Present and Past Tenses in Future Contexts*

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1. Introduction

Abusch (1998) reveals that future events in relative clauses can be expressed with present and past tense verbs when these verbs are under the scope of the future auxiliary. In order to account for this fact, she proposes a new semantics for the past tense and the future auxiliary, and then argues that past and present tense verbs in relative clauses have overlapping ranges of possible denotations.

In this paper, I will analyze present and past tenses embedded under the future auxiliary in other syntactic domain than relative clauses, which are not discussed in Abusch (1998), and then show that they behave quite differently from those in relative clauses. The domain that I will discuss is verb complement and temporal adverbial clauses. I will claim that future events can be described with present and past tense verbs in verb complement clauses as well, but present and past tense verbs have distinct denotations regarding temporal order relative to the time of matrix clause events. I will try to explain this distinction by proposing a condition on movement of an embedded tense which is based upon the semantics of tense proposed by Abusch (1997, 1998). Furthermore, I will argue that present and past tenses under the scope of the future auxiliary in temporal adverbial clauses are constrained in such a way that tenses of adverbial clauses should have the same temporal relation as those of matrix clauses. As long as this condition is satisfied, present and past tense verbs can mean a future event in temporal adverbial clauses.

The organization of this paper is as follows: in section 2, I will review Abusch's analysis of future contexts in relative clauses. In sections 3 and 4, I will discuss future contexts in verb complement and temporal adverbial clauses. In section 5, I will comment on an alternative approach to future contexts. Section 6 is a summary.

2. Abusch's Analysis of Future Contexts in Relative Clauses

Let us consider the following sentences:

(1) a. On March 1, we will discuss the abstracts which are submitted by e-mail.

b. On March 1, we will discuss the abstracts which were submitted by e-mail. Abusch (1998, p. 25)

Suppose that (1a,b) are used on January 1 in a discussion among members of a program committee, and that the deadline for submission is February 15. These sentences are completely consistent with this scenario in which the abstracts are to be submitted in the period between January 1 (the utterance time) and February 15. In (1a), although the verb has the present tense, the anticipated events of submitting papers follow the utterance time. In (1b), the temporal location for the events of submission is shifted into the future and thus the past tense apparently measures back from March 1. These sentences show that future events in relative clauses can be described with present and past tenses when these tenses are under the scope of the future auxiliary.

Abusch accounts for (1) by three assumptions. The first assumption is the now parameter written as a designated variable n. She proposes that the n parameter serves the following functions:

(2) a. In a top-level context it is interpreted as the utterance time.

b. In the complement of attitude verbs such as *believe* it is bound by lambda, with the bound parameter interpreted as the interval now of the attitude.

c. It is used in the interpretation of tenses.

Abusch (1998, p. 14)

On the basis of (2a) and (2c), she assumes that the present tense denotes n, and that n provides a temporal frame for an eventuality of a tenseless verb.

For examples, let us consider the following structure:

(3) John [$_{Tns}$ Pres] loves Bill.

The loving eventuality is located at the denotation of Pres, that is, n. (2a) requires n to be interpreted as the utterance time in a top-level context. Thus, the temporal frame for the loving eventuality is the utterance time.

(2b) is necessary for the interpretation of the following kind of sentence:

(4) John believes that Mary is happy.

Here Mary's happiness obtains at the time of John's believing rather than at the utterance time. Abusch claims that this interpretation can be obtained by assuming the following LF:

(5) John believes [λ n (that) [Mary [$_{Tns}$ Pres] is happy]]

The n parameter denoted by the embedded present tense is bound by a lambda operator on the complement of *believes*. As a result of this binding, Mary's happiness is evaluated at the now of John's believing.

The second assumption is about future meaning. Abusch supposes that future meaning is encoded with an auxiliary rather than a tense, and that *will/would* are verbs which combine first with a tenseless clause, and then with a tense compositionally. She proposes the following semantics for *will/would* that expands the now parameter n:

(6) n-expanding semantics for *will/would*

$$S: \lambda t \, [[\lambda n \, [Q \, (n)]] \, ((t, \, \infty))]$$

will/would   S:Q   Abusch (1998, p. 21)

Q represents the property of intervals denoted by the complement of *will/would*. This semantics says that λn binds any free occurrences of n in Q, with the effect of substituting $(t, \, \infty)$ for such free occurrences. Consequently, (6) resets the n parameter in Q to the interval $(n, \, \infty)$ extending from the now n temporally forward to the future infinitely.
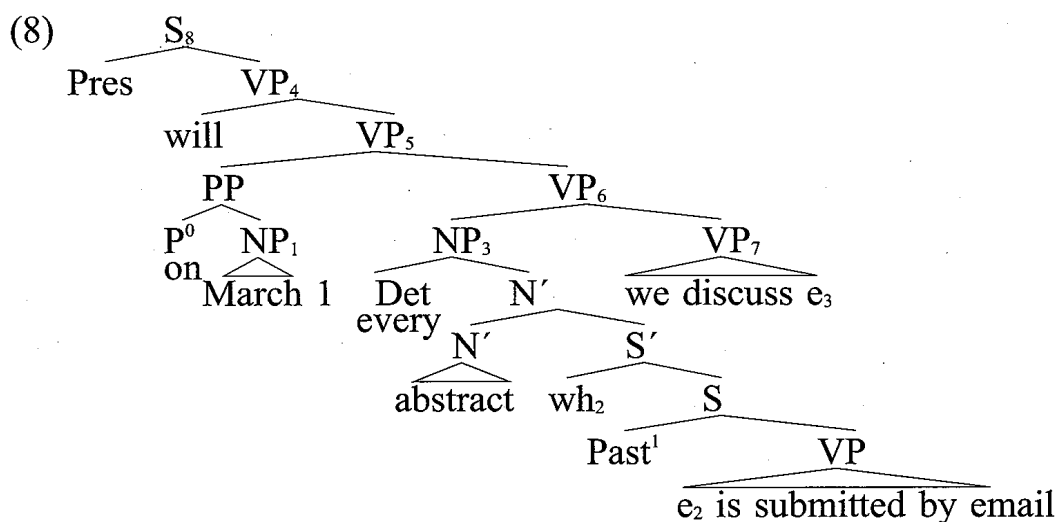
The third assumption is the following denotation of Past:

(7) Past^r denotes $\lambda Q[Q \, (-\infty, \, r)]]$, with $r \subseteq n$ presupposed.

Abusch (1998, p. 25)

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r stands for a reference point for Past. (7) has the eventuality of a tenseless clause ordered before r, which is in turn ordered with respect to n. In a top-level context, n is the utterance time u which is assumed to be an instant. Then, the only option for r is n itself because of the constraint $r \subseteq n$. Accordingly, Past denotes the interval $(-\infty, n)$ extending from the now n temporally back to the past infinitely. On the other hand, when Past is under the scope of *will*, (6) resets n in the denotation of Past to (n, ∞). Consequently, Past measures back from a reference point r which may be a proper subpart of (n, ∞).

Now, with those three assumptions in mind, let us consider (1) in detail. (1b) has the following LF:

(8)

```
            S₈
        ┌────┴────┐
      Pres       VP₄
             ┌────┴────┐
           will       VP₅
                  ┌─────┴─────────┐
                 PP             VP₆
              ┌──┴──┐        ┌────┴──────┐
             P⁰   NP₁      NP₃          VP₇
             on ┌──┴──┐  ┌──┴──┐     ┌──┴──┐
              March 1  Det   N′   we discuss e₃
                      every ┌──┴───┐
                           N′     S′
                        ┌──┴──┐ ┌──┴──┐
                    abstract wh₂   S
                                ┌──┴──────┐
                              Past¹      VP
                                   ┌──────┴──────┐
                                e₂ is submitted by email
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Since the past tense in the relative clause is under the scope of *will*, (6) resets n in the denotation of Past to (n, ∞). Then, Past measures back from a reference point r which is a proper subpart of (n, ∞). A reference point is determined by this way: the superscript in Past^r annotates the free variable which is an anaphoric index and thus is used in LFs to indicate anaphora. An antecedent for this anaphora is a reference time. In (8), the superscript in Past is coindexed with *March 1* and thus the reference time for Past is identified with *March 1*.

The relevant nodes in (8) have the following denotations and the semantic rule used is function application.

(9) a. VP₇: $\lambda t\ \exists e\ [e \subseteq t \wedge \text{discuss}\ (we, x, e)]$

b. S′: $\lambda x\ \exists e\ [e \subseteq (-\infty, r) \wedge \partial\ [r \subseteq n\ ] \wedge \text{submitted-by-email}\ (x, e)]$

c. NP_3: λP[every (λx [abstract (x) $\wedge$

$\exists e$ [$e \subseteq (-\infty, r) \wedge \partial [r \subseteq n$] $\wedge$ submitted-by-email (x, e)], P]]

d. VP_6:

λt every $\begin{bmatrix} \lambda x_1 \text{ [abstract } (x_1) \wedge \\ \exists e \text{ } [e \subseteq (-\infty, r) \wedge \partial [r \subseteq n] \wedge \\ \qquad \text{submitted-by-email}(x_1, e)]], \\ \lambda x_2 \exists e' [e' \subseteq t \wedge \text{ discuss } (we, x_2, e')] \end{bmatrix}$

e. PP: $\lambda Q \lambda t$ [Q ($t \cap$ March 1)]

f. VP_5:

λt every $\begin{bmatrix} \lambda x_1 \text{ [abstract } (x_1) \wedge \\ \exists e \text{ } [e \subseteq (-\infty, r) \wedge \partial [r \subseteq n] \wedge \\ \qquad \text{submitted-by-email}(x_1, e)]], \\ \lambda x_2 \exists e' \text{ } [e' \subseteq t \cap \text{March } 1 \wedge \text{ discuss } (we, x_2, e')] \end{bmatrix}$

g. VP_4:

λt every $\begin{bmatrix} \lambda x_1 \text{ [abstract } (x_1) \wedge \\ \exists e \text{ } [e \subseteq (-\infty, r) \wedge \partial \text{ } [r \wedge (t, \infty)] \wedge \\ \qquad \text{submitted-by-email } (x_1, e)]], \\ \lambda x_2 \exists e' \text{ } [e' \subseteq (t, \infty) \cap \text{March } 1 \wedge \\ \qquad \text{discuss } (we, x_2, e')] \end{bmatrix}$

h. Pres: $\lambda Q Q(n)$

i. S_8:

every $\begin{bmatrix} \lambda x_1 \text{ [abstract } (x_1) \wedge \\ \exists e \text{ } [e \subseteq (-\infty, r) \wedge \partial [r \subseteq (n, \infty)] \wedge \\ \qquad \text{submitted-by-email } (x_1, e)]], \\ \lambda x_2 \exists e' \text{ } [e' \subseteq (n, \infty) \cap \text{March } 1 \wedge \\ \qquad \text{discuss } (we, x_2, e')] \end{bmatrix}$

In (9a), the formula *discuss (we, x, e)* means "*e* is an event of our discussing *x* (abstract)". The bound variable *t* has the type of a time interval so that the denotation of the tenseless clause (VP_7) is a property of times. In (9b), the formula *submitted-by-email (x, e)* is understood as "*e* is an event of *x* (abstract) being submitted by email". $\partial [r \subseteq n]$ is a presuppositional constraint which requires a reference point *r* to be a proper subpart of *n*. The quantified NP_3 has the interpretation in (9c) where *P* stands for a property of times. The temporal frame adverb PP gets the denotation in (9e) in which the first argument Q is a property of times. Thus, PP combines with a property of times denoted by a tenseless clause to yield a property of times. (9h) shows that the denotation for Pres is a type-raised counterpart of the now parameter. Pres combines with a tenseless clause to

map a property of times to a proposition. Consequently, the derived semantics is (9i) which can be rewritten as follows:

(10)

every x

$$\begin{bmatrix} \text{abstract } (x) \wedge \\ \exists e \ [e \subseteq (-\infty, r) \wedge \partial \ [r \subseteq (n, \infty)] \wedge \\ \qquad \text{submitted-by-email } (x, e)], \\ \exists e' \ [e' \subseteq (n, \infty) \cap \text{March 1} \wedge \text{discuss } (we, x, e')] \end{bmatrix}$$

Here the quantified variable ($= x$) is written once after the quantifier. Since the now parameter n is interpreted as the utterance time u in a top-level context, (n, ∞) is equal to (u, ∞) extending from u temporally forward to the future infinitely. Thus, the discussing event e' is located at the intersection of the interval (u, ∞) and *March 1*. Since the reference time r for Past is *March 1*, the submission events are ordered in the interval $(-\infty, \text{March 1})$. This is consistent with the intended meaning of (1b).

Next, let us turn to (1a). It has a similar LF to (8), except that the present tense in the relative clause has no superscript. The derived semantics is as follows:

(11)

every x

$$\begin{bmatrix} \text{abstract } (x) \wedge \\ \exists e \ [e \subseteq (n, \infty) \wedge \text{submitted-by-email } (x, e)], \\ \exists e' \ [e' \subseteq (n, \infty) \cap \text{March 1} \wedge \text{discuss } (we, x, e')] \end{bmatrix}$$

Since n is interpreted as the utterance time, the discussing event and the submission events follow the utterance time. Accordingly, (11) expresses the intended meaning of (1a).

Thus, Abusch accounts for the fact that future events in relative clauses can be described with present and past tenses when they are under the scope of the future auxiliary. She claims that the present/past distinction under the scope of the future auxiliary does not have any absolute consequences regarding temporal order relative to the n parameter so that the eventuality arguments of past and present tense verbs in identical configurations have overlapping ranges of possible denotations.

In the next section, I will show that present and past tense verbs in a verb complement clause under the scope of the future auxiliary have distinct denotations regarding temporal order relative to the time of matrix clause events, and then try to provide an account of this distinction by proposing a condition on movement of an embedded tense.
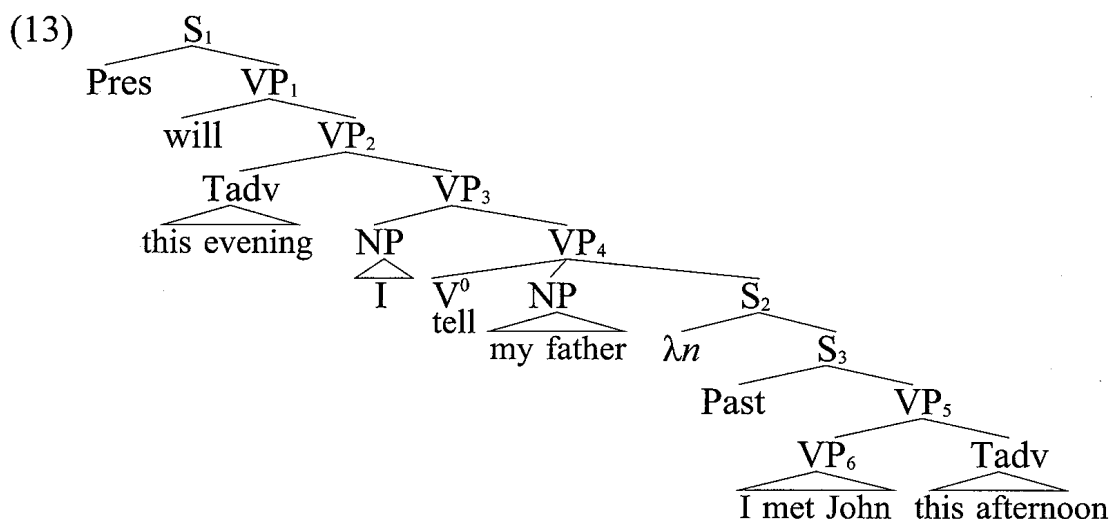
3. Verb Complement Clauses

Let us consider the following sentences uttered in the morning:

(12) a.* This evening I will tell my father that I meet John this afternoon.

b. This evening I will tell my father that I met John this afternoon.

The intended meaning is this: the meeting event takes place in the afternoon and the telling one occurs in the evening. My informants agree that (12a) is unacceptable in this contexts, but that (12b) is acceptable. This contrast shows that the eventuality arguments of past and present tense verbs have distinct denotations in future contexts of verb complement clauses.

First, let us consider the past tense version (12b). It has the following LF-representation:

(13)

S_1
Pres $\quad$ VP$_1$
will $\quad$ VP$_2$
Tadv $\quad$ VP$_3$
this evening $\quad$ NP $\quad$ VP$_4$
I $\quad$ V^0 $\quad$ NP $\quad$ S$_2$
tell $\quad$ my father $\quad$ λn $\quad$ S$_3$
Past $\quad$ VP$_5$
VP$_6$ $\quad$ Tadv
I met John $\quad$ this afternoon

The relevant denotations of (13) is given in (14):

(14) a. VP$_2$: $\lambda t\ \exists e'[e' \subseteq t \cap$ this evening $\wedge$ tell $(I,\ my\ father,$

$\lambda n\ \exists e\ [e \subseteq (-\infty,\ r) \wedge \partial\ [r \subseteq n] \cap$ this afternoon $\wedge$ meet

$(I,\ j,\ e)],\ e')]$

b. VP$_1$: $\lambda t\ \exists e'[e' \subseteq (t,\ \infty) \cap$ this evening $\wedge$ tell $(I,\ my\ father,$

$\lambda n\ \exists e\ [e \subseteq (-\infty,\ r) \wedge \partial\ [r \subseteq n] \cap$ this afternoon $\wedge$ meet

$(I,\ j,\ e)],\ e')]$

c. S$_1$: $\exists e'[e' \subseteq (n,\ \infty) \cap$ this evening $\wedge$ tell $(I,\ my\ father,$

$\lambda n\ \exists e\ [e \subseteq (-\infty,\ r) \wedge \partial\ [r \subseteq n] \cap$ this afternoon $\wedge$ meet
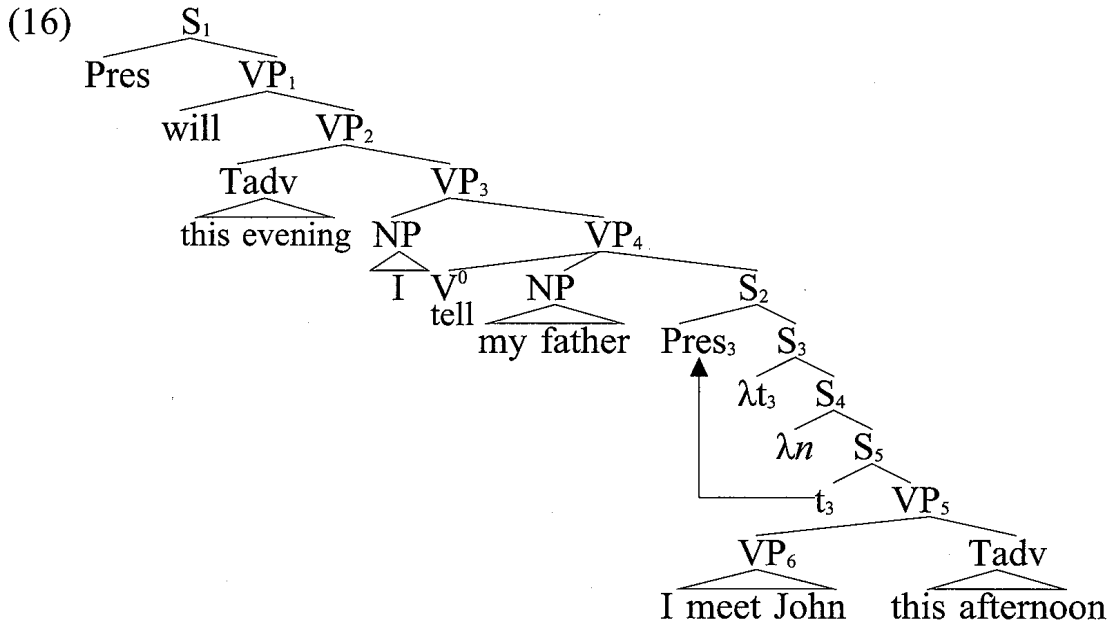
$(I,\ j,\ e)],\ e')]$

Notice that in the derivation from (14a) to (14b), t in the matrix clause is reset to (t, ∞) by the n-expanding rule (6) whereas n in the embedded clause is not. This is because a potential binder for n is λn under S_2 so that λn prevents the n-expanding rule from resetting n to (n, ∞). This is a kind of minimality condition (Rizzi (1990)). Accordingly, (14c) is the derived semantics for (12b). In (14c), the telling event (= e') is located at the intersection of (n, ∞) and *this evening*. Since the now parameter n is pragmatically interpreted as the utterance time in a top level context, the telling event is placed in the evening. On the other hand, the meeting event (= e) is located at the intersection of $(-\infty, r) \wedge \partial [r \subseteq n]$ and *this afternoon*. The now parameter n in the embedded clause is bound by the lambda operator on the complement of *tell* and thus interpreted as the time of telling which is assumed to be an instant. In this case, the only option for r is n itself because of the constraint $r \subseteq n$. Consequently, the meeting time takes place in the afternoon. This is consistent with the scenario described and thus (12b) is acceptable in this context.

Let us turn to the present tense version (12a). When the embedded present tense is interpreted in the complement clause of *told*, (12a) has a similar LF to (13) except for the embedded past tense. Then, (12a) has the following denotation:

(15) S: $\exists e' [e' \subseteq (n, \infty) \cap$ this evening $\wedge$ tell $(I,$ *my father*,

$\quad \lambda n \, \exists e \, [e \subseteq n \cap$ this afternoon $\wedge$ meet $(I, j, e)], e')]$

Like (14c), the telling event (= e') in (15) is placed in the evening. In contrast, the meeting event (= e) is placed at the intersection of n and *this afternoon*. Under (2b), n is interpreted as the time of telling because it is bound by lambda. Since the time of telling occurs in the evening, there is no intersection of n and *this afternoon*. Thus, if the embedded present tense is within the complement clause of *told*, (12a) has the denotation (15) that is inconsistent with the scenario described.

Next, let us consider the case in which the embedded present tense moves out of the complement clause so that it is interpreted in an extensional position. In this case, (12a) has the following LF structure:

(16)

```
            S₁
         ╱     ╲
      Pres      VP₁
             ╱      ╲
          will        VP₂
                   ╱      ╲
               Tadv         VP₃
          ╱        ╲      ╱      ╲
      this evening  NP            VP₄
                  ╱  ╲        ╱         ╲
                 I   V⁰   NP              S₂
                     tell ╱   ╲        ╱      ╲
                      my father    Pres₃       S₃
                                          ╱        ╲
                                        λt₃          S₄
                                                ╱        ╲
                                              λn           S₅
                                                      ╱        ╲
                                                    t₃          VP₅
                                                           ╱         ╲
                                                        VP₆            Tadv
                                                      ╱     ╲        ╱      ╲
                                                 I meet John      this afternoon
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The n in Pres₃ is not bound by a lambda operator on the complement of *told*. As a result, it is subject to the n-expanding rule (6) which resets it to the interval (n, ∞). Since Pres₃ in the top-level context is interpreted as the utterance time, it denotes the interval extending from the utterance time temporally forward to the future infinitely. Accordingly, (16) leads to the following denotation:

(17) S: $\exists e'[e' \subseteq (n, \infty) \cap$ this evening $\wedge$ tell $(I,\ my\ father,$

$\exists e\ [e \subseteq (n, \infty) \cap$ this afternoon $\wedge$ meet $(I, j, e)],\ e')]$

(17) shows that the meeting event takes place in the afternoon and hence it is consistent with the scenario described. Thus, if (12a) has (16), it should be acceptable in the relevant context, contrary to fact. We have to find out some way of ruling out (16).

In order to block (16), I will propose the following condition on movement of an embedded present tense:
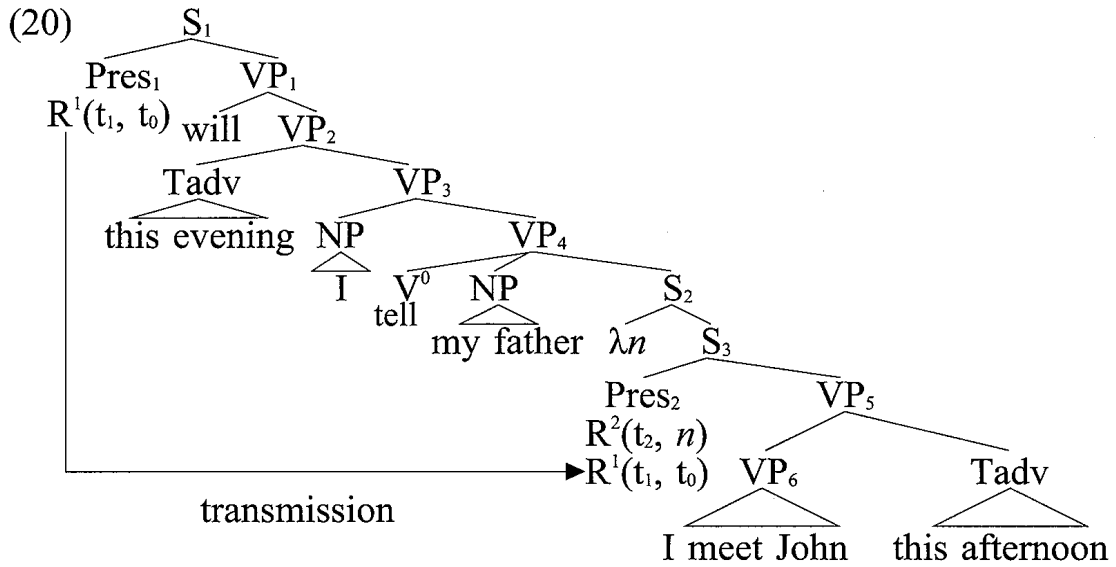
(18) An embedded present tense can move out of a complement clause of an attitude verb only when the movement would eliminate contradictory constraints on temporal relation variables.

The idea behind (18) is that an application of movement is not free but a "last resort" in that movement must be applied in order to overcome a failure to meet some condition on representations (Chomsky (1991)). The constraints on temporal relation variable is based upon the following assumptions about a tense embedded in an intensional context:

(19) a. All temporal arguments (not only tenses, but also covert arguments of nominal such as *desire*) are supplied with a relation variable relating their index to local evaluation time, as determined in LF.

b. An intensional operator such as *believe* or *desire* transmits the relation associated with its temporal argument to its intentional argument by a feature passing mechanism. Such relations are cumulative down the tree, so that a tense embedded in an intensional context has access to a set of temporal relation variables.

c. The semantics of tense is a constraint on a set of temporal relations, consisting of the local relation together with transmitted relations. For past tense, the constraint is that at least one of the relations must be the temporal precedence relation.

Abusch (1997, p.31)

(19a) gives a temporal relation variable to the matrix present tense and the embedded one in (12a). Since the local evaluation time of the matrix present tense is the utterance time, its temporal relation variable relates the denotation of the matrix present tense with the utterance time. On the other hand, the local evaluation time of the embedded present tense is the attitude holder's "now" expressed by a lambda operator. Then, its temporal relation variable associates the denotation of the embedded present tense with the telling time. (19b) transmits the temporal relation variable of the matrix present tense to the embedded present tense. Thus, (12a) has the following LF representation:

(20)

S_1

$Pres_1$ VP_1

$R^1(t_1, t_0)$ will VP_2

Tadv VP_3

this evening NP VP_4

I V^0 NP S_2
tell

my father λn S_3

$Pres_2$ VP_5

$R^2(t_2, n)$

$\blacktriangleright R^1(t_1, t_0)$ VP_6 Tadv

transmission

I meet John   this afternoon

R^1 stands for the relation between the denotation of the matrix present tense t_1 and the utterance time t_0, whereas R^2 means the relation between the denotation of the embedded present tense t_2 and the telling time n. The transmission of R^1 to the embedded clause allows the embedded tense $Pres_2$ to have access to R^1. (19c) forces R^1 and R^2 to satisfy the constraint that the semantics of tense imposes on them. For present tense, the constraint is that none of the relations must be the temporal precedence relation (Abusch (1997, p. 40)). The matrix present tense t_1 does not precede the utterance time t_0. The embedded present tense t_2 does not precede the telling time n either. Since the embedded present tense $Pres_2$ does not put any contradictory constraint on R^1 and R^2, $Pres_2$ does not have to move out of the verb complement clause in order to eliminate contradictory constraint. Accordingly, condition (18) prevents $Pres_2$ from moving to the matrix clause to yield (16). Thus, (18) blocks (16) and hence accounts for the unacceptability of (12a).

This analysis also explains the difference in meaning between the following two sentences:
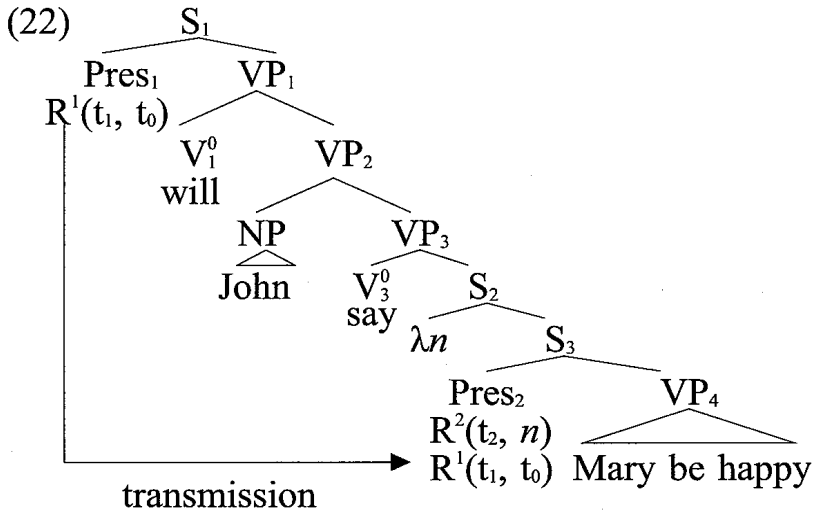
(21) a. John will say that Mary is happy.

Giorgi and Pianesi (1997, p.286)

b. John said that Mary is pregnant.
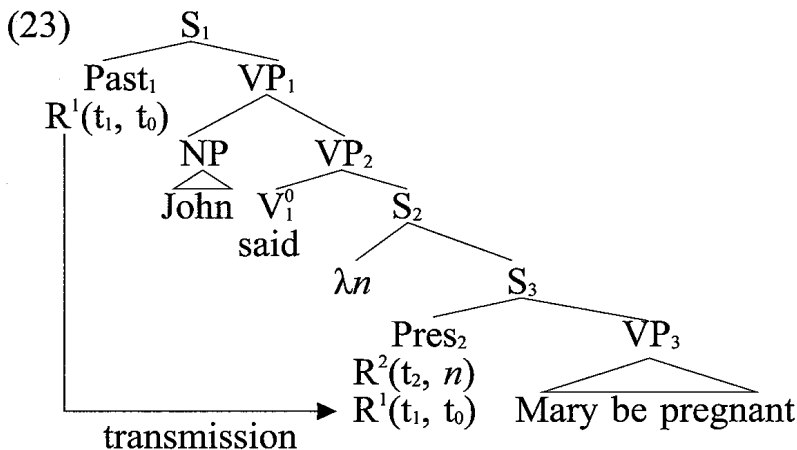
Giorgi and Pianesi (1997, p.285)

(21a) is true if John says in the future something about Mary's happiness that holds at the time of the saying rather than the utterance time. On the

other hand, (21b) requires that Mary be pregnant at the utterance time as well as the past time of the saying. The interpretation of (21b) is called the double-access reading. First, let us consider (21a). (19) gives (21a) the following LF representation:
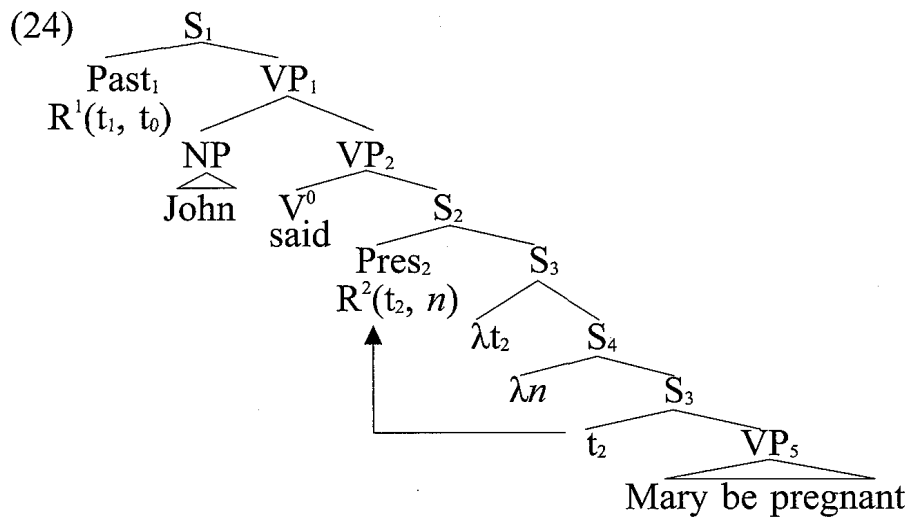
(22)

$$S_1$$

Pres$_1$ VP$_1$

$R^1(t_1, t_0)$

            V_1^0 VP$_2$

            will

                NP   VP$_3$

                John V_3^0 S$_2$

                      say λn S$_3$

                              Pres$_2$ VP$_4$

                              $R^2(t_2, n)$

                   transmission $\longrightarrow$ $R^1(t_1, t_0)$ Mary be happy

Since both R^1 and R^2 are the temporal simultaneity relation, (22) involves no contradictory constraint on Pres$_2$ so that (18) prevents Pres$_2$ from moving out of the embedded clause. Accordingly, n in Pres$_2$ is bound by the lambda operator of *say* and thus Mary's state of happiness is placed at the now of John's saying in the future.

Next, let us turn to the double-access reading of (21b). Assumptions (19) provide (21b) with the following LF:

(23)

$$S_1$$

Past$_1$ VP$_1$

$R^1(t_1, t_0)$

               NP   VP$_2$

             John V_1^0 S$_2$

                 said

                 λn S$_3$

                      Pres$_2$ VP$_3$

                      $R^2(t_2, n)$

          transmission $\longrightarrow$ $R^1(t_1, t_0)$ Mary be pregnant

The tense constraint introduced by Past$_1$ requires R^1 to be the temporal precedence relation. This relation is transmitted to the embedded present tense Pres$_2$ whose constraint prevents t_1 from preceding t_0. Thus, R^1 must

satisfy these two contradictory constraints. In order to avoid them, (18) allows $Pres_2$ to move out of the embedded clause:

(24)

S_1
- $Past_1$ $R^1(t_1, t_0)$
- VP_1
  - NP: John
  - VP_2
    - V^0: said
    - S_2
      - $Pres_2$ $R^2(t_2, n)$
      - S_3
        - λt_2
        - S_4
          - λn
          - S_3
            - t_2
            - VP_5: Mary be pregnant

Since $Pres_2$ is out of an intensional context, it does not impose the constraint on R^1. Consequently, the time of Mary's pregnancy includes the n parameter interpreted as the utterance time.[1] Thus, the proposed analysis explains the difference in meaning between (21a) and (21b).

Before concluding this section, I have to consider dialect variation in judgement of sentences like (21a). It is pointed out by many researchers including Baker (1995, p.540), Giorgi and Pianesi (1997, p.286), Hornstein (1990, p.86) and Lepore and Ludwing (2003, p.80) that a present tense embedded under a future auxiliary is interpreted relative to the time of a matrix verb rather than the utterance time. However, Stump (1985, p.110) reports that for most speakers, sentence (25) has an interpretation in which Mary is hitting Bill right now rather than the time of John's claim.

(25) John will claim that Mary is hitting Bill.

This appears to offer a problem to my analysis. In order to deal with (25), I assume with Lepore and Ludwing (2003, p.100) that (25) is interpreted as intended in this way: the speaker could say, 'Mary is hitting Bill and John will claim her hitting Bill', but this is a mouthful, and hence in the heat of the moment, (25) comes out as a fusion of the two sentences. If this assumption is on the right track, (25) is an example of loose talk rather than a counterexample to the proposed analysis.

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[1] I will not offer a compositional analysis of (24). For the detailed analysis of the double-access reading, see Abusch (1997), Ogihara (1996) and so on.

To summarize this section, I have shown that present and past tenses in future contexts of verb complement clauses have distinct denotations regarding temporal order relative to the time of matrix clause events. If the present tense in a verb complement clause is under the scope of *will*, it is linked to the future time of a matrix clause event. In contrast, if the past tense in a verb complement clause is under the scope of *will*, it measures back from the future time of a matrix clause event. I have provided an account of this distinction by the function of n parameter in (2b) and the condition on movement of an embedded present tense in (18). The proposed analysis also explains the double access reading of a present tense complement of a past tense verb.

4. Temporal Adverbial Clauses

Now, let us move on to future contexts in temporal adverbial clauses. Consider the following sentences:

(26) a.   John will leave when Mary arrives.

   b.* John will leave when Mary arrived.

(27) a.   John will leave before Mary arrives.

   b.* John will leave before Mary arrived.

(28) a.   John will leave after Mary arrives.

   b.* John will leave after Mary arrived.

The (a)-sentences in (26-28) show that although *arrives* has a present tense, the anticipated arriving event follows the utterance time. In contrast, the (b)-sentences in (26-28) illustrate that a past tense verb *arrived* cannot locate the arriving event after the utterance time. Thus, present and past tenses in temporal adverbial clauses interact with the future auxiliary in matrix clauses in a distinct way. I will give an account of this distinction in temporal adverbial clauses.
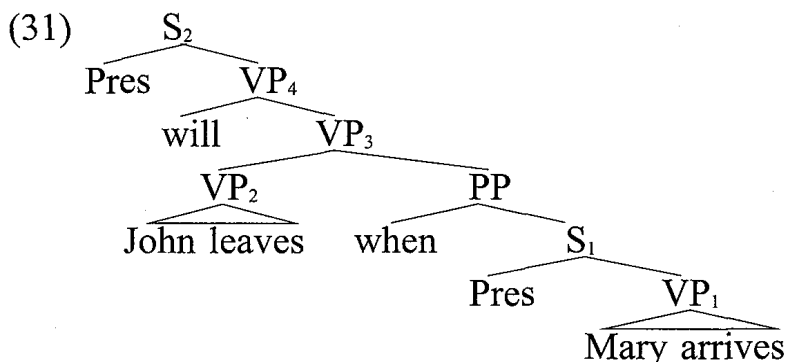
First, let us consider (26a). I will assume that *when* has the following denotation if it adjoins to S-node:

(29) $[\![when_S]\!] = \lambda x \lambda y$ [x is simultaneous with y]

Furthermore, on the basis of type-raising, I will suppose that *when* has the following denotation if it adjoins to VP-node:

(30) $[\![when_{VP}]\!] = \lambda x \lambda P \lambda t\ [\![when_S]\!]\ (x)\ (P(t))$

Given (30), (26a) has the following LF:

(31)
$$S_2$$

Pres VP_4

will VP_3

VP_2 PP

John leaves   when S_1

Pres VP_1

Mary arrives

VP_1 is under the scope of *will* so that (t, ∞) is substituted for an occurrence of t in VP_1. Accordingly, the derived semantics is as follows:

(32) S_2: $[\![when_s]\!]$ $(\exists e'[e' \subseteq (n, \infty) \wedge$ arrive $(m, e')])$ $(\exists e [e \subseteq (n, \infty) \wedge$

leave $(j, e)])$

$= (\exists e'$ $[e' \subseteq (n, \infty) \wedge$ arrive $(m, e')])$ is simultaneous with

$(\exists e$ $[e \subseteq (n, \infty) \wedge$ leave $(j, e)])$.

Since both the arriving event (= e') and the leaving one (=e) follow the utterance time, these two events can be simultaneous. Therefore, the anticipated arriving event is ordered after the utterance time and thus (26a) is acceptable.[2]

The same kind of argument holds of (27a) and (28a). Suppose that *before* and *after* have the denotations in (33) if they adjoin to S-node, and that they have the denotations in (34) if they adjoin to VP-node:

(33) a. $[\![before_s]\!] = \lambda x \lambda y$ [x follows y]

b. $[\![after_s]\!] = \lambda x \lambda y$ [x precedes y]

(34) a. $[\![before_{VP}]\!] = \lambda x \, \lambda P \, \lambda t \, [\![before_s]\!]$ (x) (P(t))

b. $[\![after_{VP}]\!] = \lambda x \, \lambda P \, \lambda t \, [\![after_s]\!]$ (x) (P(t))

(34) assigns (27a) and (28a) the following LFs (35) and (36) respectively:

(35) $[\![before_s]\!]$ $(\exists e'[e' \subseteq (n, \infty) \wedge$ arrive $(m, e')])$ $(\exists e [e \subseteq (n, \infty) \wedge$

leave $(j, e)])$

$= (\exists e'$ $[e' \subseteq (n, \infty) \wedge$ arrive $(m, e')])$ follows $(\exists e [e \subseteq (n, \infty) \wedge$

leave $(j, e)]$)

---

[2] *When* very often does not mean that something is simultaneous but rather that it is after, as illustrated in the following example:

(i) John will leave when Mary arrives.

(i) means that John is to leave after, perhaps immediately after, Mary arrives. It is an open question how this denotation is derived.

(36) ⟦after$_s$⟧ ($\exists e'[e' \subseteq (n, \infty) \wedge$ arrive $(m, e')]$) ($\exists e [e \subseteq (n, \infty) \wedge$

leave $(j, e)]$)

$= (\exists e' [e' \subseteq (n, \infty) \wedge$ arrive $(m, e')]$) precedes ($\exists e [e \subseteq (n, \infty) \wedge$

leave $(j, e)]$)

Thus, (a)-sentences in (27-28) are accounted for by (34) which are based upon type-raising.[3]

Next, let us turn to (b)-sentences in (26-28). Before attempting an analysis of them, I show that similar sentences like them are unacceptable in whatever contexts we may create in order to make it easier to interpret them. Consider the following sentences in the context in which the utterance time is January 1 and the time of submission follows the utterance time.

(37) a. The deadline will be March 1. When abstracts are submitted by e-mail, we will forward them to the reviewers as soon as possible.

b.* The deadline will be March 1. When abstracts were submitted by e-mail, we will forward them to the reviewers as soon as possible.

(38) a. The deadline will be March 1. After abstracts are submitted by e-mail, we will discuss them on April 1.

b.* The deadline will be March 1. After abstracts were submitted by e-mail, we will discuss them on April 1.

---

[3] (33a) cannot account for the denotation of the following sentence:

(i) John gave up wrestling before he hurt himself.

According to (33a), (i) would mean that John's hurting himself followed his giving up wrestling. However, this expectation is contrary to fact. On its natural interpretation, (i) means that John never hurt himself because he gave up wrestling. There is no past time when John hurts himself. This kind of *before* is referred to as non-factual or counterfactual *before* (Anscombe (1964), Heinämäki (1972, 1974) and Landman (1991)). In order to address this problem, I suppose that an evaluation time abstractor is adjoined to the temporal adverbial clause and hence binds the past tense:

(ii) John gave up wrestling before λn_1 [he Past$_1$ hurt himself]

Then, (ii) representation leads to the following denotation:

(iii) $(\lambda n_1 \exists e' [e' \subseteq (-\infty, r) \wedge \partial [r \subseteq n_1] \wedge$ hurt $(j, e')]$) follows

($\exists e [e \subseteq (-\infty, r) \wedge \partial [r \subseteq n] (n, \infty) \wedge$ gave up $(j$, wrestling, $e)]$)

It remains to be seen how the lambda-binding is interpreted. I will leave further investigation of this issue for future research.

(39) a.　The deadline will be March 1.　Before abstracts are submitted by e-mail, we will discuss the guideline for submission on February 1.

　　　b.*　The deadline will be March 1.　Before abstracts were submitted by e-mail, we will discuss the guideline for submission on February 1.

All my informants agree that (a)-sentences are acceptable in this context, but (b)-ones are unacceptable. The acceptability of (a)-sentences shows that a present tense verb in a temporal adverbial clause is under the scope of the future auxiliary. Consequently, in (b)-sentences, a past tense verb in a temporal adverbial clause is also under the scope of the future auxiliary and then the n-expanding semantics (6) resets n in the denotation of Past to (n, ∞). Suppose that the reference time for Past is March 1. Then, (39b) has the following denotation:

(40) $[\![before_s]\!]$ $(\exists e' [e' \subseteq (-\infty, \text{March } 1) \wedge$ submitted-by-email $(abstracts, e')])$

$(\exists e\ [e \subseteq (n, \infty) \cap \text{February } 1 \wedge$ discuss $(we, the\ guideline, e)])$

$= (\exists e' [e' \subseteq (-\infty, \text{March } 1) \wedge$ submitted-by-email $(abstracts, e')])$

follows

$(\exists e\ [e \subseteq (n, \infty) \cap \text{February } 1 \wedge$ discuss $(we, the\ guideline, e)])$

This is consistent with the intended meaning of (39b), and then does not induce any contradictory interpretations. The same kind argument holds of (37b) and (38b).

　　Considering these facts, I propose that (b)-sentences in (26-28) are excluded by the following condition:

(41) A temporal argument of an adverbial clause must contain the same temporal variable relation as the one of a matrix clause.

(cf. Geis 1970, Smith 1975)

This condition is independently necessary for blocking the following unacceptable sentences:

(42) a.*　John came before Mary leaves.　　(Hornstein 1990, p. 46)

　　　b.*　John leaves after Mary arrived.

(Kaneko and Endo 2001, p. 60)

Although these sentences do not have contradictory interpretations, they

violate (41) because a temporal variable relation of an embedded tense is not the same as the one of a matrix tense. For example, in (42b), the variable associated with the adverbial tense is the temporal precedence relation, whereas the one supplied with the matrix tense is the temporal simultaneity relation. Accordingly, (41) accounts for the unacceptability of (42).[4]

Furthermore, (41) also explains the meanings of the following sentences:

(43) a. Mary left after the festival.

b. Mary left before the festival.

(43a) obviously entails that the festival is already over. (43b) ordinarily implies that the festival, or at least the beginning of the festival, is in the past. The meaning of (43b) follows from (41) under the assumption that *festival* has a covert temporal argument denoting the beginning of a festival. Since the temporal argument of the matrix tense has the temporal precedence relation, (41) requires the covert temporal argument of *festival* to be supplied with the temporal precedence relation. Thus, the ordinary meaning of (43b) comes about because of (41).

The independently motivated condition (41) provides a straightforward account of why (b)-sentences in (26-28) are unacceptable. Let us consider (26b), repeated here as (44):

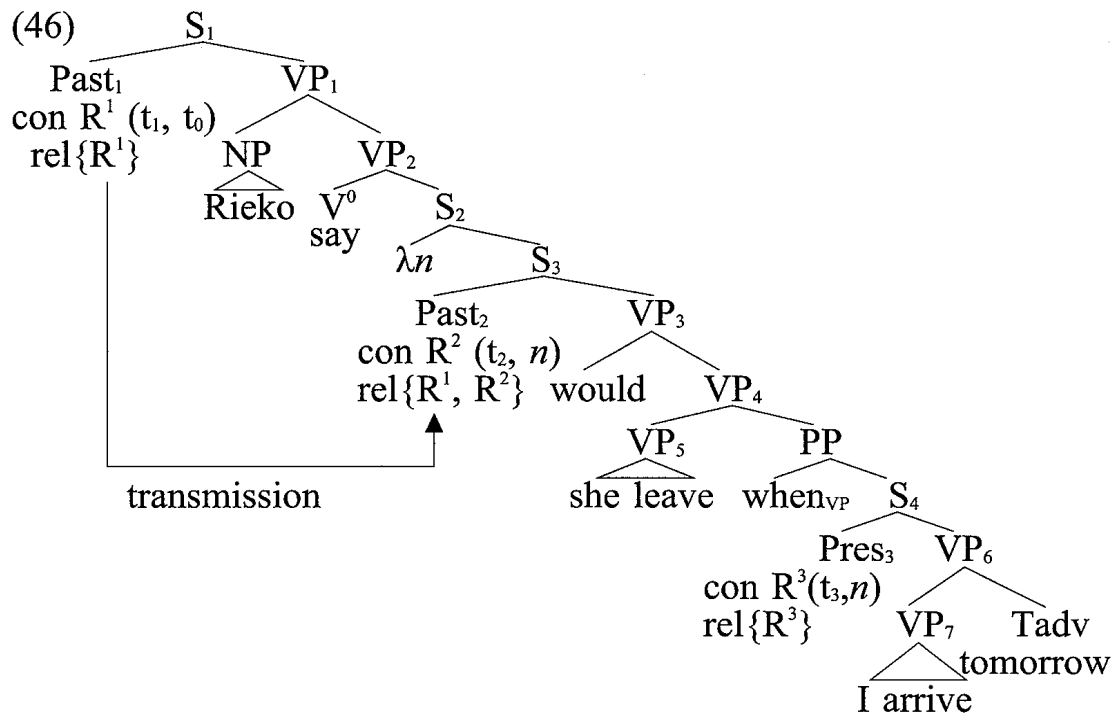(44) *John will leave when Mary arrived.

Since the temporal variable relation of the matrix tense is simultaneous, (41) prevents the temporal argument of the adverbial tense from having the precedence relation variable and hence excludes (44). The same argument applies to (b)-sentences in (26-28).

The proposed analysis also explains the following sentence:

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[4] Stump (1985, p.146) tries to attribute the unacceptability of (42) to the following pragmatic reason: when uttering a sentence of the form α after β and α before β, a speaker presupposes the truth of β (Heinämäki (1974)). Given this, the use of (42a) would indicate the presupposition of *Mary leaves* so that the assertion of *John came* would suffice to establish the succession of John's coming and Mary's departure. In other words, the information of (42a) could be conveyed by the much simpler assertion of *John came*. Consequently, (42a) violates a principle of conversational economy (cf. Grice (1975) and Stalnaker (1978)). If Stump's analysis is on the right track, (42) might not support (41).

(45) Rieko said that she would leave when I arrive tomorrow.

Although the temporal adverbial clause contains the present tense *arrive*, the modified embedded clause has the past tense *would*. At first sight, this disharmony appears to violate (41). However, it turns out that (45) follows from (41) in conjunction with assumption (19b). Remember that the intensional operator of *said* transmits the temporal precedence relation of the matrix tense to the temporal argument of the embedded tense. This transmission gives (45) the following LF structure:

(46)

```
                  S₁
        _____/  _____
     Past₁                  VP₁
   con R¹ (t₁, t₀)      ___/  \___
     rel{R¹}          NP         VP₂
                      |        __/  \__
                    Rieko    V⁰        S₂
                             say    __/  \__
                                   λn        S₃
                                        ___/    \___
                                     Past₂          VP₃
                                  con R² (t₂, n)  __/  \__
                                   rel{R¹, R²}  would     VP₄
                                                       __/    \__
                                                    VP₅          PP
                                                  _/  \_     __/    \__
                    transmission               she  leave  when_VP    S₄
                                                                   __/    \__
                                                                Pres₃         VP₆
                                                             con R³(t₃,n)   __/  \__
                                                              rel{R³}     VP₇       Tadv
                                                                        _/  \_    tomorrow
                                                                       I  arrive
```

The past tense constraint in (19c) is that at least one of the relations specified under *rel* must be the temporal precedence relation. Then, Past₂ requires that either R^1 or R^2 be temporal precedence. Since R^1 is the temporal precedence relation between Rieko's saying time and the utterance time, it licenses the past tense constraint of Past₂. On the other hand, R^2 is the temporal simultaneity relation between the embedded tense Past₂ and the now of Rieko's saying. This R^2 harmonizes with the temporal simultaneity relation R^3 between the embedded tense Pres₃ and the now of Rieko's saying. Consequently, (46) satisfies (41). The derived semantics for S_1 is as follows:

(47) $\exists e_1$ $[e_1 \subseteq (-\infty, r)] \wedge \partial [r \subseteq n] \wedge$ say $(r, \lambda n \ _1[(\exists e_2 \ [e_2 \subseteq (n_1, \infty)$

$\cap$ tomorrow $\wedge$ arrive $(I, e_2)])$ is simultaneous with

$(\exists e_3 \ [e_3 \subseteq (n_1, \infty) \wedge$ leave $(r, e_3)])], e_1)]$

The interval (n_1, ∞) extends from the time of saying, which precedes the speech time, to the future. Accordingly, the temporal location for the leaving event ($= e_3$) and the arriving one ($= e_2$) can follow the utterance time. Thus, the proposed analysis can explain the interpretation of (45).

This analysis predicts that a past tense verb can express a future event in a temporal adverbial clause if a temporal precedence relation of a matrix tense is transmitted into a tense of the temporal adverbial clause. This prediction holds:

(48) a. Rieko said that she would leave when I arrived tomorrow.

　　　b. John expected that he would be there when I arrived tomorrow.

(Declerck 1999, p. 496)

The past tense verbs *arrived* can locate their eventualities after the utterance time.[5] My analysis provides (48a) with the following LF structure:
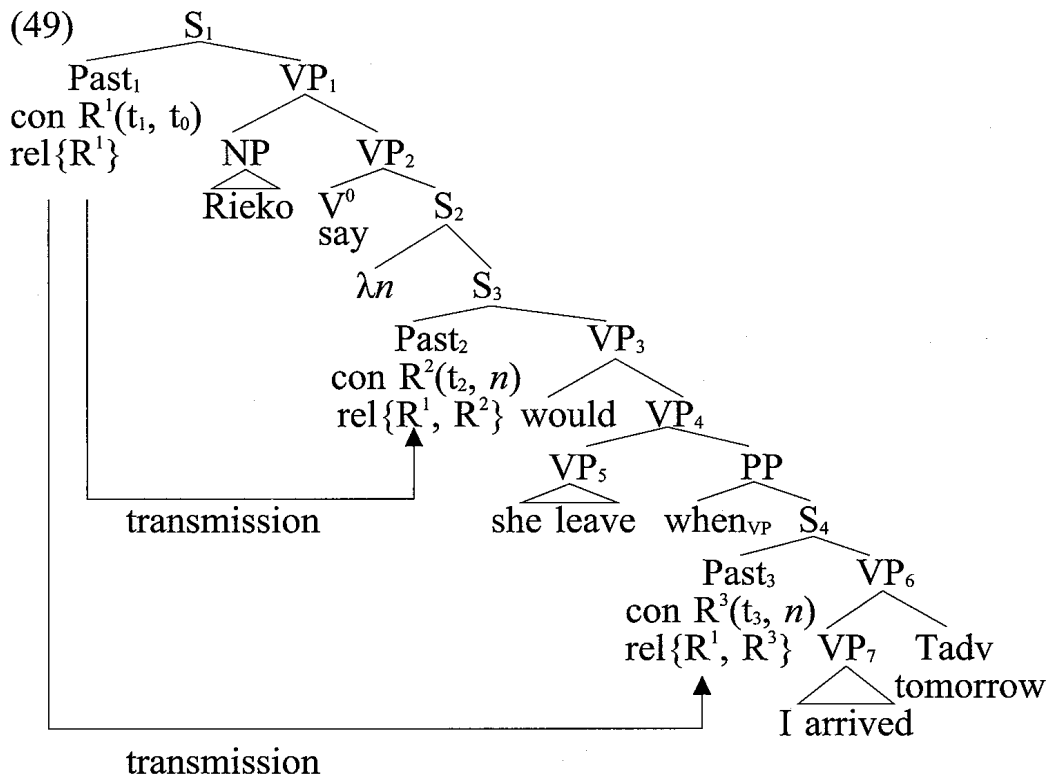
(49)

Since both Past$_2$ and Past$_3$ are licensed by the temporal precedence relation R^1, both R^2 and R^3 can be the temporal simultaneity relation to meet (41). Consequently, (49) leads to the denotation of (47). The same argument holds of (48b).

Notice that a temporal precedence relation of a matrix clause is transmitted into a tense of an adverbial clause optionally rather than obligatory. This is because the obligatory transmission into an adverbial clause would incorrectly predict that (45) is unacceptable: if the temporal precedence relation R^1 were obligatory transmitted into the present tense Pres$_3$ of the adverbial clause, R^1 would have to meet contradictory constraints on temporal relation variables. Then, in order to avoid them, Pres$_3$ would move out of the future auxiliary so that it would not be able to express a future event, contrary to fact. Accordingly, the acceptability of (45) shows that the transmission to a complement clause is obligatory, whereas the one to a adverbial clause is optional. It is an open question how this asymmetry is explained.

Summarizing this section, I have analyzed the behavior of tenses in future contexts in temporal adverbial clauses. If a present tense verb is under the scope of *will*, it can express a future event in a temporal adverbial clause. On the other hand, a past tense verb cannot locate its event after the utterance time even if it is under the scope of *will*. I have ascribed this distinction to the condition that requires that matrix and embedded tenses have the same temporal relation. Since *will* in a matrix clause has a temporal simultaneity relation, a future event must be described with a present tense verb in an embedded clause. To the extent that this condition is satisfied with the help of the transmission in (19b), a past tense verb can also express a future event in a temporal adverbial clause.

5. Comments on an Alternative Approach

Finally, this last section discusses Ogihara's (1994, 1996) analysis of future contexts, and then evaluates it in terms of the data presented in this paper. His approach is based upon the following rule:

(50) The Sequence-of-Tense (SOT) rule

When tense A locally c-commands tense B and A and B are

occurrences of the same tense (i.e., PRES or PAST), the SOT rule
optionally deletes B.   Ogihara (1994, p. 252)
Ogihara (1996, p. 185) assumes that the SOT rule must apply to temporal
adverbial clauses when the conditions are satisfied. Then, (50) gives
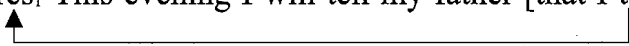sentence (51a) the LF structure (51b) where φ means a deleted tense:

   (51) a. John will call Mary before he visits her.

       b. John will call Mary before he φ visit her.

The adverbial clause in (51b) has become tenseless and hence denotes the
set of times at which John visits Mary. He argues that the temporal order
between the main clause and the adverbial one is indicated only by a
temporal connective. In (51b), the temporal connective *before* requires that
the time of John's visiting Mary follow the one of his calling her that is
after the utterance time. Thus, (50) allows the present tense verb *visits* to
locate the visiting event after the utterance time.

   Let us see whether this analysis accounts for the unacceptability of
(12a), repeated here as (52):

   (52) * This evening I will tell my father that I meet John this afternoon.
(50) applies to the embedded clause so that the embedded present tense is
deleted at LF:

   (53) This evening I will tell my father that I φ meet John this afternoon
The embedded tenseless clause denotes the set of times at which I meet
John. The temporal location of this event is determined in relation to the
matrix clause episode. More specifically, the time of my meeting John
must be simultaneous with the one of telling. However, this runs counter
to the supposed context. Furthermore, Ogihara argues that in addition to
(53), (52) has the following LF structure as well under the assumption that
an embedded tense can move out of an embedded clause freely:

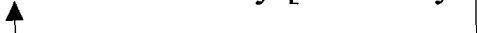   (54) Pres_1 This evening I will tell my father [that I t_1 meet John this afternoon]

In (54), since the matrix present tense does not c-command Pres_1, (50) does
not delete Pres_1. Accordingly, Pres_1 is interpreted as the utterance time.
This is not the intended meaning of (52) either. Thus, it appears that
Ogihara's approach explains (52) without resorting to condition (18) and
hence is theoretically superior to the proposed analysis based upon (18).

However, his analysis cannot account for the interpretation of (21a), repeated here as (55):

(55) John will say that Mary is happy.

As I said in section 3, (55) means that Mary's happiness holds at the time of the saying rather than the utterance time. Ogihara's approach allows (55) to have the following LF representation:

(56) Pres$_1$ John will say [that Mary t$_1$ be happy]

(56) yields the double-access reading, which is contrary to fact. Although Ogihara (1996, p. 123) argues that (56) is an example of a double-access reading, many researchers such as Enç (1996, p. 352) judge that a present tense embedded under the future auxiliary *will* does not allow a double-access reading. All my informants agree with Enç's judgement. As long as (55) does not have a double-access reading, we cannot accept his analysis of (52).

There are other problems with Ogihara's approach. It might not be able to account for the interpretation of (28a), repeated here as (57):

(57) John will leave after Mary arrives.

The SOT rule deletes the embedded present tense of (57) so that it has the following LF representation:

(58) John will leave after Mary φ arrive.

The adverbial clause in (58) denotes the set of times at which Mary arrives. The temporal connective *after* requires the time of Mary's arrival to precede the one of John's departure that is after the utterance time. Then, his analysis predicts that the present tense verb *arrives* can locate the relevant event before the utterance time. However, this prediction is not borne out. Native speakers do not judge Mary's arrival to be a past event. Consequently, I think that his analysis has to find out some way of blocking this illegitimate meaning.

The acceptability of (45), repeated here as (59), might also pose a problem to his approach:

(59) Rieko said that she would leave when I arrive tomorrow.

In (59), the temporal adverbial clause dose not have the same tense as the modified embedded clause so that (50) does not apply to the temporal

adverbial clause. Accordingly, his analysis predicts that the semantic contribution of the present tense *arrive* in the adverbial clause is measured relative to the utterance time so that (59) is unacceptable, contrary to fact. The SOT rule might be inadequate to account for (59).

Furthermore, his approach might not be able to account for the interpretation of (1a). The SOT rule provides (1a), repeated here as (60a), with the LF representation in (60b):

(60) a. On March 1, we will discuss the abstracts which are submitted by e-mail.

b. On March 1, we will discuss the abstracts which φ be submitted by e-mail.

In (60b), the present tense in the relative clause is deleted under identity with the present tense in the matrix clause so that the relative clause becomes tenseless. Ogihara (1996, p. 162) assumes that the tenseless relative clause is semantically controlled by the higher tense. This assumption requires that the time of submitting abstracts be simultaneous with the one of discussing them that is on March 1. Then, his analysis predicts that (60a) is unacceptable under the intended context where the abstracts are to be submitted in the period between January 1 and February 15. However, this prediction is contrary to fact. Thus, the interpretation of (60a) might be problematic to the approach based upon (50).

In this section, I have pointed out some problems with Ogihara's analysis of future contexts based upon the SOT rule. To the extent that this analysis is subject to these criticisms, I think that it is unsatisfactory.

6. Summary

Abusch shows that the eventuality arguments of past and present tense verbs under the scope of the future auxiliary have overlapping ranges of possible denotations in relative clauses, and then accounts for this fact by proposing the *n*-expanding semantics for the future auxiliary and a new semantics for the past tense. I have pointed out that in verb complement clauses, present and past tense verbs under the scope of the future auxiliary have distinct denotations regarding the temporal relation to the time of matrix clause events. I have provided an account of this distinction by

proposing that an embedded present tense can move out of a complement clause of an attitude verb only when the movement would eliminate contradictory constraints on temporal relation variables. Furthermore, I have argued that in temporal adverbial clauses, tenses in future contexts are subject to the condition which requires that a tense of an adverbial clause have the same temporal relation variable as one of a matrix clause. To the extent that this condition is satisfied, future events in temporal adverbial clauses can be described with present and past tense verbs. I have also examined Ogihara's analysis of future contexts and then pointed out some problems with it.

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