subset \text{last-thursday} \ \& \ \text{end}(t) \supseteq g(1) \ \& \ \text{live}(t, \text{John}, \text{Amsterdam})]$ ;  $g(1)$  is the time of speech.

The universality of the claim follows directly from the sub-interval property of the state predicates. The existentiality of the claim in (54b) follows from the interpretation of the PERFECTIVE operator, as indicated in (58):

- (58) a. [John [PRES<sub>1</sub> [PERF [PERFECTIVE eaten lunch [since<sub>1</sub> last Thursday]]]]]  
 b.  $\exists t [t < g(1) \ \& \ \text{begin}(t) \subset \text{last-thursday} \ \& \ \text{end}(t) \supseteq g(1) \ \& \ \exists e [\text{time-of}(e) \subset t \ \& \ \text{eat}(e, \text{John}, \text{lunch})]$ ;  $g(1)$  is the time of speech.

In contrast to most analyses the *since*-modifier applies not to the perfect predicate but to the embedded property of times. This may leave us to wonder why in non-perfect, tensed clauses *since* adverbials are so infelicitous, as illustrated in (59).

- (59) a. ??*John ate lunch since last Thursday.*  
 b. ??*John is sick since last Thursday.*

Particularly the infelicity of (59b) is troublesome, as similar sentences are acceptable in languages such as German and English (Giorgi and Pianesi 1998). The problem, I suggest, is a conflict between the *since*-adverbial and the tense. The analyses of (59a) and (59b), given in (60a) and (60b), respectively, clearly illustrate the problem:

- (60) a.  $\text{begin}(g(1)) \subset \text{last-thursday} \ \& \ \text{end}(g(1)) \supseteq g(1) \ \& \ \exists e [\text{time-of}(e) \subset g(1) \ \& \ \text{eat}(e, \text{John}, \text{lunch})]$ ;  $g(1)$  is before the time of speech.  
 b.  $\text{begin}(g(1)) \subset \text{last-thursday} \ \& \ \text{end}(g(1)) \supseteq g(1) \ \& \ \text{sick}(g(1), \text{John})$ ;  $g(1)$  is the time of speech.

The time denoted by the tense must be in the past, must start on the relevant Thursday and must extend up until just before the time denoted by the tense. To verify (60a) or (60b) the interval denoted by  $g(1)$  must be before itself! In tenseless clauses, or in perfect sentences, as we have seen, this conflict doesn't arise because it is a time other than the time denoted by the tense that is associated with the *since* adverbial. In the case of a perfect

sentence, for example, the *since* adverbial can serve as the argument for the embedded temporal predicate without there being a conflict, because the tense does not also fill this argument. But in non-perfect sentences, we end up with a conflict. The fact that we see *since*-adverbials only in perfect sentences is, I am claiming, due to a conspiracy of factors, not to any particular selection.

We are now in a position to turn to the contrasts between eventives and statives that we discussed at the outset, and attempt to account for them in the setting we have just sketched.

#### 4. Accounting for the parallels

The very first similarity between lexically stative predicates and perfect predicates that we noted was that neither of these could felicitously be combined with the progressive:

- (61) a. ??*John is knowing Mary.*  
b. \**John is having left town.*

On the analysis just presented, there is a trivial explanation of this fact. The PROGRESSIVE operator takes as argument an event predicate and returns a predicate of times. Since both perfect predicates and stative predicates are predicates of times, neither is in the domain of this operator, so the progressive can apply to neither. This account may seem unsatisfyingly formalistic and stipulative, and there is some reason to believe that a more general account of the English progressive is required.

One of the empirical objections to the account just suggested is that there are acceptable examples of stative verbs used in the progressive (Sag 1973; Zucchi 1998):

- (62) a. *John is resembling Bill more and more.*  
b. *Kids are knowing more and more about sex.*

As Zucchi points out, the crucial difference between standard uses of stative verbs and those in (62) is that the stative verbs used in (62) are being used to describe a change of state. In (62a) John's resemblance to Bill is being claimed to increase, as is the kid's knowledge of sex in (62b). In fact,

this use is restricted to state verbs that admit of degree modification, as both *resemble* and *know* do:

- (63) a. *John resembles Bill quite a lot.*  
 b. *Kinds know quite a lot about sex.*

State verbs such as *own*, which do not admit degree modification, also cannot be used in the progressive:

- (64) a. *??John owns his house a lot.*  
 b. *??John is owning his house more and more.*

Zucchi observes that Taylor's (1977) account of the progressive can be applied to these cases. Taylor suggested that the progressive is an operator that applies to predicates of intervals of time and returns sub-interval. When applied to predicates that are already sub-interval predicates, such as statives, the progressive is superfluous, and this is what accounts for the usual infelicity of progressive statives. When a stative verb is used to describe a change of state, however, as in (62), the progressive is acceptable precisely because the verbs are being used to describe change, and are, therefore, **not** sub-interval predicates. On this account, (62a) is taken to mean something like: the present moment is included in an interval of time at which John's resemblance to Bill is increasing.

What lexical statives like *own* and perfect predicates share is the property of being purely sub-interval predicates. They do not involve change and cannot be reinterpreted as describing a changing state. This is taken to be the source of their infelicity with the progressive. Likewise, the property that eventive predicates have that makes them typically compatible with the progressive is that they always hold of extended intervals.<sup>6</sup> This difference between interval predicates and sub-interval predicates accounts for much of the special distribution of stative predicates and perfect predicates.

#### 4.1. Present-oriented constructions

Only a totally sub-interval predicate can apply to a moment. If we adopt the assumption that the evaluation time of a clause is always viewed as a point (Mittwoch 1988), the contrast between statives and perfects on the one hand and eventives on the other in present-oriented constructions has a

straightforward account. With respect to the present tense, of course, this is trivial to see. Lexically stative predicates are intrinsically predicates of moments of time, and therefore appear naturally in the simple present tense.

- (65) a. *John is hungry.*  
 b.  $\text{hungry}(g(1), \text{John})$ ;  $g(1)$  is the speech time

The predicate can, simply by virtue of its lexical properties hold of the moment denoted by  $g(1)$ . Similarly in the progressive, the predicate applies to a time included in an interval, which can also be a moment.

- (66) a. *John is eating.*  
 b.  $[\text{John} [\text{PRES}_1 [\text{PERFECTIVE eat}]]]$   
 c.  $\exists e [\text{eat}(e, \text{John}) \ \& \ g(1) \subset \text{time-of}(e)]$ ;  $g(1)$  is the speech time

And finally, in the perfect, it is clear that although the eating event is extended, and the time of the eating (here  $t'$ ) is non-momentary, the perfect predicate, which is predicated of times after this extended interval, can apply to moments.

- (67) a. *John has eaten.*  
 b.  $[\text{John} [\text{PRES}_1 [\text{PERFECT} [\text{PERFECTIVE eat}]]]]$   
 c.  $\exists t' \exists e [\text{eat}(e, \text{John}) \ \& \ \text{time-of}(e) \subset t' \ \& \ t' < g(1)]$ ;  $g(1)$  is the speech time

It is the inherent compatibility of perfect, progressive, and stative predication with moments of time to which we can attribute the felicity of such sentences as (65a), (66a), and (67a).

This account can be generalized to all of the present-like contexts discussed above. For example, the the point-like nature of the evaluation time for a clause can be said to account for the infelicity of perfective predicates in the tenseless complements of attitude verbs such as *believe* (see Katz (2001)):

- (68) a. *John believed Mary to be hungry.*  
 b. *??John believed Mary to leave.*

Following Heim (1994), Ogihara (1996), von Stechow (1995) and others, I take *believe* to denote a function from individuals, times and worlds to the

set of doxastic alternatives for that individual at that time in that world, i.e., the set of worlds and times compatible with what the individual believes to be the case. The analyses of (68a) and (68b) are given below.

- (69) a. [ John PAST<sub>1</sub> believe [Mary [to be hungry]]]  
 b.  $\forall w, t$  [ $\langle w, t \rangle \in \text{beliefs}_{w_0}(g(1), \text{John}) \rightarrow \text{hungry}_w(t, \text{Mary})$ ];  
 $g(1)$  before the time of speech
- (70) a. [ John PAST<sub>1</sub> believe [Mary [to [PERFECTIVE leave]]]]  
 b.  $\forall w, t$  [ $\langle w, t \rangle \in \text{beliefs}_{w_0}(g(1), \text{John}) \rightarrow \exists e$  [time-of(e)  $\subset$  t  
 & leave<sub>w</sub>(e, Mary)];  $g(1)$  before the time of speech

The particular details are less important. What leads to the contrast in (68) is the fact that the times that are quantified over in (69b) and (70b) are moments of time. They are times that the believer takes to be alternatives for his present. Beliefs are about what is the case now, or at least that time that is believed to be now (Abusch 1997).

Of course what is the case now might also be that a particular event has already occurred, and this is why the perfect is acceptable in these contexts. We illustrate this in (71).

- (71) a. *John believed Mary to have left.*  
 b. [John PAST<sub>1</sub> believe [Mary [to [PERFECT [PERFECTIVE leave]]]]]  
 c.  $\forall w, t$  [ $\langle w, t \rangle \in \text{beliefs}_{w_0}(g(1), \text{John}) \rightarrow \exists t' \exists e$  [ $t' < t$  & time-of(e)  $\subset$  t' & leave<sub>w</sub>(e, Mary) ]];  $g(1)$  before the time of speech

Here the leaving is located in the subjective past, and thus there is no conflict between the momentary nature of the “local now” and the extended nature of the leaving.

Similar considerations account for the impossibility of an epistemic interpretation for such sentences as (72).

- (72) *John must leave.*

Epistemic modality is, like belief, present-oriented. Formally, the modal base (Kratzer 1977) for epistemic modals contains only indices which are momentary – these are considered alternatives for the real world at the

moment of evaluation. The modal base for deontic modals, on the other hand, contains only future indices – these are considered alternatives for the way the world ought to be at some future time. The interpretation of (72) given in (73), makes clear that only those modal bases (MBs) that contain non-momentary times will make such sentences as (72) felicitous.

- (73) a. [ John PRES<sub>1</sub> must [PERFECTIVE leave]]  
 b.  $\forall w, t [ \langle w, t \rangle \in MB_{w_0}(g(1)) \rightarrow \exists e [ \text{time-of}(e) \subset t \ \& \ \text{leave}_w(e, \text{John}) ] ; g(1) \text{ is the time of speech}$

When the complement clause is a perfect or a stative, of course, an epistemic modal base is perfectly acceptable, as should be clear from the analysis in (74).

- (74) a. *John must have left.*  
 b. [John PRES<sub>1</sub> must [PERF [PERFECTIVE leave]]]  
 c.  $\forall w, t [ \langle w, t \rangle \in MB_{w_0}(g(1)) \rightarrow \exists t' \exists e [ t' < t \ \& \ \text{time-of}(e) \subset t' \ \& \ \text{leave}_w(e, \text{Mary}) ] ; g(1) \text{ before the time of speech}$

The interaction between temporal, aspectual and modal semantics is evident in the domain of attitude verbs as well. As discussed in Katz (2001), attitude verbs such as expect, which are clearly future-oriented also take as complements non-stative predicates:

- (75) *John expects Mary to leave.*

The account is relatively straightforward: Presumably the indices associated with both expectation and deontic modality – being associated with future times – are not limited to moments, but contain extended intervals. This means that they are compatible with non-sub-interval predicates.

#### 4.2. Narrative discourse

Let us now turn to the interpretation of narrative discourse. On the analysis presented above, determining the time that a tense refers to is taken to be essentially a pragmatic issue. On this referential analysis of tense the theory of narrative interpretation outlined by Dowty (1986) is quite appealing.

Dowty strategies for choosing the time to which tense refers to that are something like the following:

**Narrative strategy:** Adopt as the temporal referent for a tense, a reasonable time ‘just after’ the salient time picked out by the most recent sentence.

**Out-of-the-blue strategy:** Adopt as the temporal referent for tense, the most reasonable time

This may seem, as given, practically absent of content. But in fact it is enough to draw the distinction between event sentences and state sentences. The reason is that, because the semantics for event sentences involves inclusion and existential quantification, there is a certain amount of intrinsic vagueness involved. Consider the out-of-the-blue strategy. If for the utterance *John left* the time chosen for the past tense interpretation is, say, the whole of last week, then the sentence is true no matter when John left, so long as it was sometime last week. In fact, for full generality we might take the whole of the past as the denotation for the past tense. Further information might later be brought to bear to locate the event more exactly, but this is a monotonic process. For event sentences, since the perfective operator is an inclusion operator, as long as the time chosen is large enough, it will include the appropriate event, therefore for a given event there is a whole range of choices that are truth-conditionally equivalent.

In the case of states and perfects, however, this is not the case. Every choice of a time is truth conditionally distinct, and therefore it is impossible, short of a strong narrative context, to choose an appropriate time. Whatever time is chosen is the time at which the state will be taken to hold. So for an utterance such as *John was hungry*, if the time chosen for the past-tense interpretation is the whole of last week, then the sentence is false if John is not hungry for all of last week. If this is not what is intended by the speaker – say he meant only last Tuesday at lunchtime – and this becomes apparent in the course of subsequent discourse, we cannot simply monotonically add information. Rather we must re-interpret the utterance. In absence of any other information, we need to make a guess about when the speaker intends and the guess must be exactly correct. This is entirely different than the case of event predicates, where we can assign a very general temporal interpretation to the sentence and wait for subsequent refinement.

Since we are particularly concerned with the interpretation of perfect sentences, consider the problems raised by the perfect sentence (76).

(76) *Peter had left.*

In interpreting an utterance of (76), we cannot take the past tense to refer to the whole past. In this case the sentence could never be true, since the leaving event would have to be located at a time before the whole past, i.e., before all of time. Absent any other information, whatever time we chose, we run the risk that the intended leaving event is actually located after that time, and so we will have misinterpreted the utterance. The best we can do is to choose a time just before the utterance time. In this case the leaving event referred to might have taken to be any time in the past. This seems almost adequate. We have, however, eliminated the informativity of the past perfect: we might as well simply have chosen a past or a present perfect.

The point is that with statives and perfects, choosing an appropriate denotation for the tense is crucial. In discourse contexts this is easy, and is accomplished by choosing the time denoted by the previous tense. This accounts for the non-moment of narrative time. In “out of the blue” contexts this is not possible and this results in the infelicity.

#### 4.3. Adverbial modification

Finally, we turn to the interpretation of temporal adverbials, as it is here that we noted a contrast between perfects and statives. One of these contrasts was that in (77).

- (77) a.      ??*For several minutes it was true that John had left.*  
b.      *For several minutes it was true that John was hungry.*

Above we suggested that the oddness of (77a) was attributable to the permanence of perfect predicates. This semantic property of perfect predicates would seem to follow directly from the semantics for the perfect that we gave above. Since once an event occurs or a state holds at a time it will always be the case that the event occurred or the state held, if a perfect is true of a time, it is true of all subsequent times. As Giorgi and Pianesi

(1998) suggest, this makes it pragmatically infelicitous to claim that this perfect state held only of some shorter interval.

There are, however, certain exceptions. If we choose our event predicates wisely we can find perfect predicates that are acceptable in such constructions as that in (77). One such example is given in (78):

(78) *For several minutes it was true that I had talked to everybody in the room.*

One situation in which (78) can naturally be interpreted is one in which there are three people in the room, who I talk to individually one after the other, and then, several minutes later, somebody else walks into the room. The domain of quantification is expanded and, therefore, after the new person enters it is no longer true that I have talked to everybody in the room.

A simple analysis of this sentence makes the issue quite straightforward. For simplicity I will assume a universal analysis of the *for*-adverb, and treat the tenses as bound variables. This is illustrated in (79).

- (79) a. *For several minutes, John was tired.*  
 b. [For several minutes<sub>1</sub> [John PAST<sub>1</sub> be tired]]  
 c.  $\exists t$  [t is several minutes long &  $\forall t' \in t$  [tired(t',John)]]

Recall that the presuppositions of the tense require that t be a past time. For the acceptable reading of (78) the interpretation is as given in (80).

- (80) a. [For several minutes<sub>2</sub> [it PAST<sub>2</sub> be true that [everybody<sub>1</sub> in the room [I [PAST<sub>2</sub> [PERF [PERFECTIVE [talk to t<sub>1</sub>]]]]]]]]]  
 b.  $\exists t$  [t is several minutes long] &  $\forall t' \in t$  [it is true at t' that  $\forall x$  [x is in the room at t']  $\rightarrow \forall t''$  [t'' < t' &  $\exists e$  [time-of(e)  $\subset$  t'' & [talk(e,I,x)]]]]]

The crucial formal issue here is that the nominal predicate has a temporal component (Musan 1995), which is bound by the tense time. So the claim is that there was a past interval of time which was several minutes long, for which all subintervals were such that for all individuals in the room at that subinterval there was an event prior to that subinterval in which I talked to that individual. Here the perfect is no longer a permanent state predicate because of the nature of the event. And because of this, temporal adverbials

are acceptable. Note that in the same situation we might say, just after the new person enters the room.

(81) *I have no longer talked to everyone in the room.*

Recall that the adverb *no longer* is one that only appears with stative predicates and typically does not appear with perfects. The analysis of *no longer* is somewhat complex, and we reserve the detailed treatment for the future. The point, however, should be clear. What restricts the use of certain adverbials that typically go with stative predicates from appearing with the perfect in many cases is that perfect predicates are usually permanent. As we have seen, however, this is not always the case.

## **5. Conclusion**

In summary, we have seen that, as frequently assumed, perfect predicates are best treated as stative. They have much the same semantic and syntactic distribution and this distribution can be accounted for in much the same way. This conclusion constrains both proper analysis of the perfect – pure Reichenbachian analysis are no longer as appealing and extended now accounts might need to be reconsidered – as it does analysis of the syntax/semantics interface. The fundamental temporal semantic contrast between stative predicates and eventive predicates, which we have taken here to be a temporal semantic contrast, must also make stativity a property that perfect predicates can have as well.

## Notes

1. Most event predicates have a habitual or generic usage, which patterns syntactically and semantically with that of lexically stative verbs. While there is much to say about this (see Krifka, et. al. (1995)), we will not be concerned with this issue here. Generic and habitual readings should be ignored throughout.
2. Progressive predicates have the sub-interval property, and perfective predicates do not.
3. There are also existential readings of perfects of statives, as in *Peter has been in New York since July*. I follow Rathert (2000) in the suggestion that the acceptable reading of such sentences involves an implicit frequency adverbial – a silent *once*.
4. We might expect that we would be able to combine *since* with perfective predicates as well as with stative predicates. This turns out to be the case, although both English morphology and pragmatic considerations makes finding felicitous examples difficult. (i) is such an example, however.
  - i. *Reaching more than ten 5000 meter summits since last year, Fabrizio is well on the way to achieving his goal.*
5. The exact way to spell out this binding requirement remains the subject for future research.
6. The treatment of activity predicates has always been problematic on this account. As Dowty (1979) argues, however, these are only sub-interval predicates “to a degree”. And it is the total sub-interval nature of statives and perfects that appears to be crucial.

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