CHAPTER 22

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EMBEDDED TENSES

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1. Introduction

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The English present tense does not exhibit a uniform behavior in all embedded environments. Its ability to receive a simultaneous reading in complement clauses of attitude verbs depends on the matrix tense, as illustrated by(1).[1]

(1) a. Joseph found out that Mary loves him.
     b. Joseph will find out that Mary loves him.

In (1a), the time of Mary's loving must overlap the utterance time; but in (1b) it need not: the time of Mary's loving time may overlap the utterance time, but it can also overlap the finding-out time without overlapping the utterance time. This is confirmed by the contrast in (2): (2a) is contradictory; (2b) is not.

(2) a. #Mary doesn't love Joseph now but she did once, and he found out that she loves him.
     b. Mary doesn't love Joseph now but she will some day, and he will find out that she loves him.

Likewise, in relative clauses, the present tense is capable of receiving a simultaneous reading if the matrix tense is future, but not if it is past, as illustrated in (3).[2]

(3) a. Joseph met a woman who loves traveling.
     b. Joseph will meet a woman who loves traveling.

In (3a), the loving time again must overlap the utterance time; but not so in (3b), where the loving time may overlap the utterance time, but need not.

It is well known that not all languages exhibit the same behavior, and not all languages that behave in a manner different from English behave in the same way (see, among many others, Borer, 1981; Ogihara, 1996; Sharvit, 2003, 2008; Grønn and von Stechow, 2010; Hatav, this volume and references cited there). On the one hand, there are languages (e.g., Japanese, Hebrew), where the present tense receives (or can receive) a simultaneous reading in complement clauses of attitude verbs, even when the matrix tense is past. On the other hand, there are languages (e.g., Japanese, but not Hebrew), where the present tense can receive a simultaneous reading in relative clauses, even when the matrix tense is past.

This chapter investigates the nature of these language-internal and crosslinguistic variations, and the success (or lack thereof) of two particular theories in accounting for it: the theory we refer to as the *ULC-based theory* (where ULC stands for Upper Limit Constraint) and the theory we refer to as the *copy-based theory*. The former is largely due to Abusch (1993, 1997), and the latter to Ogihara (1995a, 1996). We will see that both theories are only partially successful and that each of them accounts for a different aspect of this variation. We will examine a third theory, which borrows insights from both.

The paper is structured as follows. Section 2 examines in detail the language-internal and crosslinguistic variation mentioned above and supplies the empirical domain of the discussion. Section 3 introduces the two theories—the ULC-based theory and the copy-based theory, highlighting their advantages and shortcomings. Section 4 supplies some additional data that justifies merging the two theories. Section 5 explores some benefits of a theory that borrows insights from both the ULC-based theory and the copy-based theory.

2. The Data

As regards the embedding of tenses, languages that have (overt, morphological) tense differ from each other along two dimensions: (i) the interpretation of *a past tense morpheme under another past tense morpheme* (past-under-past);[3] and (ii) the interpretation of *a present tense morpheme under another tense morpheme* (present-under-past/ future). Within each dimension, there might also be differences that are due to the nature of the embedded clause—a complement of an attitude verb vs. a relative clause.

Let us start with the first dimension (past-under-past). Regarding complement clauses of attitude verbs, languages such as English are characterized by the fact that past-under-past sentences are ambiguous between a "simultaneous" reading and a "back-shifted" reading, as indicated in (4).

(4)   a. Joseph believed in 2005 that Mary loved him (in 1999).
         Back-shifted reading:
         Joseph to himself, in 2005: "Mary loved me (in 1999)."
      b. Joseph believed in 2005 that Mary loved him (then).
         Simultaneous reading:
         Joseph to himself, in 2005: "Mary loves me (now)."

By contrast, (5), the counterpart of (4) in Japanese, is claimed to have only the back-shifted reading.[4] The verb complement clause of (5b) contains the adverbial *sono-toki* "that time" or "then," and this forces that the alleged time of Mary's loving John to overlap John's thinking. The pound sign (#) indicates that (5b) is unacceptable on this simultaneous interpretation.

(5)   a.   2005-nen   ni   Joseph-wa   Mary-ga   1999-nen-ni zibun-o
           2005-year   in   Joseph-TOP Mary-NOM   1999-year-in self-ACC
           aisi-te i-ta-to   sinzi-te i-ta.
           love-PROG-PAST that   believe-PROG-PAST
           Back-shifted reading equivalent to that of (4a).
      b.   #2005-nen   ni   Joseph-wa   Mary-ga   sono-toki   zibun-o
           2005-year   at   Joseph-TOP Mary-NOM   that-time   self-ACC
           aisi-te i-ta-to   sinzi-te i-ta.
           love-PROG-PAST that   believe-PROG-PAST
           Simultaneous reading (as shown in (4b)) is not possible.

There are languages such as Hebrew that show what appears to be inconsistent behavior.[5] On the one hand, (6) certainly has a back-shifted reading. On the other hand, just like its English counterpart in (4), it also allows a simultaneous reading for some (though admittedly not all) Hebrew speakers.

(6)   lifney   alpayim   šana, Yosef xašav   še   Miriam   ahava   oto
      before   two-thousand   year   Yosef PAST-think that Miriam   PAST-love him

Importantly, (7a)—with the time adverbial *az* ("then")—allows a simultaneous reading for all the speakers we consulted, whereas (7b)—with the adverbial "in his childhood"—has only a back-shifted reading.

(7)   a.   lifney   alpayim   šana, Yosef xašav   še   Miriam   ahava
           before   two-thousand   year   Yosef PAST-think that Miriam   PAST-love
           oto   az
           him   then
           Simultaneous reading, possible:
           Yosef's belief, two thousand years ago: "Miriam loves me now."
      b.   lifney   alpayim   šana, Yosef xašav   še   Miriam   ahava
           before   two-thousand   year   Yosef PAST-think that Miriam   PAST-love
           oto   be-yalduto
           him   in-childhood-his
           Back-shifted reading:
           Yosef's belief, two thousand years ago: "Miriam loved me in my childhood."

The presence of *az* (like that of *sono toki* in the Japanese example above) favors an interpretation where the loving time overlaps the thinking time (though, if a previous time is mentioned in a previous sentence, other interpretations are possible too).

This doesn't mean, though, that Hebrew behaves like English with respect to past-under-past. First, as we already mentioned, there is some variation among

speakers regarding the availability of a simultaneous reading in (6). Secondly, the Hebrew (8a)—with an intervening future-oriented infinitive—does not allow a simultaneous reading of the most deeply embedded past (for any speaker), unlike its English counterpart in (8b), which does (see Sharvit, 2003).

(8) a.

Dan	xašav	etmol	še	Mira	hayta	amura	(az)
Dan	PAST-think	yesterday	that	Mira	PAST-be	supposed	then
lomar	le-ima	tox	šavua	še	hi	hitga'age'a	eleha
INF-tell	to-mother-her	within	week	that	she	PAST-miss	to-her

Mira says to her mother: "I miss you."   Impossible.
Mira says to her mother: "I missed you."   Possible.

     b. Yesterday, John thought that Mary was supposed to say to her mother within a week that she missed her.

The generalization seems to be this: in limited simple past-under-past cases (for example (7a), which doesn't contain an intervening future-oriented infinitive), Hebrew allows simultaneous readings of past-under-past.

Conceivably, one could attribute the simultaneous reading of (6) to pragmatics, roughly along the lines of Gennari (2003): semantically, the reading is back-shifted (i.e., denotes a time prior to the believing time), but Miriam's loving time may, in practice, extend beyond the distant past into a less distant past (which may coincide with Yosef's thinking time). However, such an analysis faces some difficulties. The main difficulty concerns crosslinguistic variation. For example, a pragmatic theory cannot explain the contrast between Hebrew and Japanese, which are very different in this regard, as shown by the ill-formedness of the Japanese sentence (5b). Likewise, within a pragmatic theory we would not expect Hebrew to differ from English with respect to complex embeddings such as (8a). In other words, if the possibility of sometimes interpreting a past-under-past as "simultaneous" were pragmatic and not grammatically restricted, we would not expect crosslinguistic variation of any kind. In fact, Gennari (2003), who is not concerned with crosslinguistic variation, uses her theory to account for the simultaneous readings of the English (4b) and (8b) (in the latter, the missing time presumably extends from a time prior to the telling time into the future), but the Japanese and Hebrew facts cast doubt on this analysis (either for English or for Hebrew). Therefore, we take the position that the simultaneous readings of the Hebrew (6) and the English (8b) are grammatically encoded (and those very same grammatical principles, whatever they are, disallow such a reading in (8a)).

Regarding relative clauses, a past-under-past in English may have a simultaneous reading (9a), a back-shifted reading (9b), and a forward-shifted reading (9c).

(9)   a. In 1989, Joseph met a woman who loved him then.
     b. In 1989, Joseph met a woman who loved him in the 70s.
     c. In 1989, Joseph met a woman who loved him in the 90s.

Hebrew and Japanese do not show any identifiable difference here: both Hebrew and Japanese past-under-past in a relative clause shows the same three-way ambiguity as English (see (10) and (11), respectively).

(10) a. be 1989,   Yosef   pagaš   iša   še   ahava   oto   az
          in 1989   Yosef   meet-PAST   woman   Comp   love-PAST   him   then
      b. be 1989,   Yosef   pagaš   iša   še   ahava   oto
          in 1989   Yosef   meet-PAST   woman   Comp   love-PAST   him
          be-šnot   ha-šiv'im
          in-years   the-seventies
      c. be 1989,   Yosef   pagaš   iša   še   ahava   oto
          in 1989   Yosef   meet-PAST   woman   Comp   love-PAST   him
          be-šnot   ha-tiš'im
          in-years   the-nineties

(11) a. 1989-nen   ni,   Joseph-wa   sono toki   aisi-te i-ta   zyosei-ni
          1989 year   in   Joseph-TOP   that time   love-PROG-PAST   woman-DAT
          at-ta.
          meet-PAST
      b. 1989-nen   ni,   Joseph-wa   1970 nen dai ni   aisi-te i-ta
          1989 year   in   Joseph-TOP   1970s   in   love-PROG-PAST
          zyosei-ni   at-ta.
          woman-DAT   meet-PAST
      c. 1989-nen   ni,   Joseph-wa   1990 nen dai ni   aisi-te i-ta
          1989 year   in   Joseph-TOP   1990s   in   love-PROG-PAST
          zyosei-ni   at-ta.
          woman-DAT   meet-PAST

Let us move on to the second dimension (present-under-past/future). Starting with complement clauses of attitude verbs, Hebrew and Japanese are characterized by the fact that present-under-past sentences receive a simultaneous interpretation, as shown by the Japanese (12) (from Ogihara, 1996), which has a reading according to which Taro says: "Hanako is sick," and by the Hebrew sentence in (13), which has only a simultaneous reading according to which Yosef said to himself, two thousand years ago: "Miriam loves me."[6]

(12) Taroo-wa   [Hanako-ga   byooki-da]-to   it-ta
      Taro-TOP   Hanako-NOM   be-sick-PRES   say-PAST
(13) lifney   alpayim   šana, Yosef gila   še   Miriam   ohevet
      Before   two-thousand   year Yosef find-out-PAST   that Miriam   love-PRES
      oto
      him

The English sentence corresponding to (13) is unacceptable, as shown by (14).

(14) ##Two thousand years ago, Joseph found out that Mary loves him.

However, even English does not always exclude a present-under-past in the complement clause of an attitude verb, as shown by (15), which differs minimally from (14), in that the temporal adverbial is *a month ago*, rather than *two thousand years ago*.

(15) A month ago, Joseph found out that Mary loves him.

(15) is well-formed, but it has a special interpretation, which the corresponding (16), with an embedded past, does not have.

(16) A month ago, Joseph found out that Mary loved him.

The truth and acceptability of (16) requires two things: (a) that Mary loves Joseph a month before the utterance time, and (b) that in Joseph's mind, Mary loves him during a time that overlaps his "now." But the truth and acceptability of (15) require (a) and (b), and something in addition: (a´) Mary's loving time has to cover, in addition to the finding out time, the utterance time itself (i.e., her loving cannot be momentary; it has to hold for at least one month). This reading is the so-called "double access" reading.[7] But how does this reading come about? In fact, if all that is required from the embedded present is that it overlap the utterance time, a possible reading should be one where Joseph says to himself that Mary will love him (in "his" future). But this is not possible. This would have to be conveyed by a different sentence such as (17). To make this pragmatically plausible, we need to assume a science fiction-like scenario in which Joseph looks into a crystal ball, which tells him about what will happen to him in the future.

(17) A month ago, Joseph found out that Mary would love him (in a month).

On the other hand, when a present tense is embedded under future tense, all three languages behave in the same way, and a simultaneous reading of the embedded present is possible, as shown in (18).

(18) a. In 2020, (Mary will love Joseph and) he will find out that she loves him.

b.	be-2020,	(Miriam	tohav	et	Yosef	ve)	hu	yegale
	in-2020	Miriam	love-FUT	OM[8]	Yosef	and	he	find-out-FUT
	še	hi	ohevet	oto			
	that	she	love-PRES	him			

c. 2020-nen-ni, (Mary-wa Joseph-o aisi-te i-te),
2020-year in, Mary-TOP Joseph-ACC love-PROG-and
kare-wa [kanozyo-ni ai-sare-te i-ru-to]
he-TOP she-DAT love-PASS-PROG-PRES-that
wakaru-daroo.
understand.PRES-perhaps
"In 2020, (Mary will love Joseph and) he will find out that he is being loved by her."

Moving on to present in relative clauses, (19) shows that the availability of a simultaneous reading of the present in English again depends on the matrix tense: a matrix past blocks a simultaneous reading, but a matrix future does not. (19a) and (19b) should both be understood as uttered when Joseph is a young man.

(19) a. In his childhood, Joseph met a woman who loves traveling.
          Simultaneous reading, *impossible*: loving time overlaps meeting time (but need not
          overlap utterance time).
          Non-simultaneous (indexical) reading, *possible*: loving time overlaps utterance time
          (but need not overlap meeting time).
      b. As a middle-aged man, Joseph will finally meet a woman who loves traveling.
          Simultaneous reading, *possible*: loving time overlaps meeting time (but need not
          overlap utterance time).
          Non-simultaneous (indexical) reading, *possible*: loving time overlaps utterance time
          (but need not overlap meeting time).

Here, an important difference between Hebrew and Japanese manifests itself, unlike
past-under-past cases: Hebrew exhibits the same behavior as English (see (20)),[9]
whereas Japanese allows a simultaneous reading, not only when the matrix tense is
future, but also when it is past (see (21)).[10]

(20) a. be-yalduto,   pagaš   Yosef   iša   še   ohevet
          in-childhood-his   meet- PAST   Yosef   woman   Comp   love-PRES
          letayel
          traveling
          Loving time (may overlap meeting time but) must overlap utterance time.
      b. be-gil ha-amida,   sofsof yifgoš Yosef   iša   še   ohevet
          in-middle-age-his   finally meet-FUT Yosef woman   Comp   love-PRES
          letayel
          traveling
          Loving time overlaps utterance time or meeting time.

(21) a. Kodomo-no   koro, Joseph-wa [ryokoo-o   aisu-ru   zyosei]-ni
          child-GEN   time, Joseph-TOP [travelling-ACC love-PRES   woman]-DAT
          at-ta.
          meet-PAST
          [Default reading]
          Loving overlaps meeting time (but not necessarily the utterance time).
          [Possible reading when appropriate adverbials are supplied]
          Loving overlap the utterance time (but not necessarily the meeting time).
      b. Tyuunen-ni   nat-te kara,   Joseph-wa   yat-to   tabi-o
          middle-age-DAT   become-from   Joseph-TOP   finally   travelling
          aisuru   zyosei-ni   au-daroo.
          love-PRES   woman-DAT   meet-probably
          [Default reading] Loving time overlaps the meeting time (but not necessarily the
          utterance time).
          [Possible reading when appropriate adverbials are supplied]
          Loving overlaps the utterance time (but not necessarily the meeting time).

Table 22.1   Availability of simultaneous readings

	Past-under-past	Present-under-past	Present-under-future
English complements of AVs	possible	impossible	possible
English RCs	possible	impossible	possible
Hebrew complements of AVs	often impossible	possible	possible
Hebrew RCs	possible	impossible	possible
Japanese complements of AVs	impossible	possible	possible
Japanese RCs	possible	possible	possible

Table in (22.1) summarizes the empirical observations noted so far, regarding the availability of a simultaneous reading (AV stands for attitude verb; RC for relative clause).

What we learn from the above discussion is that the traditional division into SOT (Sequence-of-Tense) languages vs. non-SOT languages is a bit misleading: English is definitely a SOT language (in the sense that past-under-past always has the option of receiving a simultaneous reading), but only Japanese shows a uniform non-SOT behavior (in the sense that an embedded present is always capable of receiving a simultaneous reading).[11] Hebrew seems to have properties of both: with respect to relative clauses, it seems to behave like English; but with respect to complements of attitude verbs, it behaves like English only in some restricted cases. Because of this lack of uniformity (which will become even more evident as we proceed), we refrain from using the traditional SOT/non-SOT terminology.

The next two sections discuss the two theories of embedded tense mentioned in section 1. We first present the ULC-based theory of embedded tense, showing both its merits and its shortcomings. Then we present the copy-based theory, showing that it solves some of the problems raised by the ULC-based theory, but crucially not all of them.

3. TWO THEORIES OF EMBEDDED TENSE

3.1. What the Two Theories Have in Common

Before we begin, it is important to point out that even though the main ingredients of the ULC-based theory, as we understand it, are due to Abusch (1993, 1997), and the main ingredients of the copy-based theory are due to Ogihara (1995a, 1996), we are not being entirely faithful to either one of them. Rather, we borrow from their

proposals what seem to us to be the crucial assumptions. We borrow other assumptions from Heim (1984), von Stechow (1995), Kratzer (1998), Schlenker (1999) and others. The reason for this "unfaithfulness" is practical: it facilitates the comparison and allows us to focus only on those differences that are relevant to the current discussion (i.e., those differences that help us assess the level of success of these theories in accounting for the facts discussed above), and disregard differences that are irrelevant.

Secondly, it is important to point out that there are some assumptions that are shared by these theories, and therefore some of their predictions overlap. Both theories assume the following ingredients: (a) a "deletion" parameter; and (b) a parameter for an inborn relative present[12] (or "deleted present").[13] Starting with (a), both theories assume the existence of a "deletion" rule in some languages: *a tense that is c-commanded by an agreeing tense (past-under-past, present-under-present) may optionally be converted into a zero-tense*[14] (i.e., *equivalent to a relative present tense).*[15] A tense that has not undergone "deletion" is a doubly-indexed pronominal expression, an expression that requires two times for its interpretation; a tense that has undergone "deletion" has one index only.[16] Thus, a "non-deleted" past is like a complex pronominal expression: the first index denotes the local evaluation time, which is designated by the index 0, and the second index—a time that precedes it. A past tense that has undergone "deletion" has a single index and it must be bound. This is illustrated in (23). Note that "<" stands for an interpreted past tense feature (i.e., a past tense that is not deleted), which contributes an anteriority presupposition, whereas "≮" stands for an uninterpreted past tense feature (i.e., a past tense that has been "deleted"), which results in the absence of any presupposition. The embedded past that has a single index is bound by an abstractor—λo—introduced by the attitude verb.[17] The embedded past that has two indices has its first index bound by the same abstractor,[18] and its second index bound by a default existential.[19]

(23) Joseph believed that Mary loved him.
    a. LF resulting from applying the "deletion" rule:
       Joseph $\text{PAST}^{<}_{0,2}$ believe λo[that Mary $\text{PAST}^{\not<}_{0}$ love him][20]
       Joseph to himself, in the past: "Mary loves me now" (simultaneous reading)
    b. LF resulting from not applying the "deletion" rule:[21]
       Joseph $\text{PAST}^{<}_{0,2}$ believe λo[$\exists_3$ [that Mary $\text{PAST}^{<}_{0,3}$ love him]]
       Joseph to himself, in the past: "Mary loved me" (back-shifted reading)

Importantly, not all languages have the "deletion" rule. English has it, but Japanese and Hebrew do not. This has the result schematized in (24).

(24) [.... $\text{PAST}^{<}_{0,2}$ AV λo[.... $\text{PAST}^{\not<}_{0}$ ...]]
    Well-formed in languages that have a "deletion" rule; ill-formed in languages that do not.

The assumption that Japanese and Hebrew lack the "deletion" rule explains why (5) and (8a) do not have a simultaneous reading (though it does not explain why the Hebrew (7a) does have a simultaneous reading for many speakers; we come back to this issue below).

Let us now move on to the point (b) raised above. Languages also differ from each other regarding whether they have an inborn relative ("deleted") present tense. It is a present tense that is interpreted in relation to a time introduced by the closest higher tense. We use the term "inborn relative present tense" because this type of present tense does not have to undergo deletion in order to produce a simultaneous reading. This is different from the case of the English present, which can receive a simultaneous reading but only if it has undergone "deletion." The English present, when it is not "deleted," is an absolute present in the sense that it denotes a time containing the utterance time (i.e., the time of the context).

We shall represent the undeleted English present $\text{PRES}^o_{u,k}$, where o is mnemonic for "overlap," u is an index that always denotes the utterance time, and k is presupposed to denote a time overlapping what u denotes (i.e., the utterance time). On the other hand, the present tense in Hebrew and Japanese—or rather their embedded present tense—is designated by PRES^{σ}_o, where σ indicates that its feature o is deleted, and its index o (zero) is required to be bound by λo. The predicted variation regarding present-under-past sentences involving verb complements is illustrated in (25).

(25) a. $[\ldots \text{PAST}^{<}_{o,2} \text{ AV } \lambda o[\ldots \text{PRES}^{\sigma}_o \ldots]]$
Well-formed in languages that have an inborn relative PRES.

  b. ?? $[\ldots \text{PAST}^{<}_{o,2} \text{ AV } \lambda o[\ldots \text{PRES}^o_{u,k} \ldots]]$
This is what is predicted for English. But it is not clear if it is interpretable.

(25a) explains why the Hebrew (13) has a simultaneous meaning, the same simultaneous meaning as the English (16) (*A month ago, Joseph found out that Mary loved him*). (25b) appears to show that in the English (15) (*A month ago, Joseph found out that Mary loves him*), the embedded present is understood as overlapping the utterance time. However, it is not clear whether (25b) is interpretable as is. As we shall see below, (25b) may violate the ULC (Upper Limit Constraint) or the Temporal Orientation Principle, and we need a different way of accounting for the reading that (15) has (i.e., a "double access" reading). In addition, (25b) gives us no clue as to why (14) (*##Two thousand years ago, Joseph believed that Mary loves him*) and (15) contrast in acceptability. We now turn to the explanation of these facts. The explanation lies in the third ingredient that both theories share, namely, the existence of a *de re* mechanism for tense interpretation. However, each of these theories assumes a slightly different *de re* mechanism. Therefore, we now turn to the actual comparison, which will highlight the different predictions.

3.2. The ULC-Based Theory of Embedded Tense

In addition to the assumptions discussed so far, the ULC-based theory makes the following sub-proposals: (i) a *de re* mechanism of tense interpretation which is based on the Upper Limit Constraint (ULC); and (ii) restrictions on zero-binders (or zero-abstraction indices). Let us discuss them in turn.

For those who are not familiar with the formal analysis of *de re* interpretations which we adopt for the purpose of this chapter, let us discuss some basic examples. The basic intuition behind a *de re* interpretation of some expression is that it denotes the object associated with the expression and its descriptive content plays no role from the perspective of the attitude-holder. Traditionally, this is contrasted to a *de dicto* interpretation, whose interpretation necessarily involves its descriptive content, from the attitude-holder's perspective. One prototypical situation in which *de dicto/de re* ambiguity becomes an issue is a verb complement clause. For example, in (26) the definite description the CEO of Google is used as a means of getting to the current referent of this expression, Eric Schmidt, and it is possible that the attitude holder, Mary, does not know that Eric Schmidt is the CEO of Google.

(26)   Mary thinks that the CEO of Google is smart.

A possible scenario for which a *de re* interpretation of *the CEO of Google* in (26) is appropriate is that Mary met Eric Schmidt at an informal gathering and talked to him. He impressed Mary with his conversation skills and gave her the impression that he is a smart person. Eric did not reveal his identity, however. So Mary's thought must be characterized in terms of the actual person she talked to at the gathering, not in terms of the expression *the CEO of Google*. In other words, she would not use the expression *the CEO of Google* if she were to describe her belief about the gentleman she talked to at the gathering. But this expression could be used in a report as in (26), and it is said that in this case *the CEO of Google* receives a *de re* reading. Montague (1973) provided a wide scope rendition of the definite description as a way of accounting for the *de re* interpretation of (26) (and similar examples). The relevant (but rough) logical representation is given in (27).[22]

(27)   [the x. x is the CEO of Google] [Mary believes (x is smart)]

The informal description of (27) would be that according to what Mary believes, in each of Mary's "belief worlds" Eric Schmidt, who happens to be the CEO of Google in the actual world, is smart. He is not required to be the Google CEO in the worlds consistent with Mary's beliefs in the actual world.

(26) can also receive a *de dicto* interpretation on a different scenario. For example, Mary loves the search engine Google and other products that Google offers and is convinced that the CEO of Google is a smart person without knowing who the CEO is. This reading of (26) is referred to as a *de dicto* reading, and it is generally analyzed in terms of a structure like (28) in which the definite description is interpreted in situ (or at least within the scope of the verb *believe*).

(28)   [Mary believes ([the x. x is the CEO of Google] is smart)]

In this case, what Mary conveys is intrinsically associated with the expression *the CEO of Google*, and she may or may not be acquainted with Eric Schmidt himself. Stated in a slightly more technical language, what is required here is that in each world *w* that is consistent with what Mary believes in the actual world, the unique individual who is the CEO of Google in *w* is smart in *w*.

The above characterization of *de re* attitude reports does not account for a well-known problem associated with *de re* attitude reports (e.g., Quine, 1956). Quine's line of reasoning goes as follows. Ralph sees a man in a brown hat under questionable circumstances and believes that he is a spy. On a different occasion, Ralph glimpses a gray-haired man at the beach who he believes is a pillar of the community. It is clear, then, that Ralph does not believe that the man he saw at the beach is a spy. It so happens that the two men Ralph saw are one and the same: Bernard Ortcutt. Given the above analysis of *de re* attitudes, we expect (29a) to be true on its *de re* reading. This reading is rendered as in (29b) informally:

(29)   a.   Ralph believes that the man in a brown hat is a spy.
        b.   [the x. x was in a brown hat] [Ralph believes (x is a spy)]

Unfortunately, we expect (29a) to be **false** on its *de re* rendition (i.e., (29b)) regarding the man who Ralph glimpsed at the beach. This is because in actuality the man in a brown hat is the same as the man Ralph saw at the beach, and it should not matter which expression we use as long as the expression denotes the right individual (in the actual world). Thus, we are faced with the problem of attributing two conflicting beliefs on the part of Ralph: (29a) is true and false at the same time on its *de re* interpretation.

One possible remedy of this situation is to adopt Lewis's (1979) and Cresswell and von Stechow's (1982) formalization of *de re* attitudes. For example, this theory analyzes a *de re* reading of (29a) as in (30), which means that *believe* denotes a three-place relation involving an individual, an object, and a property. (30) is obtained when the expression that denotes the *res* (the man in a brown hat) moves out of the complement clause and becomes a semantic argument of the verb believe, creating a property-denoting expression out of the complement clause in the process.

(30)   Ralph believes [the x. x was in a brown hat], λy. y is a spy

Here it is important to assume that the attitude holder (Ralph) is acquainted with the *res* (the man in a brown hat) via a relation (called an acquaintance relation). That is, the context supplies a suitable relation R such that the *res* is the unique object to which the attitude holder is related via R. In the situation where Ralph sees Ortcutt in a brown hat, the relevant relation is {<x, y> | x sees y and y is in a brown hat}; in the other situation where Ralph sees Ortcutt at the beach, the relevant relation is {<x, y> | x sees y at the beach}. Then the entire sentence asserts that Ralph ascribes (in the relevant context) to the *res* (Ortcutt) the property of being a spy. Since the above two contexts involve different acquaintance relations, one and the same formula (30) could produce two distinct semantic consequences (**true** and **false**). That is, although the definite description *the man in a brown hat* denotes the same person in both cases, i.e., Ortcutt, Ralph is related to him in two different ways in the two circumstances in question. This offers an intuitively plausible way of avoiding the unwelcome theoretical prediction of attributing to Ralph contradictory beliefs.

In what follows, we will assume this analysis of *de re* attitude reports. One major difference between the examples discussed in this section and those that we are

concerned with in this chapter is that the latter involve temporal individuals (time intervals), not "regular" individuals, like Ortcutt.

3.2.1. *The De Re Mechanism and the ULC*

The ULC-based theory assumes that any embedded tense (with "undeleted" features) has the option of being interpreted *de re*, as shown in the LF in (31), where the embedded tense has undergone *res*-movement (see Heim, 1984). The moved present tense leaves behind a trace (e_3) that is understood as a variable over times. The analysis relies on a salient description (like the acquaintance relation discussed above) that "outside" the attitude context uniquely determines the denotation of the *res* (in this case, $PRES^o_{u,3}$).[23]

(31)   [Joseph $PAST^<_{o,2}$ [believe$^{DE\text{-}RE}$-$PRES^o_{u,3}$] $\lambda 3 \lambda o$[Mary [e_3-love him]]]

> The context supplies a salient time description that is compatible with the presuppositions of $PRES^o_{u,3}$ and $PAST^<_{o,2}$. For example, "the month that surrounds now" is a description that is compatible with them and picks out (the denotation of) $PRES^o_{u,3}$—a time that overlaps the utterance time and the month that surrounds (the denotation of) $PAST^<_{o,2}$.

There is an additional crucial underlying assumption: e_3 must obey the ULC. The ULC requires that the reference of an embedded tense, or its trace, not be a time that begins after the attitude-holder's "now." A bit informally, it can be stated as in (32).[24]

(32)   Where T is a Tense node, [$_T$ α] has a denotation only if the denotation of α is not a time that is after the local evaluation time of T.

Since, by assumption, T (which dominates e_3) is c-commanded by λo, the local evaluation time of e_3 is the believer's "now." In terms of our LF in (31), e_3 cannot denote a time later than Joseph's "now." Thus, to avoid attributing a contradictory belief to Joseph, the description that Joseph uses to describe PRES to himself can only be such current-time-oriented adverbials as "this week" or "this month," and not "next week" or "next month." This explains why a present-under-past cannot be used to report Joseph's belief when he believes "Mary will love me next month." It also explains why *Two thousand years ago, Joseph believed that Mary loves him* is odd: it implies that in Joseph's mind, Mary's loving extends beyond the normal human lifespan (and that the state that caused Joseph to form his belief extends beyond that lifespan too).

Importantly, nothing in this theory prevents an embedded past tense from being interpreted *de re*. (33) is thus a possible LF for *Joseph believed that Mary loved him*.

(33)   [Joseph $PAST^<_{o,2}$ [believe$^{DE\text{-}RE}$-$PAST^<_{o,3}$] $\lambda 3 \lambda o$[Mary [e_3 loved him]]]

> The context supplies a salient time description that is compatible with the ULC and the presuppositions of the moved PAST. "The duration of the sentence I am uttering" satisfies these presuppositions because the presupposition of $PAST^<_{o,3}$ is that it denote a time prior to the utterance time (i.e., the denotation of o).

According to (33), the trace of the moved tense e_3 has to meet the requirements of the ULC (which does not force anteriority). Thus, he could regard "his now" to be a time when Mary's loving him is taking place. According to this theory, then, a *de re* LF of past-under-past may support a "simultaneous" reading (as well as a "back-shifted" reading; when the time description happens to be "a month before now," for example).

It is a little hard to see whether the LF in (33) is justified, as long as we look just at English, because the "simultaneous" reading of a past-under-past sentence can be derived, as we saw, from a non-*de re* LF such as (34) where the "deletion"-rule has applied, and the back-shifted reading from an LF such as (35).

(34)   [Joseph $\text{PAST}^<_{o,2}$ believe λo[Mary $\text{PAST}^<_o$ love him]]

(35)   [Joseph $\text{PAST}^<_{o,2}$ believe λo[$\exists_3$ [that Mary $\text{PAST}^<_{o,3}$ love him]]]

What seems to justify (33) is the fact that (again, for many though not all) Hebrew speakers, the corresponding Hebrew (6) has a simultaneous reading. Since Hebrew lacks a "deletion" rule (and therefore (6) cannot have an LF such as (34)), the only way to derive the simultaneous reading is via a *de re* LF.

Why, then, does the Hebrew (8a) lack a simultaneous reading (whereas the corresponding English sentence in (8b)—*Yesterday, John thought that Mary was supposed to say to her mother within a week that she missed her*—has one)? Note that a simultaneous reading in this case would suggest that a moved past tense denote a time simultaneous with the time of saying. This is inconsistent with the lexical meaning of the past tense because it is expected to denote a time earlier than the time of saying. English can resort to the "deletion" rule in order to interpret that embedded past as receiving a simultaneous reading, and Hebrew resorts to its (inborn relative) present tense.

(36) | Dan | xašav | etmol | še | Mira | hayta | amura | (az) |
       |-----|-------|-------|-----|------|-------|-------|------|
       | Dan | PAST-think | yesterday | that | Mira | PAST-be | supposed | then |
       | lomar | le-ima | tox | šavua | še | hi | mitga'aga'at | eleha |
       | INF-tell | to-mother-her | within | week | that | she | PRES-miss | to-her |

   Mira says to her mother: "I miss you."   Possible.

Thus, the data in (8a, b) are accounted for.

Recall the alternative pragmatic theory of "simultaneous" readings discussed in section 2, according to which a simultaneous reading may result in past-under-past sentences when the time referred to in the embedded clause happens to extend into a less distant time. We noted in section 2 that such a theory cannot account for crosslinguistic variation (including the data in (8)). Such a theory would also make it extremely difficult to account for (37), where *bediyuk beoto rega* ("at that same moment") is understood as anaphoric to the matrix adverbial.

(37) | etmol | be-teša | baboker, | Yosef | amar | še | Miriam |
       |-------|---------|----------|-------|------|-----|--------|
       | yesterday | at-nine | in the morning | Yosef | PAST-say | that | Miriam |

xašva	alav	bediyuk	beoto	rega	aval	lo	lifney
PAST-think	about-him	exactly	at-the-same	moment	but	not	before

xen
now
Simultaneous reading—possible
Yosef: "Miriam is thinking about me right now but didn't think about me before now."

Even if Miriam's thinking begins a very short period of time before Yosef's saying time, the thinking time still has to overlap Yosef's saying time. If the embedded past were indeed semantically back-shifted, to make it compatible with the embedded adverbial we would have to say that only a part of the extended thinking time—and not necessarily all of it—is required to be co-temporal with the time denoted by the adverbial. This would incorrectly lead to non-existent forward-shifted readings of past-under-past, even in English. For example, *John said two days ago that Mary was thinking about him yesterday* would be predicted to have a reading where John says: "Mary will be thinking about me tomorrow" (as only part of the extended thinking time has, on these assumptions, to be co-temporal with yesterday). Such a reading, of course, does not exist (either in English or in Hebrew), and on the ULC-based version of the *de re* theory, it is excluded by the ULC.

On the other hand, the theory fails to explain why the Japanese counterpart of (4b) (i.e., (5b)), lacks a simultaneous reading, and this is puzzling if we assume that Hebrew and Japanese are alike regarding the semantics of propositional attitude verbs. This is one of the shortcomings of the ULC-based theory.

3.2.2   *Restrictions on Zero-Binders*

What are the implications of the ULC-based theory for relative clauses? Recall the English data discussed in section 1, a portion of which is repeated in (38).

(38)   a.   In 1999, Joseph met a woman who loved traveling in 1999.
      b.   In his childhood, Joseph met a woman who loves traveling.
          Loving time must overlap utterance time.
      c.   In his middle-age, Joseph will (finally) meet a woman who loves traveling.
          Loving time need not overlap utterance time.

The acceptability of (38a), which indicates that a past-under-past configuration in a relative clause can have a simultaneous reading, makes it tempting to assign it the LF in (39), where the "deletion" rule has applied to the embedded past, and the matrix past has been moved by Quantifier Raising (QR).[25]

(39) $PAST^<_{o,2}$ λo[Joseph e_o meet [a woman [who $PAST^<_o$ love traveling]]]

Coindexation between e_o and $PAST^<_o$ results in them both being bound by the abstractor "λo," and in that the meeting time and the loving time coincide. According to the above proposal about the English present, which assumes that it is an inherently indexical tense, the fact that the relative clause in (38b) only receives a reading sensitive to the utterance time is predicted correctly. This is shown by the LF in (40).

$\text{PRES}^o_{u,3}$ indicates that it denotes a time overlapping the utterance time, which is a correct prediction.

(40) $\text{PAST}^<_{o,2}$ λo[Joseph e_o meet [a woman [who $\text{PRES}^o_{u,3}$ love traveling]]]

Moreover, the Japanese relative clause facts shown in (21a) receive a natural explanation here. Japanese is claimed to have an inborn relative present and the free variable o is bound by λo. This is shown schematically in (41).

(41) $\text{PAST}^<_{o,2}$ λo[Joseph e_o meet [a woman [who PRES^o_o love traveling]]]

However, these predictions for English and Japanese do not sit well with the Hebrew facts in relative clauses. As we have already seen, Hebrew verb complement facts show that it has an inborn relative present tense on a par with Japanese. However, given this assumption, we cannot account for the fact that in Hebrew relative clauses, the present does not produce a simultaneous reading under past as shown in (20a). This means that the configuration given in (41) is not permitted in Hebrew, and we need to improve our account in some way.

On the other hand, if we adopt an alternative account of the present according to which all languages have a present tense that denotes a time overlapping what the index o denotes, i.e., $\text{PRES}^o_{o,k}$ (where the superscripted o indicates temporal overlap), then this would have an unwelcome consequence in that (38b) could have the LF in (42), which incorrectly predicts a non-existent reading, namely, where the time of loving occurs in the past (and crucially does not overlap the utterance time). This is equally unwelcome for languages like Hebrew, though it only produces a harmless redundant way of obtaining a simultaneous reading for languages like Japanese.

(42) $\text{PAST}^<_{o,3}$ λo[Joseph e_o meet [a woman [who $\text{PRES}^o_{o,2}$ love traveling]]]

For different but related reasons, von Stechow (1995) suggests (cf. Abusch, 1993) the QRC (QR Convention: The movement index created by QR is always different from the distinguished index o, which is the index that prefixes a complement of an intensional operator).[26] *John met a woman who loved him* does not have any intensional operators, therefore (39) is ruled out by the QRC (and so is (42)). Rather, the sentence may have the LF in (43). The LF in (44)—which implies that the loving time overlaps the utterance time—is ruled out by the assumption that a PAST that has been subjected to the "deletion" rule has to be bound.

(43) Joseph $\text{PAST}^<_{o,2}$ [meet [a woman [who $\text{PAST}^<_{o,3}$ love him]]]
(44) # $\text{PAST}^<_{o,2}$ $\lambda 3$[Joseph e_3 meet [a woman [who $\text{PAST}^<_o$ love traveling]]]

The two past tenses in (43) can accidentally co-refer. To account for the fact that (38c) has a simultaneous reading, it is necessary to assume that *will* is composed of PRES and an intensional operator—the modal *woll* (an assumption that is independently motivated by the *will/would* alternation) making the following LF possible. Here the assumption would have to be that in this case, the movement of the future auxiliary is permitted and the creation of λo takes place. This leaves us with an

unnatural asymmetry between (present and past) tense morphemes and the future auxiliary, but it at least accounts for English and Hebrew relative clause facts.[27]

(45) $\text{PRES}^\circ_{o/u,2}$ woll λo[Joseph e_o meet [a woman [who PRES°_o love him]]]

Even if this "solution" is accepted for English and Hebrew (and other languages), this theory still fails to account for the fact that Japanese relative clauses behave differently: crucially, an embedded present can receive a simultaneous reading even when the matrix tense is past. The copy-based theory aims to explain this fact.

Before we move on to the copy-based theory, it is worth noting that the ULC and the QRC are related: the ULC assumes that all attitude verbs and modal auxiliaries introduce λo, and the QRC says that only attitude verbs and modal auxiliaries introduce it. This will become significant in the next section, where the copy-based theory is discussed.

3.3. The Copy-Based Theory

As we already mentioned, like the ULC-based theory, the copy-based theory also assumes a "deletion" parameter, an inborn relative present tense parameter, and the availability of a *de re* mechanism for tenses with "undeleted" features (though, as we will soon see, a significantly different *de re* mechanism). Its account of relative clause data could take some different forms. One possibility is what is provided in Ogihara's (1996) work, according to which all tense morphemes can be interpreted as embedded regardless of clause types. Since Ogihara does not assume the ULC, he does not need to presuppose the existence of a designated variable that denotes the "evaluation time," and his account is encoded in a way very different from the proposals entertained here. If we were to formalize his proposal within the general framework adopted here, it would be encoded in terms of an optional tense movement, which introduces the binder λo as shown in (41). This allows an inborn relative present in Japanese to be bound, and a simultaneous reading is produced as a result. This mechanism, along with a tense deletion rule for English, produces a structure like (39), which indicates a simultaneous reading. Though redundant, this prediction is innocuous. In this case, there is no special restriction on QR. Since this proposal is combined with the assumption that the (undeleted) English present is a true indexical ("absolute") tense in that it denotes a time containing the utterance time, the proposal is acceptable as far as English and Japanese are concerned. As mentioned above, the problem with this proposal is that it fails to account for the Hebrew data in relative clauses. One possible "solution" is to say that Hebrew is subject to the QRC (Quantifier Raising Constraint) mentioned above, but other languages are not.

An alternative account of the present was discussed above according to which all languages have a present tense that denotes a time overlapping what the index o denotes, i.e., $\text{PRES}^\circ_{o,k}$. According to this proposal, Japanese is an exceptional language because a stipulation is needed to explain the behavior of relative clauses. Since this proposal gives us no new insight from the viewpoint of a copy-based

theory, our discussion here is very brief. According to this account, all languages have a pronominal present tense of the form $\text{PRES}^o_{o,k}$, and to restrict the bound occurrences of this tense form, the QRC (Quantifier Raising Constraint) is posited. However, since Japanese relative clauses allow a shifted present-under-past in relative clauses, one must stipulate that Japanese does not have the QRC: λo may appear anywhere (thus allowing an LF such as (42) above). Presumably (39) is still ruled out in Japanese because it lacks a "deletion" rule altogether. However, it is hard to show this convincingly because a simultaneous reading for a past tense in a relative clause is available by co-reference, as we saw.[28]

Given that Japanese is not required to obey the QRC, the ULC becomes less attractive from a conceptual and empirical point of view (recall that both the ULC and the QRC are based on the assumption that λo has a special status). If there are languages that do not respect the QRC, is it possible that λo doesn't have a special status at all (at least in those languages), and that the job the ULC does in intensional contexts is done by some other principle? Indeed, in the copy-based theory the job that the ULC does in complements of attitude verbs is done by the requirement that a moved tense leave behind a copy (whose features are interpreted). To be precise, what is left behind is not an exact copy of the original in the case of the simple present in English. Given the assumption that the English present is an inherently indexical expression, what is left must not be an identical copy. It must be a present tense that is almost identical with the original but with the indexical character stripped off. The intuitive idea behind it is that what is left in the original position must preserve the temporal orientation of the original but must not carry the indexical nature of the original, if any. The formal encoding of this idea could take many different forms. Here, we simply encode this in terms of the difference between the original indexical present tense $\text{PRES}^o_{u,3}$, which gets moved, and the non-indexical "copy" $\text{PRES}^o_{o,3}$ of the original, which is left behind in the original position. This proposal is motivated by independent arguments that have been made in recent years in favor of the Copy Theory of Movement (Chomsky, 1993). In addition, it is motivated by what we might call the *Temporal Orientation Principle* (or what Ogihara, 1996, calls the Temporal Directionality Isomorphism): the attitude holder must have the same temporal orientation as the speaker toward the *res*. For present-under-past sentences (with attitude verbs), the prediction is the same as in the ULC-based theory (i.e., a "double access" reading).[29]

(46)   [Joseph $\text{PAST}^<_{o,2}$ [believe$^{\text{DE-RE}}$-$\text{PRES}^o_{u,3}$] $\lambda3\lambda o$[Mary [$\text{PRES}^o_{o,3}$-love him]]]

The context supplies a salient time description that is compatible with the presuppositions of the moved $\text{PRES}^o_{u,3}$ and the presuppositions of $\text{PAST}^<_{o,2}$. "The month that surrounds now" may be easily compatible with all three, and this description picks out the month that surrounds Joseph's "now." Crucially, this time overlaps the utterance time in accordance with the presuppositions of the moved $\text{PRES}^o_{o,3}$. The entire sentence says that Joseph attributes this time the property of being a current time of Mary's loving him (i.e., Joseph).

So the question we are faced with is whether the ULC is needed after all. We come back to this question in section 4.1.

Importantly, if indeed λo has no special status, the QRC has to be dispensed with, since it makes reference to λo. We replace the QRC with the assumption that only quantificational expressions can be QR'ed, and that languages may differ as to whether their tenses are pronouns or quantificational expressions. Japanese has pronominal tenses (PAST, PRES) as well as quantificational tenses—past, present, and future (*past*, *pres*, *fut*); English and Hebrew have only pronominal tenses.[30] This assumption renders (47a) (and perhaps (47b)) well-formed in languages such as Japanese but not in English or Hebrew, and (47c) and (47d) ill-formed in all languages.

(47)   a. $past_o$ λo[Joseph e_o meet [a woman [who $PRES^o{}_o$ love traveling]]]
       b. $past_o$ λo[Joseph e_o meet [a woman [who $PRES^o{}_{o,2}$ love traveling]]]
       c. $PAST^<{}_{o,3}$ λo[Joseph e_o meet [a woman [who $PRES^o{}_o$ love traveling]]]
       d. $PAST^<{}_{o,3}$ λo[Joseph e_o meet [a woman [who $PRES^o{}_{o,2}$ love traveling]]]

In English and Hebrew past and present are pronouns and *woll* is a quantificational modal (and when it is QR'ed, the present tense that is attached to it piggy-backs and is QR'ed too).[31]

In addition, the ULC, should we decide to keep it, would have to be revised to require that the denotation of $[_T \alpha]$ cannot be after the local evaluation time.[32] So the only question we are concerned with is whether the ULC—the new ULC—can be dispensed with in favor of the assumption that a moved tense leaves behind a copy.

The copy-based theory, as we saw, makes correct predictions regarding present-under-past (see (46)). It also predicts that past-under-past sentences cannot yield a simultaneous reading (only a back-shifted reading).

(48)   [Joseph $PAST^<{}_{o,2}$ [believe^{DE-RE}-$PAST^<{}_{o,3}$] λ3λ4[Mary $PAST^<{}_{4,3}$-love him]]

> The context supplies a salient time description that is compatible with the presuppositions of the moved PAST and of its copy. "The month that surrounds now" cannot satisfy these presuppositions, because relative to John and his "now," it picks out a time overlapping John's "now," not a time that completely precedes it.

This correctly predicts that a past-under-past in Japanese cannot receive a simultaneous reading (see section 3.1), but it runs into the opposite problem, namely, making wrong predictions regarding Hebrew. As we already saw, the Hebrew counterpart of *Joseph believed that Mary loved him* has, for some speakers, a simultaneous reading. This is predicted by the ULC-based theory, as shown above.

In section 5 we will present a solution that constitutes a "marriage" between the ULC-based and the copy-based theories; but before we do that, it is worth discussing some additional data that supports maintaining the ULC.

4. Additional Data

We already discussed one piece of evidence that supports the ULC, namely, Hebrew past-under-past. In this section we discuss some additional past-under-past facts and some new facts concerning present with an intervening future.

4.1. *De Re* Past-Under-Past in Languages without a "Deletion" Rule

There is no question that in non-SOT languages such as Hebrew, the preferred way of expressing a simultaneous reading of an attitude report (when the matrix tense is past) is, usually, with an embedded present. This fact is most easily illustrated by the by-now familiar example from section 2, repeated in (49).

(49) Dan xašav   etmol   še   Mira   hayta   amura
     Dan PAST-think yesterday   that   Mira   PAST-be   supposed
     lomar   le-ima   tox   šavua še   hi   hitga'age'a eleha
     INF-tell   to-mother-her within   week   that   she   PAST-miss   to-her
     Mira says to her mother: "I miss you."   Impossible.

If Hebrew had an SOT-rule, (49) would allow a simultaneous reading of the most deeply embedded past tense. But this is not so. For this very reason, the contrast in (50) (also familiar from section 2) is telling.

(50) a. lifney   alpayim   šana,   Yosef   xašav   še   Miriam
        before   two-thousand   year   Yosef   PAST-think   that   Miriam
        ahava   oto   az
        PAST-love   him   then
        Yosef's belief, two thousand years ago: "Miriam loves me now."
     b. lifney   alpayim   šana, Yosef xašav   še   Miriam
        before   two-thousand   year Yosef PAST-think   that   Miriam
        ahava   oto   be-yalduto
        PAST-love   him   in-childhood-his
        Yosef's belief, two thousand years ago: "Miriam loved me in my childhood."

Although both the simultaneous and back-shifted readings are available, the time-adverbial disambiguates the sentence: when *az* is anaphoric to the matrix adverbial, (50a) has only a simultaneous reading, while (50b) has only a back-shifted reading. This point is confirmed by (51).

(51) etmol   be-teša   baboker,   Yosef   amar   še   Miriam
     yesterday   at-nine   in the morning   Yosef   PAST-say that Miriam
     xašva   alav   bediyuk   beoto   rega   aval lo   lifney xen
     PAST-think   about-him   exactly   at-the-same moment   but   not   before now
     Simultaneous reading—possible
     Yosef: "Miriam is thinking about me now but didn't think about me before now."

It is clearly the presence of the embedded adverbial that is responsible for the simultaneous reading. Importantly, as we saw in section 2, any theory that attempts to attribute simultaneous readings of past-under-past to the possibility of extending the time referred to by the embedded past to cover a larger time interval faces difficulties, at the very least in accounting for crosslinguistic variation.

Therefore, we would like to pursue the hypothesis that in Hebrew (and possibly in other non-SOT languages), a *de re* interpretation of past-under-past is allowed in principle, but in practice it is exercised only in special circumstances. We do not attempt to give here an exhaustive list of such special circumstances, but such case is when a *de re* interpretation implies something that the other interpretation does not. An example from Sharvit (2008) illustrates this: the example involves a mistake on the part of the attitude holder, a mistake concerning the time he is living in. Imagine that Dan just woke up from a coma, and mistakenly believes that it is February, although it is already March (and to make matters worse, the calendar on his bedside table still shows February). In his mind, his wife is pregnant and is expected to give birth in the near future (in fact, she has already given birth). We talk to Dan, and he says (52a). A day after talking to Dan, it seems (again, for some speakers) to be perfectly fine to utter either variant of the report in (52b): the variant with *hayta amura* ('was supposed') and the variant with *amura* ('is supposed').

(52) a. išti   amura   laledet   be-februar
          wife-my   PRES-be-supposed   to-give-birth   in-February
          "My wife is supposed to give birth in February."
      b. Dan   amar   še   išto   (hayta)   amura
          Dan   PAST-say   that   wife-his   PAST-be   supposed
          laledet   be-februar.
          to-give-birth in-February
          "Dan said that his wife was supposed to give birth in February."

For those speakers who accept the past-under-past variant of (52b) as a faithful report of the situation in which Dan uttered (52a), it must be the case that the embedded past is interpreted *de re*: this interpretation implies that Dan has a belief of a particular time in the past. This provides the speaker with a way to emphasize that Dan is mistaken regarding the time he is living in.

It is worth noting that in addition to (49), there are other cases where past-under-past is simply *impossible* in Hebrew. Consider (53), which expresses belief of a generic statement.

(53) Dan xašav   še   esrim   hu/*haya   mispar   rišoni
     Dan think-PAST that twenty be-PRES/PAST number   prime
     "Dan thought that twenty is/was a prime number"

The embedded present variant is good, presumably because it corresponds to the belief "20 is a prime number," which is a "generic" belief (and is always true). The embedded past variant is bad, presumably because it implies that Dan holds the implausible belief that the property of being prime is a property that may change over time. Indeed, some speakers report that in a situation where Dan indeed believes that a number can be prime one-day and non-prime the next, (53) improves considerably.

Finally, interesting examples of Russian "simultaneous" past-under-past facts are discussed in Altshuler (2008).

(54) V   prošlom godu v   bare ja   do-li-l   bakal Dudkin-a   i
     In   last   year at   bar   I   PFV-pour-PST.1s glass of-Dudkin and
     skaza-l,   čto   ja   xote-l emu   soobščiť čto-to
     PFVsay-PST.1s that   I   wantIPF-PST.1s him announce something
     prijatnoe.
     pleasant
     "Last year, at a bar, I filled up Dudkin's glass and said that I wanted to inform him of something pleasant."

The claim is that the wanting time and the saying time/filling time overlap. This is so, despite the fact that otherwise, Russian is a language without a "deletion" rule (but with a inborn relative present). Grønn and von Stechow (2010) discuss these cases too and although (like Altshuler) they do not resort to a *de re* analysis for cases such as (54), they do so for other cases of past-under-past (specifically, factive constructions).

4.2. Present-with-an-Intervening-Future

Consider (55): this is a case where an embedded present is c-commanded by a future tense.

(55)   Two months from now John will tell his mother that he is going to the Catskills.

The most salient reading of (55) is one where John says to his mother: "I am going to the Catskills." This reading is unproblematic (the embedded present can receive a simultaneous reading under *will*—or PRES+*woll*—thanks to the "deletion" rule). But the sentence has another, less salient, reading, brought about by the presence of *tomorrow*.

(56)   Two months from now John will tell his mother that he is going to the
     Catskills tomorrow.

There are speakers who find (56) well formed; for them it implies that John said to his mother something along the following lines: "I went to the Catskills about two months ago." Only the ULC-based theory predicts this, as shown by (57), which contrasts the two analyses.

(57)   a. ULC-based LF:

[John $PRES^{\circ}_{o/u,1}$ woll [tell$^{DE\text{-}RE}$-$PRES^{\circ}_{o,3}$] his mother $\lambda 3 \lambda 1$[he e_3-be-going to the Catskills]]

Suitable description: "the time of my trip to the Catskills (including its preparation)." This description, relative to John's telling, picks out a time that contains the utterance time, and John assigns to this time the property of being a time of going to the Catskills.

b. Copy-based LF:

[John $PRES^{\circ}_{o/u,1}$ woll [tell$^{DE\text{-}RE}$-$PRES^{\circ}_{u,3}$] his mother $\lambda 3 \lambda 2$[he $PRES^{\circ}_{2,3}$-be-going to the Catskills]]

The context cannot supply a time description such as "the time of my trip to the Catskills (including its preparation)"; it is incompatible with the presuppositions of the embedded PRES: In John's "mind," that trip occurred in the past, but the presupposition of the embedded PRES is that the trip occur in the future relative to John's telling his mother.

The difference between (57a) and (57b) is that according to (57b), John's trip to the Catskills must be conveyed to his mother as taking place in the future in relation to John's "now" during the telling time, but according to (57a) this need not be so. Some speakers find (56) acceptable on the reading predicted by the ULC-based theory, namely (44a). But this reading is not universally acceptable, however. Some English native speakers accept it; others do not.

The corresponding Hebrew sentence in (58) has—for many speakers—the reading predicted by (57a), but the corresponding Japanese example in (59) does not.

(58)   be-od xodšaim   Dan   yomar   le-imo   še   hu
       in-two months   Dan   FUT-tell   to-mother-his that   he
       nosea   (maxar)   la-ketskIlz
       PRES-go   tomorrow   to-the-Catskills

(59)   #Asu   Osaka-e   iku   to   raigetsu   haha-ni
       tomorrow   Osaka-to   go   that   next month   my-mother-to
       iu   tumori-da.
       say   intend-PRES
       "Next month, I will say to my mother that I am going to Osaka tomorrow."

The fact that (58) has the relevant reading is important, because it provides indirect evidence for the claim that even languages that have an inborn relative present have the option of interpreting an embedded present *de re* (and obtaining a "double access" reading). Let us briefly elaborate on this point.

Recall that the English (15) (*John found out that Mary loves him*) has a "double access" reading, according to which Mary's loving overlaps both the finding out time and the utterance time. In both the ULC-based theory and the copy-based theory, this follows from the following assumptions: (i) the *res* must be an interval containing the utterance time; (ii) this *res* must be understood to be a non-future time (the ULC-based account) or a current time (the copy-based account). The question that arises with respect to Hebrew/Japanese-type languages is whether a present in a complement of an attitude verb must be an inborn relative present. If it can be an indexical (i.e., non-relative) present tense, then it should have the option of being interpreted *de re* (and this would be predicted by both the ULC-based and the copy-based theories). The relevant example and (simplified) LFs are given below.

(60) a. Dan gila   še   Mira ohevet   oto
       Dan PAST-find-out that Mira PRES-love him
    b. *The embedded PRES is bound*—"simultaneous" reading.
       Dan [PAST [find out [3 [Mira PRES$_3$ love him]]]]
    c. *The embedded PRES moves*—"double access" reading.
       ULC-based LF: [Dan PAST [find out-PRES] λ3[Mira e$_3$ love him]]
       Copy-based LF: [Dan PAST [find out-PRES] λ3[Mira PRES$_3$ love him]]

However, these predictions are not easy to confirm, because whenever (60c) is true, so is (60b). So it would be reasonable to say that the grammar generates only (60b), where PRES is bound. But the fact that (58) has a reading according to which Dan says "I went to the Catskills approximately two months ago"—a reading which can be generated only with a *de re* LF—suggests that the grammar also generates a *de re* LF for (60a).

More importantly, and to conclude this section, present-with-an-intervening-future sentences, just like past-under-past sentences, provide evidence either for the ULC-based theory or the copy-based theory, depending on which language one looks at. Given this state of affairs, the available theoretical options are these: (a) claim that the copy-based theory is the right one, and that the data discussed in this section should be viewed as the exception rather than the rule (and as such, falls outside the required coverage of the theory); (b) claim that the ULC-based theory is the right one, and that Japanese relative clauses are the exception rather than the rule; (c) try to find a theory that borrows insights from both. In the next section we attempt to follow the third suggestion, but we leave it to the readers to decide which, if any, is superior to the others.

5. A Combined Theory

In the previous section, we suggested the possibility that a copy-based theory distinguishes among different types of languages in terms of whether they treat their tenses as pronominal, quantificational (or both).[33] Let us adopt this assumption,

and add the following parameter, which we call the tense-copy parameter, formulated in (61).

(61)   The tense-copy parameter
        A 'res'-moved tense morpheme {leaves, doesn't leave} a copy.

And let us assume that the ULC is universal.

This combined theory correctly predicts the existence of language-types that we have observed. Japanese seems to opt for the leaving-a-copy parameter setting; Russian and Hebrew seem to choose the not-leaving-a-copy parameter setting. Regarding English, both possibilities seem to be possible depending upon how the English present is understood as discussed above. It is worth noting that even though we assume the ULC to be universal, it is not active in Japanese: the requirement that a moved tense leave a copy overrides whatever constraints the ULC imposes. This is a potential conceptual concern, but it leads to correct empirical predictions. Another concern about the ULC is that it may not be falsifiable in the following sense. A sentence in the simple present tense often makes reference to a future situation in many languages, perhaps universally. This is shown in (62). However, this type of example is assumed to carry a special meaning or to involve an implicit modal/future morpheme, and is not considered to be counter-evidence for the ULC.

(62)   a. The sun rises at 6 a.m. tomorrow.
        b. Asu   watasi-wa   Osaka-e   ikimasu.
           tomorrow,   I-TOP   Osaka-to   go-PRES
           [Lit.] "I go to Osaka tomorrow."

If all future reference of an overt simple present is assumed to involve a covert modal or an exceptional way of making reference to future, then it is not clear how to disprove the ULC. This is an empirical concern.

Supplementing the above proposal, we propose a pragmatic principle of preference for bound pronouns (see Reinhart, 1983; Schlenker, 1999, forthcoming) to account for the observed judgment variability among speakers. The pragmatic component of this proposal borrows an idea from Schlenker (1999, forthcoming). It says that an LF where a tense is bound from Comp is preferred over a *de re* LF,[34] whenever the two yield practically indistinguishable interpretations. This explains why, out-of-the-blue, for many Hebrew speakers a *de re* interpretation of past-under-past is unacceptable. The corresponding LF with a present-under-past (where the present is bound by the intensional operator) yields roughly the same interpretation (if there is any difference at all, it is too minute for those speakers to "care"). However, as we saw, in some cases the interpretation is not identical. For example, in the scenario described above for (52a, b), the *de re* interpretation, which suggests that Dan is wrong about the time he is living in, is different from the present-bound-from-Comp interpretation (which implies nothing about Dan's mistake). Similar considerations should account for the variability regarding (56): the existence of *Two months from now, John will tell his mother that he went to the Catskills*, where

has been is not interpreted *de re*, is preferred over *Two months from now, John will tell his mother that he is going to the Catskills*, where *be going* is interpreted *de re*.

There is, of course, another major concern: the multiplicity of parameters may predict the possibility of non-existing languages, even if we exclude some combinations for independent reasons.[35] To take just one example, is there a language which, like English, has a "deletion" rule, but like Japanese, has an inborn relative present tense that can be bound (i.e., can receive a simultaneous reading)? This is, of course, an empirical question which, to the best of our knowledge, cannot be answered at the moment. Our hope is that despite many loose ends, this work will serve as a springboard for more crosslinguistic study regarding the behavior of tense in embedded clauses, especially the double-access phenomena.

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NOTES

1. Note that we employ a factive predicate *find out* so that we are assured that the embedded sentence is true when the entire sentence is. This allows us to talk about the events described in the complement clause as "real events." For example, in (1a, b), we can talk about the time of Mary's loving him. If the main predicate is not a factive predicate, then discussing the temporal properties of the complement clause verb is more complex. For details, the reader is referred to Abusch (1993, 1997) and Ogihara (1996).

2. Some terms used in this work need clarification. The term "simultaneous interpretation" is used to describe a reading of an embedded clause (verb complement or relative clause) in which the time of the embedded predicate is understood to be the same as the time of the matrix clause predicate. The term "back-shifted reading" is used to talk about a reading in which the embedded predicate describes a situation that precedes the matrix predicate situation. In addition to these terms, the term "forward-shifted reading" is used to indicate a reading in which the embedded situation follows the situation described by the matrix predicate.

3. The behavior of a past tense under a future auxiliary is an important topic. But this is largely unrelated to the issues discussed in this chapter, and we will refrain from discussing it.

4. Ogihara (2007) reports cases of past-under-past in Japanese, with factive verbs, where for some speakers a "simultaneous" reading is available. However, Ogihara's

intuitions do not allow for this reading. For example, (i) is impossible according to Ogihara's judgments.

(i) #Zyuunen mae,   Bill-wa   Sue-ga   sonotoki byooki-dat-ta   to   sit-te i-ta.
     ten years ago   Bill-TOP   Sue-NOM   then   be-sick- PAST   that know-PAST
     [intended] Ten years ago, Bill knew that Mary was sick then.

     5. See Hatav (this volume) for a different view, at least concerning Hebrew.

     6. It is worth pointing out that replacing the embedded past with present in (7a) yields a result which seems to be unacceptable to many (again, admittedly not all) Hebrew speakers.

(i) #lifney   alpayim   šana,   Yosef xašav   še   Miriam
     before   two-thousand   year   Yosef PAST-think   that Miriam
     ohevet   oto   az
     PRES-love   him   then
     Simultaneous reading.
     Yosef's belief, two thousand years ago: "Miriam loves me now."

For those speakers, (7a) is the only way to convey a simultaneous reading, when *az* is present.

     7. The semantics of "double-access" readings is somewhat simplified here thanks to the factive predicate *find out*. If it were a non-factive predicate like *think* or *say*, the description and explanation of double-access sentences becomes much more complex, as discussed in Ogihara (1995b, 1996).

     8. OM stands for "object marker."

     9. For some speakers, a "historical present" interpretation is possible for the embedded present in (20a) (which obviates the requirement of overlap with utterance time). This effect is neutralized in (i) (probably because of the different narrative set-up, compared to (20a)): the divorce time must overlap the utterance time (as opposed to (ii), where it need not).

(i) lifney   šavua   pagaš   Yosef iša   še   bediyuk
     before   week   meet-PAST   Yosef woman   that   just
     nimcet   be-halixei   gerušim
     be-PRES   in-procedures divorce
     "Last week Yosef met a woman who is getting a divorce"
     (divorce-getting time overlaps utterance time).

(ii) be'od   xodeš   yifgoš   Yosef iša   še   bediyuk
     within   month   meet-FUT   Yosef woman   that   just
     nimcet   be-halixei   gerušim
     be-PRES   in-procedures divorce
     "In a month, Yosef will meet a woman who is getting a divorce"
     (divorce-getting time need not overlap utterance time).

     10. Korean relative clauses behave like Japanese ones. In other words, a relative clause in the present tense can receive a simultaneous reading even when the matrix clause is in the past tense. (i) is an example.

(i) Taro-nun   wul ko iss-nun salam-ul   mannass-ta.
     Taro-top   cry-PROG-REL   person-ACC   meet-PAST
     "Taro met a man who was crying (at that time)."

It is also interesting to note that many French children seem to agree with Japanese adults regarding the behavior of the present in relative clauses. This is reported in Demirdache and Lungu (2008).

11. That the English past can receive a back-shifted reading under past shows that the SOT rule does not apply to it obligatorily. There could be a language in which the deletion rule applies obligatorily to tense morphemes, and if so such a language could be claimed to be a SOT language in the strict(er) sense.

12. An inborn relative tense is one that does not have to undergo deletion in order to receive a simultaneous reading.

13. It is possible that languages could differ as to whether they have (inborn) relative past tenses. This chapter assumes that English (as well as Japanese and Hebrew) has a relative past tense in that (9b) is a possible reading. But it is conceivable that there are languages that do not allow for this possibility, and if so, this could be an important parameter for crosslinguistic comparison of tense morphemes.

14. Intuitively, an undeleted tense is one that can be taken at face value. For example, an undeleted past tense has a past meaning. By contrast, a deleted tense is one that has no temporal meaning: one that does not change the evaluation time.

15. There exists a slightly different way of understanding the tense "deletion" rule. It applies obligatorily to indexical tenses when they occur in situations where they cannot receive indexical interpretations and turns them into zero tenses. According to this account, the English past in a verb complement clause cannot produce back-shifted interpretations when embedded under a matrix past.

16. The treatment of tenses as pronouns was first suggested in Partee (1973), and later adopted by Abusch (1993, 1997), Heim (1984), Kratzer (1998), von Stechow (1995), and many others. This does not exclude the possibility that some occurrences of tenses are non-pronominal (i.e., that they are quantificational), as we will see in section 3.3 below.

17. We shall see below that an abstractor $\lambda 0$ may also be introduced when relative clauses are interpreted.

18. The idea here is that an index other than 0 receives an existentially quantified interpretation. This may not be the only interpretation given to such an index, especially when there is an accompanying adverbial such as the day before, in 1994, etc. But our focus is not on this type of back shifted interpretation, and we simply opt for the simplest possible option here.

19. Slightly more formally:

(i)   a. Past tense with "undeleted" features:

$[\![\text{PAST}^{<}_{j,k}]\!]^{g}$ is defined only if $g(k)$ precedes $g(j)$; whenever defined,

$[\![\text{PAST}^{<}_{j,k}]\!]^{g} = g(k)$

Thus, whenever defined, $[\![\lambda 0[\exists_{3} [\text{that Mary PAST}_{o,3}^{<} \text{ love Joseph}]]]\!]^{g} = [\lambda t \in D_{i}$. there is a $t' \in D_{i}$ such that $[\lambda t'' \in D_{i}$: t'' precedes t. Mary loves Joseph at $t''](t^{2}) = \text{True}]$.

    b. Past tense with "deleted" features:

$[\![\text{PAST}^{<}_{k}]\!]^{g} = g(k)$

Thus, whenever defined, $[\![\lambda 0[\text{that Mary PAST}_{o}^{<} \text{ love Joseph}]]\!]^{g} = [\lambda t \in D_{i}$. Mary loves Joseph at $t]$.

(ii) a. Present tense with "undeleted" features:

$[\![\text{PRES}^{o}_{j,k}]\!]^{g}$ is defined only if $g(k)$ overlaps $g(j)$; whenever defined,

$[\![\text{PRES}^{o}_{j,k}]\!]^{g} = g(k)$

    b. Present tense with "deleted" features or inborn relative present

$[\![\text{PRES}^{o}_{k}]\!]^{g} = g(k)$

(iii) $[\![believe]\!]^w(p)(t)(x)$ is defined only if: for all world-time pairs $\langle w',t'\rangle$ compatible with
what x believes in w at t, $p(t')(w')$ is defined. Whenever defined, $[\![believe]\!]^w(p)(t)(x) =$
True iff for all world-time pairs $\langle w',t'\rangle$ compatible with what x believes in w at t, $p(t')$
(w')=True.

20. This corresponds to a simultaneous reading: Joseph held some belief at the
contextually salient past time, and according to his belief, he was located at a time when
Mary loved him (at that time).

21. This corresponds to a back-shifted reading: Joseph held some belief at the
contextually salient past time, and according to his belief, Mary's loving him is located at
an earlier time (in relation to Joseph's belief time).

22. Officially, the complement clause must be interpreted to denote the proposition
associated with it (a set of worlds or world-time pairs), not its extension (truth value).

23. $[\![believe^{DE\text{-}RE}]\!]^{w,c}(t)(p)(t')(x)$ is defined only if c supplies a suitable time-concept, F_c,
such that: (i) $F_c(w)(t') = t$, and (ii) for all world-time pairs $\langle w',t''\rangle$ compatible with what x
believes in w at t', $p(w')(F_c(w')(t''))(t'')$ is defined. Whenever defined, $[\![believe^{DE\ RE}]\!]^{w,c}(t)(p)$
$(t')(x)$ =True iff for all world-time pairs $\langle w',t''\rangle$ compatible with what x believes in w at
t', $p(w')(F_c(w')(t''))(t'') =$ True.

24. A more formal rendition of (32) is this (see Heim 1984): $[\![\ [_T\ \alpha]\ ]\!]^g$ is defined only if
$[\![\alpha]\!]^g$ is not after $g(o)$. Where defined, $[\![\ [_T\ \alpha]\ ]\!]^g = [\![\alpha]\!]^g$.

Taking into account the ULC, the interpretation of [Joseph $PAST^<_{o,2}$ [believe$^{DE\text{-}RE}$-$PRES^o_{u,3}$]
$\lambda3\lambda o$[Mary [e_3-love him]]], relative to context c and assignment g, is as follows: F_c(utterance-
world)$(g(2)) = g(3)$ (which overlaps the utterance time), and for all world-time pairs
$\langle w',t''\rangle$ pairs compatible with what Joseph believes in w at $g(2)$ (which precedes the
utterance time): $[\lambda w\in W.\ [\![\ \lambda3\lambda o$[Mary [$e_3$-love him]]$\ ]\!]^{w,c}(w')(F_c(w')(t''))(t'') = [\lambda t\in D_i: F_c(w')$
(t'') is not after t. Mary loves Joseph in w' at $(F_c(w')(t''))](t'') =$ True.

25. Quantifier Raising (QR) is generally an operation through which a quantifier (an
expression that is higher in semantic type (e.g., $\langle\langle e,t\rangle,t\rangle$ or $\langle\langle\langle i,t\rangle,i\rangle$) than the standard
type (e.g., e or i) associated with the base-generated position) is moved out to correct a
type mismatch. At the same time, QR is used to create a binder for a variable-like expres-
sion (such as pronouns). The latter mechanism is more important here because the tense
movement creates the binder λo, which binds the free variable o associated with the past
tense within the relative clause in (39).

26. von Stechow (following Abusch) is concerned with English *ought*, which in
complement clauses has a "bound tense" interpretation, and in relative clauses a "free
present" interpretation. Our framework forces us to say that *ought* comes with a silent
Hebrew-like PRES, which in complement clauses is obligatorily relative. Note, on the other
hand, that the Japanese equivalent to *ought* (*beki* "ought-pres") behaves in the same way in
complement and relative clauses, suggesting that the QRC is not valid as far as Japanese is
concerned.

27. See Hatav (this volume) for discussion of "modal" uses of the future. These uses
are not covered by our proposal.

28. Ogihara (1996) proposes that a DP containing a relative clause can be quantifier
raised and that this possibility yields a reading in which a relative clause tense behaves like
an "indexical tense" (referring to any time before the utterance time).

29. The interpretation of [Joseph $PAST^<_{o,2}$ [believe$^{DE\text{-}RE}$-$PRES^o_{u,3}$] $\lambda3\lambda o$[Mary $PRES^o_{o,3}$-
love him]]], relative to context c, assignment g and a suitable time concept F_c, is as follows:
F_c(utterance-world)$(g(2)) = g(3)$ (which overlaps the utterance time), and for all world-
time pairs $\langle w',t''\rangle$ pairs compatible with what Joseph believes in w at $g(2)$: $[\lambda w\in W.$

$[\![\lambda 3\lambda 0[\text{Mary PRES}^{o}{}_{o,3}\text{-love him}]]\!]^{w,c}](w')(F_c(w')(t''))(t'') = [\lambda t \in D_i: F_c(w')(t'')$ overlaps t. Mary loves Joseph in w' at $(F_c(w')(t''))](t'') = $ True.

30. Quantificational tenses are of type $<<i,t>,t>$. Importantly, we distinguish between QR—which applies only to quantificational elements, and *res-* movement—which applies to individual-denoting and time-denoting expressions. Likewise, we distinguish between lexical quantificational tenses (such as Japanese tenses; e.g., (47a)), and pronominal tenses that are bound by a default existential (e.g., (23b)). Only the former can QR. Finally, in languages that have quantificational tenses, embedded tenses can be pronominal only if interpreted *de re*. This has the consequence that tenses in relative clauses are never free in such languages.

31. Ogihara (1996) assumes that Japanese (and English) embedded clauses already denote temporal abstracts (semantic entities of type $<i,<s,t>>$). This means that the meaning of Japanese present is such that the time variable associated with the tense is "lexically bound." So the question about binders simply does not arise. Moreover, by default, the system predicts that the time of the verb equals the time of the argument (subject or object) noun. The relative clause is then combined with the head noun essentially as a case of predicate modification (Heim and Kratzer 1998). Thus, the time of the noun and the time of the relative clause must be matched up as well, and this results in a simultaneous reading. The proposal involving raising the matrix tense presumably has the same semantic consequence, but it may not be an optimally natural way of representing the intuitions regarding the Japanese tense system.

32. More formally (cf. Schlenker 1999): If $[_{T} \alpha]$ is in the (immediate) scope of an attitude verb which introduces an abstractor, λk, then for any assignment g and any time t, $[\![[_{T} \alpha]]\!]^{g[k\to t]}$ is defined only if $[\![\alpha]\!]^{g[k\to t]}$ is not after t. Where defined, $[\![[_{T} \alpha]]\!]^{g[k\to t]} = [\![\alpha]\!]^{g[k\to t]}$.

33. We would like to reiterate the caveat mentioned above, which is the possibility that Japanese embedded clauses may involve tenses that are "bound" lexically and this idea leads to a significantly different way of encoding the behavior of Japanese (and possibly English) tense morphemes.

34. For example, an English sentence with a past tense could produce a simultaneous reading when the tense has been "deleted" to produce something analogous to a tenseless clause. This is a "bound tense" option. A past tense in English could be a complex pronominal that denotes a time prior to the utterance time. This possibility is produced by a *de re* configuration (i.e., by a moved tense).

35. Sharvit (2003) argues that an independent principle of embeddability bans languages that have no "deletion" rule and no "deleted" present (but allows languages that have both—e.g., Modern Greek). If the embedability principle didn't exist, we would predict the existence of languages where certain beliefs and thoughts could be reported only via quotation.

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