

Temporal Existentials and the Amount Perfect

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This paper examines new data concerning the Perfect aspect and its modification by *since* clauses. Past analyses of such adverbials have argued that the complement of *since* can be a clause expressing an event, but that the event must be unique (Iatridou 2003); and that the complement can be a Universal Perfect, but not an Existential Perfect (von Stechow and Iatridou, in progress). However, the sentence *It has been four years since Henry has visited the MIT Museum* is grammatical and felicitous, even though there are presumably many events of Henry visiting the MIT Museum and even though the complement of the *since* clause is an E-Perfect and not a U-Perfect. Such data presents a challenge for previous conceptions of the Perfect. In this paper, I propose a new *Amount Perfect* meaning for the Perfect morpheme that accounts for temporal existentials (with unique events in the embedded clause) by relating them to simultaneous reading sentences (with Universal Perfects in the embedded clause).

1. Introduction

For theories of the Perfect aspect, a central question is whether the Perfect and its modifiers are ambiguous in their syntax or semantics, and what the nature of that ambiguity is. Many theories have posited various possibilities (see McCoard 1978 for an early overview of theories of which most modern proposals are heirs), in many cases attempting to group different uses of the Perfect under a single denotation, with ambiguities distinguished pragmatically. For instance, many authors take the Experiential Perfect, the Hot News Perfect (or Perfect of Recent Past), and the Resultative Perfect to be variations on a single Perfect aspect; others argue for the independent existence of one or another meaning (e.g. Pancheva 2003, who presents evidence that the Resultative Perfect is independent of the others).

In this paper, I will argue in favor of separating out another use of the Perfect, which I call the *Amount Perfect* (or *A-Perfect*). Taking two recent proposals about the interpretation of *since* clauses as Perfect modifiers, I show that, in spite of some additional data that pose an apparent problem, they can be reconciled into a unified theory of the meaning of *since*. This single theory, however, underscores certain empirical challenges to both proposals, and I conclude by showing that separating the Amount Perfect from other uses of the Perfect resolves these challenges.

Section 2 is a brief overview of the theory of the Perfect used in this paper. In Section 3, I discuss the first of the two uses of *since*, in what Iatridou (2003) calls “temporal existentials” such as (1a). Section 4 then examines another use of *since* clauses which von Stechow and Iatridou (in progress, henceforth F&I) call the “simultaneous reading”: in (1b), the reading is that Tony’s taking Prozac co-occurs with Tony being happy.

- (1) a. It has been three years since his cat died.
 b. Tony has been happy since he has been taking Prozac.¹

Section 5 reconciles the two proposals and explores the need for an A-Perfect in Iatridou's temporal existential sentences, centering primarily around the sentences in (2).²

- (2) a. It has been four years since Henry has been in graduate school.
 b. It has been four years since Henry has visited the MIT Museum.
 c. Henry has lived in Somerville since he has been in graduate school.
 d. Henry has lived in Somerville since he has visited the MIT Museum.

For the time being, I will withhold judgments on the sentences' grammaticality, felicity, or truth conditions, and instead move along to Section 2, an overview of the Perfect.

2. The "Extended Now" Theory of the Perfect

Iatridou and F&I assume, and I will follow them in assuming, the account of the Perfect given in Iatridou et al. (2001, henceforth IAI), which is an "Extended Now" theory. The key to the Extended Now theory of the Perfect is that the Perfect introduces a time span (the "Perfect Time Span" or PTS) with two endpoints, a Left Boundary (LB) at the start and a Right Boundary (RB) at the end, and asserts a relation between the event in the sentence and the PTS.

The RB of the PTS is set by tense; in a Present Perfect sentence, the RB is the utterance time: that is to say, the time span under consideration is one which ends at the present. (Similarly, the Past Perfect sets the RB to be a time before the utterance time, and so forth; for the sake of simplicity, the sentences discussed here will generally be in the present tense.) The LB can be determined by context or can be set explicitly by any of a number of different adverbs. For example,

- (3) Henry has lived in Somerville.

has a PTS which ranges from some point in the past to now, and

¹ As in F&I, many sentences with *since* in this paper will have an irrelevant "because" reading; for instance, (1b) can mean "Because he has been taking Prozac, Tony has been happy." These readings should be ignored.

Some speakers, incidentally, cannot get the simultaneous reading at all for (1b); for them, the sentence has only the "because" reading, and is ungrammatical otherwise. (F&I offer some explanation of this fact, but I will be concerned in this paper only with the dialect which accepts the simultaneous reading.) I myself am one of these speakers, and have consulted other English speakers who do speak a simultaneous-readings dialect for judgments on the data in this paper.

² For the sake of making truth conditions easy to evaluate, example sentences will be about a fictional graduate student named Henry. The relevant biographical information: Henry graduated from MIT in May 1999, moved from Cambridge to Somerville, and started graduate school at MIT in September 1999. He visited the MIT Museum at three different times, most recently on the day he started graduate school. (Any similarity to any actual graduate student, living or dead, is purely coincidental.)

All sentences are considered to be uttered in the summer of 2003. Note that this makes the utterances neither exactly four years after Henry's college graduation nor exactly four years after Henry's starting graduate school, but as time spans are often used approximately, we can consider both *Henry graduated from college four years ago* and *Henry started graduate school four years ago* to be true.

- (4) Henry has lived in Somerville since 1999.

has a PTS which ranges from 1999 to now. (Other adverbials that set the LB either directly or by specifying the length of the time span include *from 1999 to now* and *for the last four years*.) Both sentences assert that Henry's living in Somerville stands in a relation to that span. What the relation is depends on whether the Perfect is interpreted as a U-Perfect or an E-Perfect.

In the *U-Perfect* (or *Universal Perfect*), the state given in the sentence is asserted to hold *throughout* the PTS. On this reading, the sentence in (4) is taken to mean, loosely, "Every interval between 1999 and now is an interval at which Henry lives in Somerville," which can be formally expressed with a universal quantification over time intervals in (5a). In contrast, in the *E-Perfect* (or *Existential Perfect*³), the state given in the sentence is asserted to hold *at some point* in the PTS. On this reading, (4) means "Some interval between 1999 and now is an interval at which Henry lives in Somerville," which can be formalized with an existential quantification over time intervals as in (5b).⁴

- (5) a. $\exists t . \text{RB}(t) = \text{now} \wedge \text{LB}(t) = 1999 \wedge \forall t' \subseteq t : \text{Henry lives in Somerville at } t'$
 b. $\exists t . \text{RB}(t) = \text{now} \wedge \text{LB}(t) = 1999 \wedge \exists t' \subseteq t : \text{Henry lives in Somerville at } t'$

Many sentences are ambiguous between a U-Perfect and E-Perfect reading—(4), for instance.⁵

It is often useful to disambiguate the two Perfects. Frequency adverbs such as *often*, *occasionally*, *twice*, *five times* are compatible only with E-Perfects. The sentence *Henry has lived in Somerville twice since 1999* necessarily means that, since 1999, there are two times at which Henry lived in Somerville, which is an E-Perfect interpretation. Adding *ever* before *since* forces a U-Perfect reading: *Henry has lived in Somerville ever since 1999* necessarily means that, since 1999, Henry has lived in Somerville the whole time. Fronting a *for* clause also forces a U-Perfect reading: *For four years, Henry has lived in Somerville* (compared to *Henry has lived in Somerville for four years*, which can also mean that he lived in Somerville for four years at some point in the past). Naturally, neither of the latter two are compatible with a frequency adverb.

- (6) a. *Henry has lived in Somerville twice ever since 1999.
 b. *For four years, Henry has lived in Somerville twice.

IAI, following Dowty (1979) and Vlach (1993), assume (at least) two adverbial levels, perfect-level and eventuality-level, the former higher in the tree than the latter, the difference being whether the adverbial is modifying the Perfect or the eventuality. They also describe two possible meanings for adverbials, "durative" (asserting that the predicate holds over a span of time) and "inclusive" (asserting that the time of the predicate holds within a span of time). When modifying the Perfect, durative adverbials are compatible only with U-Perfect meanings, inclusive only with E-Perfect meanings.

Adverbial ambiguity then results from optionality in attachment or in meaning. *Since* adverbials, according to IAI, are always perfect-level, as they cannot appear without Perfect

³ Again, this paper will not need to differentiate forms of the E-Perfect, such as the Experiential Perfect, the Resultative Perfect, and the Perfect of Recent Past; the E-Perfects discussed here are all Experiential Perfects.

⁴ Throughout this paper, $\text{RB}(x)$ means "the right boundary of time interval x " and $\text{LB}(x)$ means "the left boundary of time interval x ". Some formulae from other papers have been adapted for consistency.

⁵ See IAI for arguments that (3) is necessarily an E-Perfect unless there is an implicit modifier.

morphology (**I am sick since yesterday*), but produce a U/E-Perfect ambiguity because they can be either durative or inclusive. As one goal of the current paper is to reconcile the various meanings and uses of *since*, I will follow a related proposal of Arnim von Stechow's (p.c. to IAI, cited therein) in considering *since* clauses to be neither durative nor inclusive, and thus compatible with either meaning. In either case, the adverbial in (7) modifies the Perfect and the ambiguity results from the different interpretations of the Perfect aspect.

- (7)
- a. Henry has lived in Somerville since 1999.
 - b. There is a time span from 1999 to now, and *at every point* in that time span, Henry lived in Somerville.
 - c. There is a time span from 1999 to now, and *at some point* in that time span, Henry lived in Somerville.

On the other hand, *for* adverbials are always durative, but as shown by the fact that they can appear without the Perfect (*I was sick for five days*), they can be either perfect-level or eventuality-level. When a *for* adverbial attaches at the perfect level, the Perfect is a U-Perfect (because the adverbial is durative); when it attaches at the eventuality level, the Perfect is an E-Perfect (still durative, asserting that the predicate holds for the duration given by the *for* clause, but the eventuality-level attachment means that the predicate-holding-over-duration event occurred within the PTS). So the ambiguity in (8) is not a durative/inclusive ambiguity but an attachment level ambiguity. The U-Perfect reading in (8b) occurs when the adverbial modifies the Perfect; the E-Perfect reading in (8c) occurs when the adverbial sets the duration of the event of Henry living in Somerville.

- (8)
- a. Henry has lived in Somerville for four years.
 - b. There is a time span from **four years ago** to now, and at every point in that time span, Henry lived in Somerville.
 - c. There is a time span from some point in the past to now, and at some point in that time span, there is an event of Henry living in Somerville **for four years**.

The LB of the E-Perfect reading is left open to context, presumably something like “within Henry's lifetime”, when there is no overt perfect-level adverbial; adding an overt one sets the LB and, of course, forces the E-Perfect reading (as the *for* adverbial can no longer give a U-Perfect reading by being perfect level).

- (9) Henry has lived in Cambridge for four years since 1990.

It is this syntactic attachment ambiguity that allows *since* clauses to front with both E-Perfects and U-Perfects, but *for* clauses to front only with U-Perfects: perfect-level adverbs can front (because they attach higher in the tree), while eventuality-level adverbs cannot.

IAI demonstrate a number of other points about the Perfect, but these will suffice as an overview for the purposes of this paper.

3. Temporal Existential Perfects

Iatridou (2003) considers the English complementizer *since* in constructions she calls “temporal existentials”, sentences that assert the existence of a certain amount of time. I will refer to the matrix Perfects in such sentences as “temporal existential perfects” or TEPs. This is not meant to

suggest, a priori, a different Perfect meaning than the E-Perfect and U-Perfect; indeed, one purpose of this paper is to determine what kind of Perfects TEPs are.

As her premise, Iatridou draws an analogy between sentences like (1a), repeated here as (10a), and sentences like (10b). The former, runs the analogy, asserts the existence of an amount of time within a certain temporal range (the familiar Perfect Time Span), while the latter asserts the existence of an amount of space within a certain spatial range.

- (10) a. It has been three years since his cat died.
b. There are three cups of water in the sink.

Both sentences follow the pattern in (11). The light verb in English is *be* and English requires an expletive subject; the analogous Greek temporal existential (with *pu* for *since*) uses *have* as the light verb and requires no expletive.⁶

- (11) *light verb* [amount of time/space]_α [location of time/space]_β

Just as the prepositional phrase *in the sink* gives the location of three cups of water, the clause *since his cat died* in this construction gives the temporal location of the three year time span.

Iatridou (2003, example 69) offers the formula in (12) as the meaning for (10a).

- (12) $\exists t . RB(t) = \text{now} \wedge LB(t) = \text{the } t \text{ [his cat died at } t] \wedge \exists t' [3 \text{ years}(t') \wedge t' \subseteq t]$

Comparing this to the formula in (5b), repeated in (13),

- (13) $\exists t . RB(t) = \text{now} \wedge LB(t) = 1999 \wedge \exists t' \subseteq t : \text{Henry lives in Somerville at } t'$

it's clear that Iatridou treats TEPs as instances of the Existential Perfect. In section 5, I will argue that the Perfect in such sentences is not an E-Perfect (and indeed that “temporal existential” is a misnomer), but for now we shall accept this as a working hypothesis to see what follows. Certainly a TEP is not a U-Perfect, as we see if we try to force a U-Perfect reading:

- (14) a. It has been four years since Henry graduated from college.
b. *It has been four years ever since Henry graduated from college.

That a TEP does not have a matrix U-Perfect is unsurprising when one considers what a U-Perfect would mean in (14a): it would have to be the case that all time intervals between Henry's college graduation and now are intervals at which four years exist. This is clearly nonsense; much closer is the truth condition that there exists an interval between Henry's college graduation and now which is four years, which is to say, the E-Perfect interpretation of the matrix Perfect. (Notice that this interpretation will also cause the sentence *It has been two years*

⁶ Iatridou also analyzes Greek sentences with *na* instead of *pu*, which are also translatable into English with *since* and which display properties that are distinct from both *pu* sentences and the *since* sentences in this section. While *na* sentences do share some properties in common with other English sentences discussed in this paper, the differences (especially the syntactic ones) are greater than the similarities, and the analysis in this paper should not be taken as an alternate analysis of *na*.

since Henry graduated from college to be true in this context. This is not a flaw: in fact, the sentence is true, though it carries a scalar implicature that it has been no more than two years.)

Iatridou observes a number of restrictions on the clausal complement of *since* (and its Greek translation in this usage, *pu*). First, the sentence presupposes the existence of the event described in the embedded clause. This may seem an obvious restriction—just as there can't be three cups of water in the sink without there being a sink, there can't be three years between the death of his cat and now if his cat didn't die—but it is worth noting, insofar as an apparent near-paraphrase with negation plus either the Perfect (like the matrix aspect) or the simple past (like the embedded tense) does not have this presupposition at all.

- (15) a. It has been three years since Henry left the country.
 b. Henry hasn't left the country for three years.
 c. Henry didn't leave the country in the last three years.

In (15a), Henry must have left the country; continuing the sentence with *and in fact he never has left* produces a contradiction. On the other hand, (15b) and (15c)—which also seem to assert that the last three years have been free of Henry-leaving-the-country events—can be continued with *and in fact he never has left* without contradiction. Notice that the presupposition of (15a) remains when negation is added and when the sentence is turned into a question.

- (16) a. It hasn't been three years since Henry left the country.
 b. Has it been three years since Henry left the country?

Both sentences in (16) are felicitous only if Henry did leave the country at some point.

The other presupposition TEPs have is that the event in the embedded clause must be unique. Not only must the event not have occurred after the LB of the time span, it must not have occurred more than once at or before the LB of the time span. Thus (17b) is as bad as (17a).

- (17) Henry visited the MIT Museum in 1995, again in 1998, and again in 1999. (It is now 2003.)
 a. #It has been eight years since he visited the MIT Museum.
 b. #It has been four years since he visited the MIT Museum.

Using the 1995 visit to set the LB is infelicitous because Henry visited the MIT Museum after that visit; using the 1999 visit to set the LB is infelicitous because Henry visited the MIT Museum *before* the 1999 visit. Both sentences can be made felicitous by adding an explicit modifier to turn the description in the *since* clause into a unique event.

- (18) a. It has been eight years since he visited the MIT Museum **for the first time**.
 b. It has been four years since he **last** visited the MIT Museum.

If modifiers such as these were available covertly, the sentences in (17) would be acceptable with sufficient context. However, even loading the context to pick out a particular event does not improve them.

- (19) a. In 1995, Henry visited the MIT Museum to see an exhibit about Doc Edgerton. #It has been eight years since he visited the MIT Museum (and he's gone twice more in the meantime).
(cf. *It has been eight years since he visited the MIT Museum for the first time* or *It has been eight years since that visit*)⁷
- b. In 1999, Henry visited the MIT Museum to see the kinetic sculptures. #It has been four years since he visited the MIT Museum (and he still talks about how much better it was the third time).
(cf. *It has been four years since he last visited the MIT Museum* or *It has been four years since that visit*)

So the event in the embedded clause must be unique.

Of course, *since* with the simple past is not the only construction in natural language that carries presuppositions of existence and uniqueness. These presuppositions are the hallmark of the definite determiner. In the next section, we will take a first look at F&I's analysis of certain other uses of *since* clauses, to see how to incorporate a definite determiner meaning into them.

4. Simultaneous Reading Perfects

von Stechow and Iatridou consider the internal compositional semantics of *since* clauses. I begin this section with a review of their discussion of *since* clauses in general, and continue with their analysis of *since* clauses that give simultaneous readings.

4.1 Since with DPs and simple past CPs

As we saw above, a Perfect adverbial beginning with *since* sets the left boundary of the Perfect time span. In its most basic use, *since* takes as its object a time-denoting DP (*Wednesday, early this morning, 1999*, and so on). The sentence in (4), *Henry has lived in Somerville since 1999*, uses *since* this way: part of its assertion is that the LB of the PTS which contains an interval of Henry living in Somerville is the time 1999.⁸

Rather than requiring lexical ambiguity, *since* with other complements can be reduced to *since* with a time-denoting DP. The easiest examples involve DPs that denote individual occasions which occurred at a specific time, as it is trivial to postulate a covert function that maps events (e.g. *Henry's college graduation* or *Lynn's thirtieth birthday*) onto the times at which they occurred. Thus, given that Henry graduated from college in May 1999, (20a) and (20b) are truth-conditionally equivalent.

⁷ Or a noun phrase that selects a particular event, e.g. *It has been eight years since that visit to the Museum.*

⁸ Of course, 1999 is a 365-day interval, not a single point in time. The ambiguities of LB times—when exactly Henry must have arrived in Somerville to make (4) true—have been analyzed extensively elsewhere in the literature. I will simply ignore them here.

- (20) a. Henry has lived in Somerville since May 1999.
 b. Henry has lived in Somerville since his college graduation.

Since can also take a clausal complement. Because the clause is setting the left boundary of a time span, which is to say that it is specifying a point before the “evaluation time” of the Perfect, it must indicate a point in the past. One way to do so is to make the tense of the clause the simple past. For example, in (21), the complement of *since* is the simple-past sentence *he graduated from college*.

- (21) Henry has lived in Somerville since he graduated from college.

Though the clause *he graduated from college* is a useful way to pick out a particular time (and indeed may be a pragmatically relevant way to do so), it does not itself denote a time.

F&I solve this mismatch by introducing an operator *Op*, a function from sets of times to times, which works in much the same way that the definite article *the* does. *The* is a partial function from sets of individuals to individuals; given a set of cardinality one, it returns the unique member of the set, and is therefore undefined when its argument is not a set with a single member, which causes a presupposition failure. On a first pass, *Op* does the same: it takes a set of times and returns the unique time in the set.

On F&I’s analysis, the subordinate clause in (21) has a covert [AT *Op*] in it, in which the *Op* moves; it looks as follows.

- (22) since [PAST [VP [VP Henry moved to Somerville] [AT *Op*]]] →
 since *Op* λ*t* [PAST [[Henry moved to Somerville] [AT *t*]]]

The clause is thereby turned into a set of times. The reader is referred to F&I for the details of the compositional semantics, under which (22) receives the interpretation in (23):

- (23) [[*since*]] ([[*Op*]] (λ*x* . ∃*t*' < *t*_{utterance} : Henry moves to Somerville at *t*' and *x* = *t*'))

The argument of *Op* is the set of times *x* such that *x* is a time before the utterance time at which Henry graduated from college—in this case, the singleton set {May 1999}. *Op* will return its only member, i.e. May 1999. The sentence in (21) will therefore be truth-conditionally equivalent to (24),

- (24) Henry has lived in Somerville since May 1999.

which is the desired truth condition.

Because *Op* is a definite operator—that is, like the definite determiner, *Op* is a partial function from singleton sets to individuals—it has the same presupposition as the definite determiner. The fact that *since* + Simple Past presupposes the existence and uniqueness of the event in the embedded clause follows directly from the use of *Op*. If the event has never occurred, λ*t* . [[*past clause*]] AT *t*] will be an empty set; if the event has occurred more than once, the set will have a cardinality greater than one. In either case, *Op* is not defined for the set, and the sentence will have a presupposition failure. This is true for ordinary uses of the Perfect in sentences like (21), and also for the TEPs of the last section. Repeating a few relevant examples:

- (25) a. (#)It has been three years since Henry left the country.
b. (#)It has been four/eight years since Henry visited the MIT Museum.

If Henry has never left the country, *Op* will apply to an empty set in (25a), making the sentence infelicitous. Similarly, (25b) is infelicitous because the set is not a singleton set, there being three times at which Henry visited the MIT Museum.⁹

4.2 Since with Perfect CPs

If this were the extent of the data, we would have a complete explanation of *since* clauses. By requiring *since* to combine with a time and by using an *Op* to convert clauses to times, the theory presented so far predicts that TEPs and ordinary sentences in the Perfect will behave identically with respect to *since* clauses whose complements are DPs denoting times, DPs denoting events, and simple past clauses. And this is true: once again, given that Henry graduated from college in May 1999, the three U-Perfect sentences in (26) are truth-conditionally equivalent, as are the three E-Perfect sentences in (27) and the three TEP sentences in (28).

- (26) a. Henry has been living in Somerville since May 1999.
b. Henry has been living in Somerville since his college graduation.
c. Henry has been living in Somerville since he graduated from college.
- (27) a. Henry's parents have visited him twice since May 1999.
b. Henry's parents have visited him twice since his college graduation.
c. Henry's parents have visited him twice since he graduated from college.
- (28) a. (#)It has been four years since May 1999.
b. It has been four years since Henry's college graduation.
c. It has been four years since Henry graduated from college.

The only apparent exception is (28a), but it is anomalous for pragmatic reasons rather than reasons of semantic interpretation. Without context, it's strange to assert what is essentially an arithmetic truth. In a context in which the speaker is deliberately providing the arithmetic fact, either in answer to a question or to underscore the fact, the pragmatic anomaly disappears.

⁹ In some cases, of course, a salient event can be picked out (Iatridou makes a similar point with *since I went to the hairdresser*):

- (i) I have received ten get-well-soon cards since I broke my leg.

Said in a conversation to someone who doesn't know my medical history, (i) is nevertheless natural if my leg is in a conspicuous plaster cast, even if I also broke my leg years ago (and is also natural when spoken to someone who does know that me breaking my leg is not a unique event). Definite operators are often restricted to a salient set, so this is no more unusual than *Hand me the book* is in a context where there is one book nearby and many other books in the world, or more than one book nearby but one book under discussion. My leg being in a cast makes a certain set of leg-breaking events salient (in particular, the set containing the single event that led to my current condition).

- (29) A: Where's Henry living these days?
 B: When I talked to him in, let's see, May 1999, he was living in Cambridge.
 A: That's not helpful. It's been four years since May 1999.

In all these sentences, the complement of *since* marks a point before the evaluation time. A DP that denotes a time in the past will suffice, as will a DP that denotes an event in the past or a sentence in the simple past.

However, there is another way to highlight a time in the past: by using a sentence in the Perfect. Using *since* + Perfect to modify a typical sentence in the Perfect gives what F&I call a “simultaneous reading” (I will call the matrix Perfects in these sentences SRPs or “simultaneous reading perfects”). For instance, (30) means that the time of Henry being in graduate school overlaps the time of him living in Somerville (by implicature, the two overlap exactly, but the sentence is compatible with the time of Henry's being in graduate school being a proper subset of the time of Henry's living in Somerville).

- (30) Henry has lived in Somerville since he's been in graduate school.

SRPs are impossible with an embedded sentence not in the Perfect, e.g. **Henry has lived in Somerville since he is in graduate school*.¹⁰

This sentence poses a problem for the *Op* analysis as presented to this point. First, the covert AT cannot really modify sentences in the Perfect, for reasons related to the Present Perfect Paradox, i.e. that sentences in the Present Perfect cannot be modified by past tense adverbs (**Henry has arrived yesterday/four years ago*). Second, even if it could, the sentence would suffer from the same presupposition failure as a counterpart in the simple past, because the set of times at which Henry is in graduate school is not a singleton set.

4.3 Deriving simultaneous readings

Because the present Perfect cannot be modified by an adverbial PP headed by *at*, F&I postulate a second, unpronounced SINCE instead of a covert AT within the *since* clause. That is to say, in (30) the clause *since he has been in graduate school* has the form

- (31) *since Op λt . [he has been in graduate school ~~since t~~]*

The lower *since* is deleted via Antecedent Contained Deletion (the reader is again referred to F&I for the syntactic details).

By itself, this does not solve the problem, because $\lambda t . [Henry\ has\ been\ in\ graduate\ school\ since\ t]$ is also not a singleton set. In section 4.3 of their paper, F&I observe¹¹ that there are many times for which “Henry has been in graduate school since *t*” is true: if he has been in graduate school since September 1, 1999, he has also been in graduate school since, say, January 2001. That is to say, if *Henry has been in graduate school since September 1, 1999* is true, *Henry*

¹⁰ Although in German and Greek, which lack a U-Perfect, simultaneous readings of this sort occur in sentences with both the matrix and embedded clauses in the present tense. Thus, von Stechow and Iatridou's (54): *Tony ist glücklich seit er Prozac nimmt*, literally ‘Tony is happy since he takes Prozac’.

¹¹ About the sentence *Tony has been happy since he has been taking Prozac*; argument adapted here.

has been in graduate school since January 2001 is also true. The latter sentence does not assert that he started graduate school in January 2001, though a quantity implicature exists that suggests that he did; as a U-Perfect, it asserts only that all times from January 2001 to the present are times at which Henry is in graduate school. As a result, there will be many intervals (perhaps an infinite number) in the set of times t such that Henry has been in graduate school since t .

F&I therefore modify *Op* to pick out, not the single element of a set, but “that interval from whose presence in the set we can deduce the presence of all the others in the set.” For the cases analyzed above, this change has no effect. In sentences where the embedded clause denotes a unique event, the sole element in the set is certainly enough to deduce the presence of every element of the set. And in sentences where the embedded clause does not, the presupposition of *Op* still fails. If Henry has visited the MIT Museum three times, in 1995, 1998, and 1999, the set $\lambda t . \textit{Henry visited the MIT Museum at } t$ is {1995, 1998, 1999}, and knowing of any one of these times that Henry visited the MIT Museum at that time does not allow one to deduce that any other time in the set is a time at which Henry visited the MIT Museum. So there is no interval from whose presence in the set we can deduce the presence of all the others in the set.

On the other hand, for the set $\lambda t . \textit{Henry has been in graduate school since } t$, there is a time in the set from which we can deduce the other times, namely the earliest time in the set. If Henry has been in graduate school since September 1, 1999 (that is, at every time from September 1, 1999 to the present), we can deduce that he has been in graduate school since January 2001 (that is, at every time from January 2001 to the present), because the latter interval is a subset of the former. The opposite deduction is not possible.

An Op-*since* analysis therefore captures all of the data examined to this point. In the next section, I will present new data not examined by Iatridou (2003) or by F&I, and consider how F&I’s analysis can extend to such data.

5. Another Kind of Temporal Existential

The discussion in Iatridou (2003) of temporal existentials analyzed TEPs with *since* embedding the simple past. In (32) we see another kind of temporal existential, namely one with an embedded Perfect.

(32) It has been four years since Henry has visited the MIT Museum.

Such sentences have a meaning not available to TEPs with *since* + simple past, namely that the event in the clause is a repeated event. (32) is anomalous if Henry has visited the MIT Museum only once, felicitous but false if he visited it four years ago and six months ago, and true if he visited it eight years ago and four years ago. Compare this to the simple-past equivalent in (25b), *It has been four years since Henry visited the MIT Museum*, which is felicitous if Henry visited the museum only once and anomalous otherwise.

Recall that the simultaneous-reading sentence was problematic for *Op* + AT; temporal existentials with embedded perfects will have exactly the same problems. A covert AT cannot modify the Perfect in *Henry has visited the MIT Museum* any more than it could the Perfect in *Henry has been in graduate school*, and as with the latter, the set of times here (those times at which Henry visited the MIT Museum) is not a singleton set. An analysis of (32) using *Op* will, like other data involving embedded perfects, require selecting members from non-singleton sets and deletion of a *since* within the embedded clause.

5.1 The *Op* analysis of perfect-embedding TEPs

The meaning of *Op* detailed in the previous section suffices for SRPs because it picks out the earliest possible time, the time at which the event in the embedded clause started. In a TEP, however, picking out the earliest time at which the event occurred will give entirely the wrong meaning. Consider (17) with the Present Perfect replacing the simple past, as in (32):

- (33) Henry visited the MIT Museum in 1995, again in 1998, and again in 1999.
- a. It has been eight years since he has visited the MIT Museum.
 - b. It has been four years since he has visited the MIT Museum.

In this context, (33a) is false and (33b) true. If *Op* picks the earliest time at which *Henry visits the MIT Museum* is true, (33a) will be true and (33b) false, because the earliest time is 1995 and it has been eight years since that time. It looks at first as if the *Op* analysis does not work with TEPs.

But this involves a misinterpretation of *Op*. The operator does not pick the *earliest* time from a set of intervals, it picks the *most informative* time. Using *Op*, the clause *since Henry has visited the MIT Museum* will have the form in (34a), which simplifies to (34b).

- (34) a. since [PRES [PERF [[Henry visits the MIT Museum] [since *Op*]]]]
 b. since *Op* (λt . Henry has visited the MIT Museum since *t*)

What is the set λt . *Henry has visited the MIT Museum since t*, and what is its most informative member? Is the set simply {1995, 1998, 1999} once again, and is the earliest time the most informative?

We saw that if Henry started graduate school on September 1, 1999, $\{t : \text{Henry has been in graduate school since } t\}$ is the set consisting of all times after September 1, 1999. In this case, the set also contains an infinite number of intervals, but in the other direction: if Henry visited the MIT Museum in 1995, then he has visited the museum since 1994 (i.e. there is a time between 1994 and now at which he visited the MIT Museum), since 1993, since 1992... and so on, for all earlier times.¹² If he visited the museum on September 1, 1999, he has also visited the museum since January 1999, and since August 15, 1999; we can keep moving forward in this way to the time just before he visited the museum in 1999.

In other words, the set of times *t* for which “Henry has been in graduate school since *t*” is true contains all times *after he first* was in graduate school; the set of times *t* for which “Henry has visited the MIT Museum since *t*” is true contains all times *before he last* visited the MIT Museum. And therefore, just as we can deduce that all times after Henry started graduate school are times since which he has been in graduate school, we can deduce that all times before Henry last visited the MIT Museum are times since which he has visited the MIT Museum. This gives the correct predictions for (33): because Henry’s last visit was September 1, 1999, *since Henry has visited the MIT Museum* means *since September 1, 1999*, and it’s true that there are four years in that time span and false that there are eight.

¹² Modulo pragmatic restrictions on the Perfect—*Henry has visited the MIT Museum since the Peloponnesian War* is technically true if Henry visited the MIT Museum in 1999, but is pragmatically a very strange thing to say.

We have seen that *Op* with a covert *since* can give a unified explanation for SRPs and TEPs. In the next section I observe certain empirical difficulties presented by the unified theory in conjunction with the new data, followed by a sketch of a proposal for a new perfect, the *Amount Perfect*, to account for these difficulties.

5.2 An empirical challenge: switching the *since* clauses

As a prelude to this subsection, observe that, using the *Op*-and-covert-*since* theory of embedded perfects, *since* clauses receive their interpretations wholly independently of the matrix clause. The meanings of *since Henry has been in graduate school* and *since Henry has visited the MIT Museum* do not depend on the rest of the sentence, but solely on the contents of the embedded CP, the meaning of *since*, and the operator *Op*. The CP, after λ -abstraction, denotes a set of times; the operator takes the set as its argument and returns the most informative time in the set; *since* combines with that time to become a left boundary modifier of a matrix Perfect aspect; all of which happens internal to the clause.

Internally, the two clauses have *Op* selecting the most informative time from two very different sets, whose forms depend on the embedded Perfect. The clauses in (35) both set the LB of a PTS to September 1, 1999...

- (35) a. since Henry has visited the MIT Museum
 b. since Henry has been in graduate school

...but the sets internal to the clauses (λt . *Henry has visited the MIT Museum since t* and λt . *Henry has been in graduate school since t*) are, again, not identical.

- (36) a. λt . Henry has visited the MIT Museum since $t = \{t: t$ is a time on or before
 September 1, 1999}
 b. λt . Henry has been in graduate school since $t = \{t: t$ is a time on or after
 September 1, 1999}

An E-Perfect in a *since* clause gives a set of times from the event backward; a U-Perfect gives a set of times from the event forward. However, once the set has been turned into a time by *Op*, this difference becomes invisible to the subsequent compositional semantics. In other words, to the matrix sentences they compose with, the two clauses are semantically indistinguishable.

Having emphasized the independence of *since*-clause interpretation from the matrix clause, we now consider using *since* clauses with different matrix clauses. What we find is that, in spite of the fact that both *since* clauses in (35) are identical in their denotations, they cannot be used interchangeably in TEPs and SRPs. As we saw before, any matrix Perfect is semantically well-formed (though not equivalent in pragmatic felicity) with a *since* clause containing a time-denoting DP such as *September 1, 1999*.

- (37) a. Henry has gone to Cape Cod twice since September 1, 1999. (E-Perfect)
 b. Henry has lived in Somerville since September 1, 1999. (U-Perfect)
 c. It has been four years since September 1, 1999. (TEP)

When combined with *since* + Perfect, however, not all uses of the Perfect are felicitous. Let us now return to the sentences in (2), repeated here (in a slightly different order) as (38).

- (38) a. Henry has lived in Somerville since he has been in graduate school.
 b. It has been four years since Henry has visited the MIT Museum.
 c. Henry has lived in Somerville since he has visited the MIT Museum.
 d. It has been four years since Henry has been in graduate school.¹³

(38a) and (38b) are the sentences we have been considering so far, the former being a TEP and the latter being a SRP. Because the two *since* clauses both mean, in this context, *since September 1, 1999*, (38a) and (38b) are truth-conditionally equivalent to (37b) and (37c) respectively. Additionally, because the *since* clauses are identical in meaning, (38c) and (38d) should also be truth-conditionally equivalent to (37b) and (37c) respectively.

However, something goes wrong in these last two sentences: neither is felicitous in the context of the life of Henry as described to date. First, (38c) has no simultaneous reading, and is not even grammatical. Forcing a matrix U-Perfect with *ever since* makes the sentence unquestionably ungrammatical.

- (39) *Henry has lived in Somerville ever since he has visited the MIT Museum.

Nor does forcing a matrix E-Perfect with a frequency adverb improve the sentence, even in a sentence where the pragmatics make the intended meaning clear.

- (40) *Henry has revised his generals paper twice since he's met with his advisor.

Thus, *since* + E-Perfect is compatible only with a matrix TEP. If *since he has visited the MIT Museum* in the Henry context means nothing more than *since September 1, 1999*, it's not clear why that should be the case.¹⁴

(38d), while not ungrammatical, has a reading incompatible with the Henry biography. It cannot mean that Henry has been in graduate school since September 1, 1999, and that the time span from that time to now is four years. Instead, it is felicitous only in a situation where Henry has been in and out of graduate school, and the last time he was in graduate school was four

¹³ To anticipate a possible red herring, note that nothing in the discussion that follows depends on coreference of subjects or on binding. The judgments on felicity conditions are equivalent to those for the sentences in (i)-(iv)—for the sake of evaluating truth conditions, consider a scenario where it rained three weeks ago and has been warm since.

- (i) Henry has been happy since it has been warm out.
 (ii) It has been three weeks since it has rained.
 (iii) Henry has been happy since it has rained.
 (iv) It has been three weeks since it has been warm out.

¹⁴ von Stechow and Iatridou did not overlook this in their analysis; they consider an analogous sentence in their paper. I will discuss below their explanation of its ungrammaticality.

years ago. In other words, the embedded Perfect must be interpreted as an E-Perfect: as with *Henry has visited the MIT Museum*, it asserts that between a point in the past and now, there is a time at which Henry is in graduate school. For the whole sentence to be true, the most recent such time must be four years ago, which is to say that Henry cannot have been in graduate school at any time in the last four years: exactly the opposite of the actual context, in which Henry has been in graduate school at all times in the last four years.

This suggests the converse of the conclusion of the previous paragraph: a matrix TEP is compatible only with *since* + E-Perfect. However, this is not a fact about matrix E-Perfects, which can appear with embedded U-Perfects as in (41), adapted from F&I.

(41) Henry has been to Cape Cod twice since he has been in graduate school.

Like other *since* + U-Perfect sentences, this sentence has a simultaneous reading: the PTS of the matrix clause is simultaneous with the event in the embedded clause, even though the event in the matrix clause doesn't stretch over the entire PTS. This makes the above fact seem even stranger: given that *since he has been in graduate school* receives the interpretation *since September 1, 1999* in the context of Henry's biography, and given that one can locate the occurrences of events within that time span with an E-Perfect, it's not clear why one should not be able to locate a measure of time within that time span with a TEP.

In summary, TEPs must have embedded E-Perfects; SRPs must have embedded U-Perfects. The theory discussed so far will have trouble giving a semantic account for restricted distribution.

5.3 The Amount Perfect

The conclusions of the previous section's data are summarized in the table in (42), where TEP indicates the availability of a temporal existential reading, SRP indicates the availability of a simultaneous reading, and an asterisk indicates that no reading is available. (Remember from Section 3 that Iatridou's semantics for a TEP is that of an E-Perfect.)

(42)		Matrix E	Matrix U
	since E	TEP	*
	since U	SRP	SRP

In theory, simultaneous readings should be available in all four cases, though when the embedded clause is an E-Perfect, the matrix PTS would be "simultaneous" with the embedded PTS and not the time of the event in the embedded clause (the two being identical when a U-Perfect is embedded). Nevertheless, simultaneous readings are impossible with embedded E-Perfects. Similarly, temporal existentials, having matrix E-Perfects, should be compatible with either Perfect embedded, but they are not. Thus, the grammar needs a way to ensure that, first, *since* + E-Perfect occurs only with TEP matrix clauses (or possibly with any matrix E-Perfect) and never with matrix U-Perfects, and second, *since* + U-Perfect occurs only with SRPs and never TEPs.

So let us revisit Iatridou's apparent assumption that TEPs are E-Perfects. Given a schematic sentence like (43a), in which *X* is either a time-denoting DP or a CP that turns into a

single time via the *Op* mechanism of von Stechow and Iatridou, its denotation as an E-Perfect is the formula in (43b) (adapted from (12)).

- (43) a. It has been *length of time* since *time X*.
 b. $\exists t . [\text{RB}(t) = \text{now} \wedge \text{LB}(t) = X \wedge \exists t' \subseteq t . [\text{the length of } t' \text{ is } \textit{length of time}]]$

This meaning, as mentioned in section 3, better approximates the right truth conditions than one based on a U-Perfect. However, close examination shows that it makes an incorrect prediction about TEPs with *exactly*.

As noted before, this meaning predicts the truth of (44) in our scenario where Henry's college graduation was four years ago.

- (44) It has been two years since Henry graduated from college.

It is true that there is a two year long time span that is a subset of the span from Henry's graduation to now. The apparent assertion that Henry graduated two years ago derives from the scalar implicature introduced by *two*, which properly means *at least two*. So far so good, but the same sentence with *exactly two* poses a problem.

- (45) It has been exactly two years since Henry graduated from college.

In our scenario, this is false—it's been notably more than two years—but the E-Perfect-based meaning in (43b) predicts this to be true, because there does exist a time span whose length is exactly two years within the interval from Henry's graduation in 1999 until now (for instance, January 2001 to December 2002).

Another assumption about the meaning of TEPs is that the *since* clauses that modify them are, like all other *since* clauses, perfect-level adverbials. That means they, like other perfect-level *since* adverbials, should be grammatical at the front of the sentence. But this is not the case.

- (46) a. Since he started graduate school, Henry has been happy.
 b. Since he moved to Boston, Henry has gone to the MIT Museum three times.
 c. *Since {1999/Henry started graduate school/Henry has visited the MIT Museum}, it has been four years.

Similarly, as perfect-level adverbials, these *since* clauses should require the Perfect aspect. Nevertheless, temporal existentials without Perfect morphology are acceptable.

- (47) It's four years since {1999/Henry started graduate school/Henry has visited the MIT Museum}.

What we have in temporal existential sentences is Perfects that act unlike other Perfects and *since* clauses that act unlike other *since* clauses.

It seems, then, that TEPs are neither U-Perfects nor E-Perfects but some other sort of Perfect altogether. Other Perfects that have been proposed (the Hot News Perfect, the Resultative Perfect) are generally considered special uses of the E-Perfect (though again see Pancheva 2003 for an argument that the Resultative Perfect is a separate use); moreover, none of them have interpretations that capture the truth conditions of a TEP. So let us postulate that TEPs contain a

different kind of Perfect with a different syntactic structure and semantic denotation, which we can call a *Amount Perfect* or *A-Perfect*. We can see how having an A-Perfect can solve the problems discussed above.

First, separating the A-Perfect from the E-Perfect allows the two to have different meanings, so that the former can provide the correct truth conditions of TEPs. Instead of the meaning in (43b) for *It has been [amount of time] since X*, the A-Perfect has the meaning in (48).

$$(48) \quad \exists t . [\text{RB}(t) = \text{now} \wedge \text{LB}(t) = X \wedge \text{the length of } t \text{ is } \textit{amount of time}]$$

Unlike E-Perfects and U-Perfects, which make assertions about the contents of the Perfect Time Span by quantifying over subintervals, the A-Perfect makes an assertion about the PTS itself.¹⁵ This captures the intuition that, while *Henry has visited the MIT Museum since he graduated from college* seems to assert a fact about the contents of the time between 1999 and now (namely, that the time span contains events of Henry visiting the MIT Museum), *It has been four years since Henry graduated from college* asserts a fact about the time itself and not its contents (namely, that the time span is four years long). More importantly, (48) correctly predicts the falsity of *It has been exactly two years since Henry graduated from college*, as the time span is not exactly two years long, while preserving the truth and scalar implicature of *It has been two years since Henry graduated from college*. The latter sentence asserts that the length of the span from 1999 to 2003 is two years, which has the same implicature of exactness as *Henry is six feet tall* when Henry is seven feet tall, and the two can be used felicitously in the same sorts of contexts.¹⁶

Second, with the addition of the A-Perfect, the table in (42) can be recast as in (49).

(49)	Matrix E	Matrix U	Matrix A
since E	*	*	TEP
since U	SRP	SRP	*

The difficulties of attaching the right *since* clauses to the right matrix Perfects disappear. While it remains either to find an explanation for the distribution or to reconcile ourselves to having to stipulate it, that distribution can be stated in a single clear sentence: *since* + E-Perfect modifies only A-Perfects, and *since* + U-Perfect cannot modify A-Perfects. No exception need be made for some E-Perfects but not others.¹⁷

¹⁵ If the A-Perfect is the correct analysis, the term “temporal existential” is misleading. These sentences do not assert the existence of a time span relative to the PTS; they identify the length of the PTS itself. For terminological convenience, I will continue to use the “temporal existential” label.

¹⁶ For instance,

- (i) A: We need someone who can reach that high shelf. Is anyone around here six feet tall?
- B: Henry is; I’ll go ask him.

Numbers in measures, like other uses of numbers, are compatible with “or more” interpretations.

¹⁷ For the sake of completeness: A-Perfects cannot be embedded at all. No matrix clause can be modified by ...*since it has been four years*, though there certainly is a uniquely informative time *t* such that it has been four years since *t*. This fact, too, will need an explanation.

5.4 Unsolved problems with the A-Perfect analysis

The above proposal may solve some of the challenges inherent in explaining temporal existentials. Nevertheless, though it is a Perfect analysis, it is far from a perfect analysis. In this section, I consider some of the challenges to the A-Perfect plus *Op-since* theory.

5.4.1. The A-Perfect, challenge one: analogies with non-temporal existentials

Iatridou initiated exploration into temporal existentials by comparing them to spatial existentials. If the former result from use of different Perfect morphemes, which are the morphemes that introduce the existence of a span of time, should ordinary existentials use a different morpheme to introduce the existence of a span of space?

Our examination suggested that spatial existentials share with temporal existentials the problem seen in (44)-(45), namely that adding *exactly* creates a sentence that the theory falsely predicts to be true. For instance, if there are three horses in the garden, then (50) is correctly predicted to be true.

(50) There are two horses in the garden.

On the analysis of existentials analogous to Iatridou's analysis of temporal existentials, this sentence specifies a location (namely, in the garden), and asserts the existence of a plurality (consisting of two horses) in that location. Such a plurality does exist in the garden (if the three horses are named Dasher, Comet, and Prancer, then "Dasher and Comet" names one such plurality). Therefore, (51) should also be true, because there does exist a plurality consisting of exactly two horses in the location of the garden.

(51) There are exactly two horses in the garden.

However, as with the sentence *It has been exactly two years since Henry graduated from college*, (51) is false. Notice, too, that similar, non-existential sentences do not fall prey to the *exactly* problem.

(52) a. Exactly two horses are in the garden.
b. Henry graduated from college exactly two years ago.

Both of these are correctly predicted false in the given scenarios: it is not the case that exactly two horses have the property of being in the garden, and it is not the case that the temporal location of Henry's college graduation is a point exactly two years ago. It is the compositional semantics of existential sentences that create problems for (45) and (51).

Whatever mechanism explains the differing truth conditions of (50) and (51) (and several have been proposed) may be able to explain the same difference in temporal existentials, if temporal and spatial existentials are indeed analogous and therefore receive analogous analyses. If so, the concerns about the predictions of Iatridou's analysis disappear, and with them some of the motivation for the A-Perfect.

5.4.2. The A-Perfect, challenge two: why since E but not since U?

A complete theory of the A-Perfect would need to account for the distribution of *since* clauses that modify it. That is to say, why can *since* + E-Perfect clauses modify A-Perfects, but *since* + U-Perfect clauses cannot?

One possible explanation is that, as they cannot move to the front of a sentence and do not require Perfect morphology, *since* clauses with E-Perfects attach as eventuality-level adverbials. Such a hypothesis would require working out in full the details of the compositional semantics of the Perfect aspect and its modifiers, which this paper has greatly simplified. However, such an explanation faces a number of obstacles, primary among them that it seems unlikely that an eventuality-level adverbial would be able to set the LB of the PTS. If there is any semantic distinction between perfect-level and eventuality-level adverbials, it is certainly that only the former can modify the Perfect Time Span, which strongly suggests that the *since* clauses modifying A-Perfects must be perfect-level.¹⁸

The distribution in (49) can also be explained by means of syntactic features. In a minimalist view of syntax, the A-Perfect could be able to check a [+E-Perfect] feature of a modifier, while other Perfects could check [+U-Perfect] features.¹⁹ Equivalently, *since* + U-Perfect and *since* + E-Perfect could have different syntactic categories, and different Perfect morphemes would then have lexically marked selectional restrictions. But while such a system might capture the facts, it would do so only with ad hoc features at the expense of any underlying explanation.

A better explanation may exist, but as noted above, the separation of A-Perfects from E-Perfects does at least make this sort of explanation possible. Without the A-Perfect, as in table (42), the E-Perfect must behave differently in different circumstances.

5.4.3. Op-*since*, challenge one: denseness vs. discreteness of time, and larger intervals

Consider the conclusion of Section 4. I claimed that *It has been four years since Henry has visited the MIT Museum* means *It has been four years since September 1, 1999* if Henry's last visit was on September 1, 1999. This is close to, but not quite, correct. In fact, *since Henry has visited the MIT Museum*, selecting as it does the latest point for which *Henry has visited the MIT Museum* is true, will denote the last time before his last visit. This means that the Perfect Time Span runs from the time just before his last visit until now, and consequently that there is an event of Henry visiting the MIT Museum in the PTS (namely, the last one). This runs counter to the intuition that the PTS must be free of events described by the embedded clause.

If time is dense—that is, if given two points in time there is always another point between them—this lapse might be forgivable due to the looseness with which language refers to time intervals. However, if time is discrete, the lapse is harder to ignore.²⁰ To underscore the problem,

¹⁸ Independent of the A-Perfect proposal, it is not obvious to me how to reconcile the perfect-level meaning of the *since* clause in a temporal existential with its eventuality-level behavior.

¹⁹ Alternately, since all Perfects are compatible with *since* plus a DP or simple past CP complement, A-Perfects could be unable to check [+U-Perfect], and others unable to check [+E-Perfect].

²⁰ One can think of dense time as corresponding to a number line labelled with the rational numbers: for any two points on the line, you can find a point halfway between them by averaging the two numbers (the average of two rational numbers must be rational). Discrete time corresponds to a number line labelled with the integers: the point before, for instance, 2 is 1, and there is no integer between them.

consider a situation which forces the division of time into larger chunks, such as the two-week measure in the clause ...*since Henry has spent two weeks on Cape Cod*.

Suppose it is now September 1, 2003, and Henry's last two-week trip to Cape Cod was from August 1 to August 14, 2003. What then is the most recent point since which Henry has spent two weeks on Cape Cod? He has spent two weeks there since July 31; but since August 2, he has *not* spent two weeks on Cape Cod (he's only spent thirteen days there), and since August 15, of course, Henry has certainly not spent two weeks on Cape Cod (he's spent no time there at all). Now consider the follow sentences:

- (53) a. It's been a month since Henry has spent two weeks on Cape Cod.
b. It's been a fortnight since Henry has spent two weeks on Cape Cod.

The semantics given in previous sections predicts that, in these circumstances, (53a) will be true and (53b) will be false, because the most recent point since which Henry has spent two weeks on Cape Cod is the point just before his last two-week visit. But this prediction is incorrect; in fact, (53b) seems to be the true statement of the two.

Essentially, then, given larger chunks of time, *Op-sinee* makes the wrong prediction, and if time is discrete instead of dense, that prediction pervades the theory. Whether this problem is insurmountable, or whether the semantics of the *since*-clause can easily be recast to take the point *after* the most recent event described rather than the point before, remains to be seen.

5.4.4. *Op-sinee*, challenge two: the unextractability of *since*

As noted above, von Stechow and Iatridou observe the ungrammaticality of sentences like (38c); in particular, they analyze the sentence in (54).

- (54) *Tony has been happy since he has visited the Cape. (= F&I's (43))

Their explanation of its ungrammaticality presents a challenge to the *Op-sinee* analysis for embedded E-Perfects, and is thus worth examining now.

The explanation centers on the general inability of the grammar to extract *since* from an E-Perfect. They offer the following contrast (F&I's 44-45):

- (55) a. Since when have you been living on the Cape?
b. *Since when have you visited the Cape two times?

In addition to the rhetorical use of these questions (roughly, "I thought you didn't live on the Cape" and "I thought you hadn't been to the Cape two times"), (55a) has a literal question meaning, i.e. "Tell me the time such that you have been living on the Cape since that time", whereas (55b) has no such meaning in which the speaker requests to be told a time after which occurred two visits to the Cape.²¹ This restriction on extraction from an E-Perfect seems to be part of a larger paradigm; F&I provide other sentences in which extraction can occur with a U-Perfect but not an E-Perfect.

²¹ F&I additionally suggest a link between this property of E-Perfects and the ungrammaticality of requests for time before or after an event occurred: **Before/After when did Henry graduate from college?*

If *since* can never extract from E-Perfects, the inability of SRPs to embed *since* + E-Perfects follows directly from the uninterpretability of the embedded clause. But contrary to the assertion of F&I, there are of course grammatical sentences with *since* + E-Perfect: temporal existentials like (32), repeated here.

(32) It has been four years since Henry has visited the MIT Museum.

This sentence is at the heart of this paper: whether the analysis here proves right or wrong and whether or not the Amount Perfect is a meaning of the Perfect different than the Universal and Existential Perfects, any analysis of simultaneous readings, temporal existentials, and the perfect aspect will need to account for the surprising grammaticality of (32) without opening the door to illicit constructions with *since* + E-Perfect. If F&I are right that *since* cannot extract from E-Perfects, a new analysis of (32) will be needed, involving either a different approach to the *since* clause or a different overall analysis of temporal existentials.

6. Concluding Thoughts

In this paper, I have suggested that two different uses of *since* with an embedded Perfect may be unified and have proposed a new form of the Perfect aspect, the *A-Perfect*, with a meaning distinct from other Perfects. I have left open a number of questions about the details of both pieces of the argument, and it is my hope that future researchers will be able to develop the fundamental observations—that temporal existentials with *since* and an embedded perfect pose an interesting challenge for theories of the Perfect and of *since*-clauses, but not an insurmountable one.

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