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Cessation implicature and simultaneous readings

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Abstract. Altshuler & Schwarzschild (2013a, 2013b) provide an account of the simultaneous reading of past-under-past sentences in English (called the sequence-of-tense (SOT) phenomenon) based on a lack of cessation implicature. However, this analysis encounters empirical and technical issues in accounting for the English data in the same construction involving the future auxiliary *would*, the past perfect, and the future-under-future configuration. It also faces difficulty in accounting for the cross-linguistic data that concerns tense in verb complements. We are, therefore, led to conclude that the traditional solution to this problem (Abusch 1988, 1997, Ogihara 1996, von Stechow 1995, Stowell 1996, and Kratzer 1998) that renders structurally lower past tense morphemes in English semantically empty (or plain variables) is preferable. This system allows us to adopt the same semantic mechanism for both SOT languages such as English and non-SOT languages such as Japanese.

Keywords. tense; cessation implicature; sequence-of-tense phenomenon; double access sentences

1. Introduction. Let me first establish some basic sequence-of-tense facts. In English, when a matrix predicate is in the past tense, its complement clause with a stative predicate is also in the past tense to indicate that the time of the state is simultaneous with the predication time of the matrix clause.[1] This fact is referred to as the sequence-of-tense phenomenon. (1) is an example.

(1) Bill found out that Mary was in Seattle.

For (1) to be true, Bill found out something, and what he found out was that the state of Mary's being in Seattle was occurring at the time of his finding out.[2] This is generally referred to as a simultaneous reading since the time of Bill's finding out and the time at which Mary was in Seattle (according to Bill's discovery) were contemporaneous. (1) can also receive a back-shifted reading in which the time of Mary's being in Seattle is before Bill's finding out. This type of reading will be elaborated on below.

It is well-known that the same interpretation is expressed with a present tense form of the embedded predicate in languages like Japanese, Hebrew and Russian. (2) is a Japanese sentence that receives the same interpretation as (1).

(2) Biru-wa Mearii-ga Siatoru-ni iru-to sit-ta.
Bill-TOP Mary-NOM Seattle-at be.PRES-that learn-PAST
'Bill learned that Mary was in Seattle (at that time).'

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[1] Note that for a simultaneous reading, the complement clause must contain a stative predicate (e.g., *be*) or the progressive form of an event predicate such as *leave*. When the simple past tense form of an event predicate (e.g., *left*) is used, we generally obtain a shifted interpretation as shown in (3a).

[2] The complement clause must be true at the time of the finding out because find out is a factive predicate.

Unlike English, the Japanese sentence (2) contains a present tense in the complement clause even though the matrix predicate is in the past tense. This cross-linguistic difference has been a focus of much linguistic research (Ogihara 1996, Kusumoto 1999, Grønn & von Stechow 2010, Ogihara & Sharvit 2012, and many others).

To characterize different types of temporal interpretation for verb complements, we shall also discuss back-shifted interpretations given by examples like (3a-b).

(3) a. Bill found out that Mary left (or had left) Seattle.
b. Biru-wa Mearii-ga Siatoru-o syuppatusi-ta-to sit-ta.
Bill-TOP Mary-NOM Seattle-ACC leave-PAST-that find.out-PAST
'Bill learned that Mary left/had left Seattle.'

Both (3a) and (3b) receive a back-shifted (i.e., relative past) interpretation. That is, the time of Mary's leaving Seattle is understood to be earlier than the time of Bill's finding out event. Other than the possibility of using the past perfect as shown in (3a), there is no major difference between English and Japanese tense forms in (3a-b). An event predicate in the past tense occurs in the complement clause under the past tense matrix and receives a back-shifted interpretation.

As noted above, the English sentence (1) can also receive a back-shifted interpretation: Mary's being in Seattle was earlier than Bill's finding out. In other words, (1) is ambiguous between a simultaneous and back-shifted reading.

2. The Traditional Account. Simultaneous and back-shifted readings are clearly distinguished in the traditional account of the sequence-of-tense phenomenon. The basic idea underlying this account is that when a past tense occurs immediately under another past tense, the lower one (optionally) becomes semantically empty, yielding a simultaneous reading.[3] Although there are different ways of encoding this idea, I shall assume for the purpose of this article that Abusch (1988, 1997), Ogihara (1996), von Stechow (1995), Stowell (1996), and Kratzer (1998) are all subsumed under this traditional account.

The standard semantic analysis of complement-taking predicates (such as *believe*, *find out*, and *say*) is that they denote relations between individuals and propositions. Here, propositions are understood to involve both worlds and times. Set-theoretically, they can be encoded as sets of world-time pairs such as $\{<w,t> \mid$ Mary is happy at t in $w\}$. Regarding "simultaneous readings" of (1a) and (1b), the embedded clause is a plain set of world-time pairs of the form $\{<w,t> \mid$ Mary is in Seattle at t in $w\}$. The complement-taking predicate *find out* denotes a relation between individuals and propositions such that for any world w_0, time t_0, individual a, and proposition p, $[\![\text{find out}]\!]^{w_0,t_0}(a)(p) = 1$ iff in all epistemically accessible world-time pairs $<w,t>$ for a in w_0 at t_0, which must include $<w_0, t_0>$, $<w,t> \in p$.[4] Since $<w_0, t_0>$ is included in such world-time pairs, we can conclude that $<w_0, t_0> \in p$, which means that Mary was in Seattle in the actual world at the time of Bill's finding out.

Turning to back-shifted interpretations, we assume that the embedded sentence denotes a proposition that contains information about time shifting. For simplicity, I assume that past tense induces an existential quantifier over "earlier times." Specifically, the semantic interpretation of (3a) and (3b) is based on the assumption that the complement clause denotes the following

[3] As mentioned earlier, the complement clause must contain a stative predicate for receiving a simultaneous interpretation.

[4] This semantic characterization needs to be tightened for a more rigorous version because for each world-time pair, the time must be the initial moment at which a gets acquainted with p.

proposition: {<w,t> | there is a time t' earlier than t such that Mary leaves Seattle at t' in w}. Given this assumption, the rest of the semantic interpretation of (3a-b) proceeds in the same way as (1a-b). That is, (3a) and (3b) are true if and only if in the actual world w_0, at some contextually given past time t_0, all epistemically accessible world-time pairs <w,t> for Bill at <w_0,t_0> are elements of {<w,t> | there is a time t' earlier than t such that Mary leaves Seattle at t' in w}. Since <w_0, t_0> is included in the epistemically accessible world-time pairs for Bill at <w_0, t_0>, Mary left at a time earlier than t_0 in the actual world. This correctly accounts for the back-shifted interpretation of (3a-b).

Going beyond the technical details of our formalization, the most important theoretical point of this proposal is that the simultaneous and back-shifted interpretations are semantically distinct; (1) is truly ambiguous. In this article, I defend this traditional analysis of the simultaneous and back-shifted interpretations. In the next section, we turn to an alternative account of the same data offered by Altshuler & Schwarzschild (2013a, 2013b) (henceforth, A&S) and present some empirical and technical problems for it.

3. Account based on cessation implicature. A&S (2013a, 2013b) offer an analysis of the above data in English based on what they call "cessation implicature." Their discussion starts with tensed simple sentences such as (4a) and (4b).

(4) a. Mary <u>is</u> here.
b. Mary <u>was</u> here.

(4a) says that Mary's being here occurs now, whereas (4b) says that it occurred at a past time. A&S claim that (4a) asymmetrically entails (4b). Note, first of all, that *be here* is a stative predicate. In order to assert that Mary's being here occurs at the utterance time, it is inevitable that the same state also occurs shortly before the utterance time. Thus, (4a) entails (4b). However, the truth of (4b) generally does not guarantee that Mary is still here at the utterance time. Based on this alleged entailment relation between (4a) and (4b), A&S claim that using (4b) implicates that (4a) is false. A&S refer to this inference pattern as <u>cessation implicature</u>: the state of Mary's being here ceased before the utterance time. Here is the structure of their reasoning: The speaker has chosen to use (4b) rather than (4a), which is more informative. This is understood to mean that the speaker cannot assert (4a). In other words, asserting (4b) suggests (4a) is false. Since this "suggestion" is a scalar implicature, it could be canceled. For example, (4b) could be followed by "In fact, she is still here."

This argumentation is similar to the relation between (5a) and (5b).

(5) a. All the students came here today.
b. Some of the students came here today.

(5a) talks about all of the students. Thus, it entails (5b). However, (5b) does not entail (5a). In fact, the opposite is usually true. If someone asserts (5b), this usually suggests that not all of the students came here today. In other words, (5a) is understood to be false. This is also an instance of scalar implicature. This is not entailment and could be canceled just like the temporal case discussed with (4a) and (4b).

Given the characterization of cessation implicature in unembedded sentences such as (4b), A&S turn to the discussion of sentences with verb complements such as (6a) and (6b).

(6) a. Bill found out that Mary <u>was</u> in Seattle.
b. Bill found out that Mary <u>is</u> in Seattle.

(6a), which repeats (1), can receive a simultaneous interpretation. Note that the complement clause in (6a) contains a past tense. By contrast, the complement clause in (6b) contains a simple present tense form *is* of the verb *be*. The contrast between the simple past and the simple present resembles that of (4a) and (4b). However, the semantic contrast between (6a) and (6b) is not as straightforward. (6a) receives a back-shifted interpretation as well as a simultaneous one. That is, the time of Mary's being in Seattle (based on what Bill found out) is simultaneous or prior to the time of Bill's finding out. (6b) receives a peculiar reading called a double-access interpretation, rather than a purely simultaneous interpretation. Put informally, (6b) says that Bill found out that Mary was in Seattle then, and it also requires that Mary's being in Seattle persists until the utterance time.[5]

When we compare (4a) and (4b) on the one hand, and (6a) and (6b) on the other hand, we expect to find a parallel in that (6a) only has a back-shifted reading, and (6b) only receives a purely simultaneous reading. Indeed, this is what we find in Japanese sentences that correspond to (6a-b) in tense configurations. However, this does not happen in English as shown above. Therefore, the question is why tense morphemes in English-type languages behave differently in verb complement clauses, and explaining this difference is a major issue in the semantics of tense in natural language.

A&S offer an account based on (the lack of) cessation implicature. They start by accepting the indexical nature of the English present tense and the double-access construal for a sentence like (6b). Given this assumption, A&S claim that (6a) is not subject to cessation implicature because (6b) does not yield a purely simultaneous interpretation. In other words, uttering (6a) does not suggest to the hearer that Bill cannot use a sentence with a simultaneous construal because there is no tense form that uniquely identifies that meaning. This in turn creates a weak implicature: Mary's being in Seattle persisted until the time of Bill's finding out.[6] This is the so-called "simultaneous reading" according to A&S. The consequence of this account is that the back-shifted reading and the simultaneous reading do not have the same status; the back-shifted reading is "real," whereas the simultaneous reading is an implicature.

A non-ambiguous analysis of English past is desirable. In this analysis, the English past tense constantly receives a relative past interpretation, and the so-called simultaneous reading is a by-product of the special indexical nature of the English simple present. Unfortunately, this proposal suffers from empirical and technical issues.

4. Problems with A&S's account. A&S's account is based on (the lack of) cessation implicature and the claim that making an assertion using a less informative sentence implicates that the more informative sentence is false. Schematically, the pattern of reasoning can be shown as in (7).

(7) S_1 asymmetrically entails S_2
S_2 pragmatically implicates the falsity of S_1

A&S discuss examples involving the simple past and the simple present. However, there are more complex tense forms that need to be tested. We shall show that such examples pose problems for A&S's account of the sequence-of-tense phenomenon. They involve the future auxiliary

[5] Regarding double access sentences, the reader is referred to Ogihara (1995, 1996) and Abusch (1991, 1997) for basic data and some possible analyses.

[6] Strictly speaking, the implicature in question is the denial of the existence of cessation implicature: it is not the case that the state in question stopped before the time of the matrix predicate.

would (vs. *will*), the past perfect vs. the present perfect, and the *will*-under-*will* configuration vs. the present-under-will configuration. We will examine these cases one by one.

4.1. THE FUTURE AUXILIARY *WOULD.* First, let us discuss the case of *would*. Abusch (1988, 1997) posits the tenseless form *woll*, which underlies both *would* (past) and *will* (present). The morphological analysis assumed here is given in (8).

(8) *would* = PAST + *woll*
will = PRES + *woll*

Assuming that this morphological analysis of *would* and *will* is correct, we shall discuss sentences like (9a) and (9b).

(9) a. Bill found out that Mary would be in Seattle.
b. Bill found out that Mary will be in Seattle.

To account for the data in (9), A&S would need to argue that the past tense morpheme on *would* in (9a) has a back-shifted (relative past) meaning. Here is how A&S's argumentation proceeds: Given that *will* does not yield a "purely relative future" reading in (9b), the past tense morpheme in (9a) allows for a "simultaneous" reading due to the lack of cessation implicature. (9b) indeed receives a special double-access construal (Ogihara 1996). Therefore, it appears that A&S's argument based on the lack of cessation implicature should make the correct prediction. Unfortunately, this is not the case. A&S's proposal requires that the past tense on *would* has a back-shifted (i.e., relative past) reading as the source of the simultaneous reading. However, this reading is not attested. To see this, refer to the diagram in (10). CGT stands for the contextually given time. Since *would* consists of PAST and *woll*, the past tense morpheme must receive an anteriority reading in A&S's system. This means that the time indicated by the past tense is before the time of Bill's finding out. We then process the morpheme *woll*, which has a future orientation. The time of the predicate (Mary's being in Seattle) would then be located after the contextually given past time.[7]

(10) # ---------CGT ----- finding out ------ utterance time --->

Based on this alleged interpretation of (9a), the time of Mary's being in Seattle could be earlier than the time of Bill's finding out, which impossible according to native speakers' intuitions. In the actual interpretation of (9a), the time of Mary's being in Seattle (with regard to Bill's finding out) must follow the time of Bill's finding out. This fact effectively refutes the analysis of (9a) based on (the lack of) cessation implicature. Since the source of the cessation implicature does not exist, we cannot use the lack of cessation implicature to account for the "simultaneous reading" of the past tense on *would*.

The traditional analysis of the sequence-of-tense phenomenon faces no problem in handling this type of example. The idea is that when *would* occurs in a complement clause, it must occur under a matrix past. This means that the past on *would* in (9a) is semantically null.

[7] For concreteness, I introduced a CGT for the past tense morpheme. If we adopt an existential quantifier with no restriction for the past tense, our prediction is even worse because the past tense can take you to any past time indefinitely distant from the utterance time. Having *would* does not help us at all. Regarding (9), we would have to conclude that Mary's being in Seattle can be any time whatsoever.

4.2. THE PAST PERFECT. Next, let us discuss the case of the past perfect (vs. the present perfect). Consider examples in (11a) and (11b).

(11) a. Bill found out that Mary had arrived in Seattle.
b. Bill found out that Mary has arrived in Seattle.

Let us examine A&S's argumentation regarding (11a-b). For easy reference, let us refer to the time of Bill's finding out as B-time. (11b) lacks a reading in which Mary's arriving is before B-time and her being in Seattle persists (only) until B-time. Instead, Mary's being in Seattle is required to persist until the utterance time. In other words, the present tense on *has* has an indexical interpretation and lacks a "relative present" interpretation. This should allow the past perfect in (11a) to receive the reading it has. That is, A&S are expected to claim that the past tense on *had* yields a "simultaneous reading" as a by-product of the lack of cessation implicature regarding its back-shifted interpretation, which would be the only semantic interpretation available for (11a). This must be A&S's argumentation given their assumption that the past tense morpheme always receives a relative past interpretation. However, according to native speakers' intuitions, (11a) has no interpretation in which the time of Mary's arriving in Seattle is earlier than a contextually given time (CGT) located before Bill's finding out (and her being in Seattle is only required to persist until CGT). The diagram (12) shows the reading being posited here.

(12) # --------- CGT ----- finding out ------ utterance time --->
have PAST

The actual interpretation of (11a) is that Bill found out that Mary arrived before B-time and Mary's being in Seatle lasts (at least) until B-time. Since the reading indicated by (12) is not supported by native speakers' intuitions, it is unreasonable to assume that it is the source of the "simultaneous reading" of the past tense (11a). Thus, no cessation-based argumentation is tenable here.

Again, the traditional analysis faces no issue. We only need to assume that the past perfect occurs under a past tense in an immediately higher structural position, and the past tense on *had* is rendered semantically empty. The interpretation of (11a) receives a straightforward account.

4.3. PRES VS. FUTURE UNDER FUTURE. The traditional sequence-of-tense account can partially explain why the present tense under past does not receive a simultaneous reading. This is important since the English present does not always denote (a time that contains) the utterance time. For example, (13) has a present tense in the complement clause and a past tense in the matrix. Since they are not occurrences of the same tense, no "semantic adjustment" occurs. Thus, the indexical character of the English present survives in (13), resulting in a double-access construal.

(13) Bill found out that Mary is in Seattle.

This account of tense mismatch is effective if we extend the sequence-of-tense phenomenon to those cases in which the present tense occurs in sequence. For example, the simple present in the complement clause in (14a) has no indexical character, at least not obligatorily.[8] The present tense morpheme on *will* also behaves like "relative present" in (14b). That is, Mary's being in Seattle is after the future time of Bill's finding out.

[8] This type of example is discussed in Ogihara (1996) as an instance of double-access sentence.

(14) a. Bill will find out that Mary is in Seattle.
b. Bill will find out that Mary will be in Seattle.

The simple present in (14a) can receive a purely simultaneous interpretation. This is accounted for by "tense deletion" under identity in the traditional account. We assume that *will* is morphologically present. Thus, the lower present is deleted and hence behaves like a "relative present." The same account applies to (14b). According to Ogihara (1996), (14a-b) are also instances of the SOT phenomenon.

Let us examine if A&S's account can be extended to this type of example. Consider (15a-b).

(15) a. Mary is in Seattle.
b. Mary will be in Seattle.

It is arguable that (15a) asymmetrically entails (15b). If Mary is in Seattle now, this state also holds shortly after the utterance time, which is a future time. By contrast, (15b) clearly does not entail (15a). We can then say that (15b) pragmatically implicates that (15a) is false. To help the reader understand the pattern of reasoning, let me provide a schematic characterization in (16).

(16) PRESϕ asymmetrically entails FUTϕ
FUTϕ implicates ¬ PRESϕ

Let us accept this entailment relation and the pragmatic inference pattern. It may be odd to call the latter an instance of cessation implicature. However, it is an instance of scalar implicature and is similar to cessation implicature posited by A&S. If we wish to account for verb complement facts in (14a-b) in terms of the lack of this implicature, however, we clearly face difficulties. It is not easy to see how A&S handle (14a-b). Without extending the traditional account of the sequence-of-tense data to sequences of the present tense morpheme, A&S have difficulty assigning a simultaneous interpretation to (14a). The same issue arises with (14b). Even if A&S assumes that the implicature alluded to in (16) is not triggered with regard to (14a-b), no good consequence appears to follow from this assumption.

We thus conclude that even if A&S's account is accepted for past-under-past cases such as (6a), it does not account for other sequence-of-tense examples such as the future modal in the past (*would*), the past perfect (*have* V-*ed*), and the future-under-future configuration.

5. Cross-linguistic considerations. In addition to the problems mentioned above, A&S's account fails to explain the data in Japanese-type languages in which simultaneous and back-shifted interpretations are expressed with distinct tense forms.

A&S's proposal is based on the fact that (1) (repeated here as (17)) can receive both back-shifted and simultaneous readings.

(17) Bill found out that Mary was in Seattle.

A&S's idea is to think of the back-shifted reading as the only "official semantic interpretation" of (17) and relegate the simultaneous reading as a weak implicature produced by the lack of cessation implicature. However, Japanese-type languages employ distinct morphemes for the two readings in question. This is shown in (18a-b).

(18) a. Biru-wa Mearii-ga Siatoru-ni iru-to sit-ta.
Bill-TOP Mary-NOM Seattle-at be.PRES-that learn-PAST
'Bill learned that Mary was in Seattle (at that time).' [simultaneous]
b. Biru-wa Mearii-ga Siatoru-ni i-ta-to sit-ta.
Bill-TOP Mary-NOM Seattle-at be-PAST-that learn-PAST
'Bill learned that Mary was/had been in Seattle (earlier).' [back-shifted]

The complement clause in (18a) contains a past tense, while (18b) contains a present tense in the correspoding position. The Japanese tense system is semantically transparent throughout various subordinate structures. Tense morphemes receive "relative" interpretations in that they are interpreted in relation to the immediately higher tense morpheme in the structure. Thus, in verb complements, present and past tense morphemes measure their semantic contributions in relation to the matrix predication time, thereby semantically distinguishing between simultaneous and back-shifted interpretations.

It is definitely possible that the English tense system operates under very different assumptions. However, it is reasonable to claim that a cross-linguistic system in which tense morphemes in English-type languages and Japanese-type languages receive equally satisfactory accounts is preferred.

6. Conclusion. A&S's account of the sequence-of-tense phenomenon in English features a novel idea and seeks to assign a single lexical meaning to the past tense morpheme. Everything being equal, this is clearly desirable because the traditional proposal renders some occurrences of past tense semantically empty. This in effect posits a gap between surface forms and their interpretations. However, as shown above, A&S's account based on cessation implicature has very limited empirical coverage. Their proposal faces problems regarding the past tense form of the future auxiliary (*would*), the past perfect (*have* V-*ed*), and the future-under-future configuration. We also showed that Japanese-type languages distinguish between back-shifted and simultaneous interpretations overtly, and this strongly suggests that the distinction in question is semantic, and not pragmatic, in nature.

Our conclusion, therefore, is that positing a sequence-of-tense rule which renders some past tense morphemes semantically null for English-type languages receives support in view of empirical and conceptual considerations. The traditional system allows us to use the same semantic rules for both English-type and Japanese-type languages as long as we accept a well-motivated rule that renders some occurrences of tense morphemes in English-type languages semantically empty.

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