Temporal Interpretation of Relative Clauses

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1. Introduction

This paper discusses the temporal interpretation of present tense relative clauses in different languages in connection with the so-called sequence of tense (SOT) phenomena.

In English, when a present tense relative clause is embedded under a past tense matrix clause, as in (1), the relative clause tense necessarily receives what I call the speech time interpretation.[1] I.e., the event described by a relative clause predicate is understood to hold at the time of the speech. For instance, for the sentence (1a) to be true, the relevant guy has to be working for the project at the speech time. Similarly for (1b).

(1) a. Eva interviewed the guy who is working for the project
     b. Mariko gave me the book that is on the table

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[1]When a present tense relative clause is embedded under the future *will*, the speech time interpretation is not the only possibility. In this paper, I will concentrate on embedded contexts under a past tense. This is because I believe the past tense and the future *will* differ not only in terms of temporality but also in terms of quantificational force over worlds (see Kusumoto 1999). If this is correct, we expect differences in embedded contexts under past or future. In English, we should also be concerned with the fact that *will* is morphologically present tensed (as opposed to its past tense counterpart *would*.) So I will leave this issue for future research.

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Therefore, the speaker of (1) cannot continue with the sentences in (2) without contradicting herself.

(2)   a. The guy is not working for the project anymore now
        b. The book is some place else now

When a relative clause contains a past tense, on the other hand, as in (3), the continuation with (2) is fine.

(3)   a. Eva interviewed the guy who was working for the project
        b. Mariko gave me the book that was on the table

This is because the events described by the relative clause predicates are understood to hold at some past time. Most naturally, we understand that the relative clause events take place simultaneously with the matrix events. For (3a), for instance, the guy was working for the project when Eva interviewed him. I call this interpretation the simultaneous interpretation.

    The situation described above for English is not universal. For instance, the present tense in Japanese behaves differently. Consider the following examples, which are roughly the translations of English examples in (1). The matrix clauses have a past tense and the relative clauses have a present tense.[2]

(4)   a. Eva-wa sono sigoto-o   tantoo-si-teiru   otoko-to   hanasi-o sita
           E-top   that work-acc in_charge-do-teiru-pres man-with talk-acc do-past
           'Eva talked to the man who is (now) in charge of the project'
           'Eva talked to the man who was in charge of the project'

        b. Mariko-wa tukue-no ue-ni aru   hon-o   watasi-ni kureta
           M-top   desk-gen top-on be-pres book-acc I-dat   give-past
           'Mariko gave me the/a book that is (now) on the table'
           'Mariko gave me the/a book that was on the table'

The sentences are ambiguous. On one interpretation, they are true when the relevant guy is working for the project and the book is on the table respectively at the time of the speech. That is, they have the speech time interpretation. The fact that the following continuations are felicitous shows that the speech time interpretation is not the only interpretation available to the sentences.

(5)   a. Sono otoko-wa ima-wa   sono sigoto-no tantoo   de-wa nai
           that man-top   now-top that work-gen in_charge be-top neg-pres
           'That man is not in charge of that project now'

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[2]What I am calling the present tense is the -u ending of the relative clause predicates. It is sometimes called non-past tense. Note that I am using the term descriptively, and am not claiming that the relevant ending is a tense morpheme. See below.

b. Sono hon-wa   ima-wa betuno   tokoro-ni oite aru
   that   book-top now-top different place-on put be-pres
   'That book is at a different place now'

The sentences in (4) also have a simultaneous interpretation.

     The observed contrast between English and Japanese is an interesting one, and certainly needs an explanation. In the literature, this difference is attributed to the fact that English is one of the languages that exhibit the SOT phenomenon whereas Japanese is not (See Ogihara 1989, 1996 for instance.)

     In languages like English, a present tense in a direct quotation turns into a past tense in its indirect quotation counterpart, as the examples in (6a) and (6b) show. That is, the event of Cecilia's crying can be understood to take place simultaneously with Miyuki's saying event in (6b), where a past tense is used in the embedded clause. In languages like Japanese, a present tense must be used in the embedded clause, as in (6c), in order to have this simultaneous interpretation. Using a past tense results in the so-called backward shifted interpretation, in which the embedded event is understood to take place prior to the matrix event.
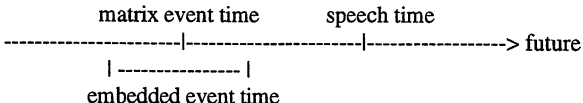
(6)   a. Miyuki said, "Cecilia is crying"
       b. Miyuki said that Cecilia was crying
       c. Miyuki-wa Cecilia-ga naiteiru   to   itta
         M-top   C-nom   cry-teiru-**pres** comp say-past
         'Miyuki said that Cecilia was (lit. is) crying'

       Cf. Miyuki-wa Cecilia-ga naiteita   to   itta
         M-top   C-nom   cry-teiru-**past** comp say-past
         'Miyuki said that Cecilia had been (lit. was) crying'

When a present tense is used in embedded clauses in English as in (7), the sentence has a peculiar interpretation, often called a double-access interpretation (see Ogihara 1995, 1996 and Abusch 1991, 1994, 1997).

(7)   Miyuki said that Cecilia is crying

Very roughly speaking, the sentence implies that the embedded event time stretches over to include the speech time.[3] When what Miyuki said is true at the time of her speech but Cecilia stops crying before the speech time, as depicted in (8a), the sentence is in general judged false. Sentences like (7) can only be truthfully uttered in situations like (8b).

(8)   a.

```
                    matrix event time        speech time
-----------------------|----------------------|------------------> future
                       | ---------------- |
                    embedded event time
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[3]The semantics of sentences like these (so called double-access sentences) is much more complicated than this imprecise description. See the references cited above.

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    b.
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                      matrix event time        speech time
---------------------|---------------------|-----------------> future
                     | ----------------------------------- |
                            embedded event time
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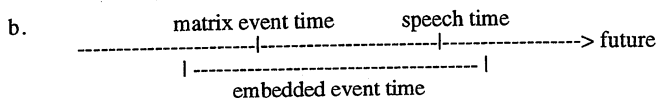
The behavior of the present tense in clausal complements show that the two languages differ in the relevant respect; when a present tense is embedded under a past tense, Japanese allows the simultaneous interpretation while English does not.

Under this view, the contrast between English and Japanese relative clauses observed earlier in this section is just one instance of a more general difference in the semantics of the present tense in these languages. Ogihara (1989, 1996) puts it this way: the present tense in SOT languages like English is indexical in nature.[4] Its evaluation time goes back to the speech time of the context even when embedded under the scope of a past tense (whether in a relative clause or a clausal complement). The present tense in non-SOT languages like Japanese is a relative tense. When embedded under the scope of a past tense, it is evaluated with respect to a past time introduced by the past tense.[5]

In this paper, we will see that a picture like this makes a wrong prediction regarding other non-SOT languages such as Polish and Russian. Present tense relative clauses in these languages follow the English pattern. I will argue that Japanese on the one hand and Polish and Russian on the other do not differ in terms of the semantics of the present tense but in terms of the structure of relative clauses. What we call 'present tense relative clauses' in Japanese are structurally not true relative clauses but have a structure that is more or less like a participle construction in English (as in *the boy crying over there*) whereas Polish and Russian relative clauses are true relative clauses with full-fledged CPs.

2.   Embedded tense in Polish and Russian

That Polish and Russian are non-SOT languages is a well-known fact. When a present tense is embedded under a past tense in clausal complements, as in (9a) and (10a), the sentences receive a simultaneous interpretation. When a past tense is used instead, as in (9b) and (10b), the sentences are unambiguously interpreted as having a backward-shifted interpretation.

(9)   a. Ania powiedziała że Marcin płacze   (Polish)
         A   say/past/perf that M   cry/**pres**
         'Ania said that Marcin was crying'

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[4]The indexical like behavior of the present tense disappears when embedded under the future *will*. Ogihara captures it by positing a rule that deletes tense under feature identity. A present tense can be deleted under *will* since *will* is morphologically present. It cannot be deleted under a past tense because their tense features do not match. This correctly captures the different behavior of the present tense under *will* on the one hand and under a past tense on the other. See Ogihara (1989, 1996) for more discussion.
[5]This would only give us the simultaneous interpretation. Ogihara derives the speech time interpretation by scoping the relavent noun phrase outside the scope of the matrix past tense.

b. Ania powiedziała   że   Marcin płakał
   A   say/past/perf that M   cry/**past**/imp
   'Ania said that Marcin had been crying'

(10)   a. Maša skazala,   čto Vova spit   (Russian)
        M   say/past/perf that V   sleep/**pres**
        'Masha said that Vova was sleeping'

b. Maša skazala,   čto Vova spal
   M   say/past/perf that V   sleep/**past**/imp
   'Masha said that Vova had been sleeping'

This shows that these languages are non-SOT languages like Japanese. Now consider the behavior of the present tense in relative clauses in Polish and Russian.

(11)   a. Ania spotkala   člopca, ktory placze[6]   (P)
        Ania meet/past/imp boy   who cry/**pres**
        'Ania meet a/the boy who is (now) crying'

b. Ania spotkala   člopca, ktory plakal.
   Ania meet/past/imp boy   who cry/**past**/imp
   'Ania meet a/the boy who was crying'

(12)   a. Maša videla   eloveka, kotoryi plačet   (R)
        M   see/past/imp   man   who   cry/**pres**
        'Masha saw a/the man who is (now) crying'

b. Maša videla   čeloveka, kotoryi plakal
   M   see/past/imp man   who   cry/**past**/imp
   'Masha saw a/the man who was crying'

Interestingly, Polish and Russian are like English in this respect.[7] When a present tense is embedded under a past tense, as in (11a) and (12a), the sentences can only have the speech time interpretation. That is, when the relevant boy was crying when the subject saw him but not any more at the speech time, the sentences are judged false.

This is a puzzle under a hypothesis like Ogihara's. Polish and Russian do allow a simultaneous interpretation with a present under a past when it is in a clausal complement. There are more than a few directions to solve the puzzle. If we strictly follow Ogihara and assume that the speech time interpretation is derived by scoping out (see footnote 5), we could say that QR is obligatory in Polish and Russian for some reason. To pursue this

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[6] A comma is always inserted between a noun and a relative clause that modifies the noun in Russian and Polish. Unlike English, the existence of a comma does not distinguish restrictive and non-restrictive relative clauses in these languages. In this paper, we are concerned with a restrictive interpretation of relative clauses.

[7] Polish and Russian are different from Japanese and behave like English in temporal adjunct clauses (such as *before*- and *after*-clauses), too. See Arregui and Kusumoto (1998) for an analysis.

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hypothesis means to find an independent motivation for obligatory QR, and correlation between the tense interpretation of relative clauses and the scope of noun phrases that head those relative clauses.[8] We could alternatively say that the semantics of the present tense in Polish and Russian is sensitive to the distinction between relative clauses and clausal complements in a relevant way while that in Japanese is not. Although how exactly this particular hypothesis works out depends on many issues, this amounts to saying that languages divide into three groups rather than the traditional view of SOT/non-SOT distinction. That is, children have to know whether a present tense embedded under a past can have a simultaneous interpretation in which environment.

	English	Japanese	Russian/Polish
Relative clauses	*	ok	*
Complement clauses	*	ok	ok

I will instead pursue an alternative hypothesis, maintaining the traditional two-way SOT/non-SOT distinction.

3. An alternative hypothesis: Japanese 'relative clauses' are not relative clauses

3.1. Preliminary

Let us begin with a small quiz. Translate the following Japanese sentences into English. The noun modifiers in these sentences all have what we call 'the present tense', namely, *-i* ending for adjectives (13a), *-na* ending for adjectival nouns (13b), and *-u* ending for verbs (13c).

(13) a. Junko-wa siroi   neko-o katta
      J-top   white-pres cat-acc buy-past

    b. Satoshi-wa taikutuna   koogi-o   kiiteita
      S-top   boring-pres lecture-acc listen-teiru-past

    c. Mariko-wa naiteiru   otokonoko-ni hanasikaketa
      M-top   cry-teiru-pres boy-to   talk-past

There are at least two ways to do so. The modifiers in (13) may be translated into simple nominal modifiers as in the (a) sentences or they can be translated into relative clauses as in the (b) sentences.

(14) a. Junko bought a/the white cat
    b. Junko bought a/the cat which was white

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[8]In Kusumoto (1999), I argued against an analysis of tense interpretation that relies on movement in English. If similar facts are found in Japanese, Russian, and Polish, they will show that such an analysis is also untenable in these languages.

(15)   a. Satoshi was listening to a/the boring lecture
        b. Satoshi was listening to a/the lecture which was boring

(16)   a. Mariko talked to a/the crying boy
        b. Mariko talked to a/the boy who was crying

Both sentences in (14), (15), and (16) may be true in the same situation. For instance, when Junko bought a cat at some time in the past and the cat was white at the time of her purchase, the sentences in (14) are judged true.   That is, both sentences have a simultaneous interpretation regarding the modifiers of the object noun. But this does not mean that the truth conditions of these two sentences are derived in the same way. I argue that the simultaneity of the temporal interpretation of the modifiers in the (a) sentences is a result of being in the immediate scope of the past tense in the matrix clause while that in the (b) sentences is due to binding.

Let us illustrate the difference. I assume that predicates like *white* and *cat* are two-place predicates, one for an individual argument and the other for a time argument.

(17) $[[\text{white/cat}]]^{g,c} = f: D_e \rightarrow D_{<i,t>}$
        For all $x \in D_e$, and $t \in D_i$, $f(x)(t) = 1$ iff x is white/cat at t

In a modification structure like *white cat*, we take the 'intersection' of these two denotations, as shown below:

(18)   a. white cat
        b. $\lambda x \lambda t[\text{white}(x)(t)\ \&\ \text{cat}(x)(t)]$

                    white   **cat**
        $\lambda x \lambda t[\text{white}(x)(t)]$ $\lambda x \lambda t[\text{cat}(x)(t)]$

The time arguments of *white* and *cat* are unsaturated at this point, and therefore their temporal interpretation is dependent on elements that take scope over them. Let us compute the truth conditions of the sentence (14a) and see if we correctly derive the simultaneous interpretation. I assume the following structure for the sentence. The past tense morpheme is realized as *past$_i$*, which is a time variable. It is semantically vacuous as far as temporality is concerned, and it saturates the time argument slot of a predicate they are affixed to.[9] Relevant temporal information intuitively associated with the past tense comes from a null operator *PAST*. Its evaluation time is syntactically represented as the variable *t**. The decomposition of what we call the past tense into these two parts is useful to capture the SOT phenomena, where some occurrences of the past tense appear semantically vacuous. (See Stowell 1993. Cf. Abusch 1994, 1997, and Ogihara 1989, 1996).

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[9] See Kusumoto (1999) for motivation of this assumption.

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(19)
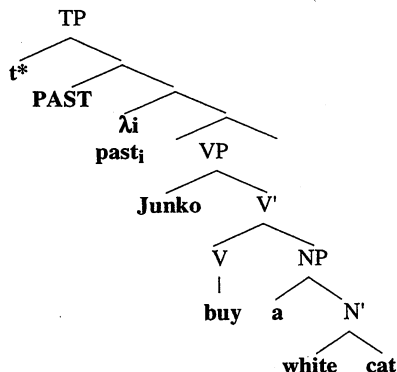
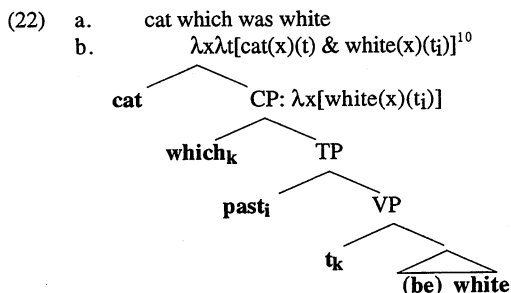The denotations of the relevant parts of the sentence is given below:

(20) a. $[[\mathbf{past_i}]]^{g,c} = g(i)$
      b. $[[\mathbf{PAST}]]^{g,c} = f\colon D_{<i,t>} \to D_{<i,t>}$
         For all $p \in D_{<i,t>}$, and $t \in D_i$, $f(p)(t) = 1$ iff there is a time t' such that t' < t and
         p(t') = 1
      c. $[[\mathbf{t^*}]]^{g,c}$ = the speech time of c, abbreviated as s*
      d. $[[\mathbf{a}]]^{g,c} = f\colon D_{<e,<i,t>>} \to D_{<<e,<i,t>><i,t>}$
         For all P and $Q \in D_{<e,<i,t>>}$, and $t \in D_i$, $f(P)(Q)(t) = 1$ iff there is an individual
         x such that $P(x)(t) = 1$ and $Q(x)(t) = 1$
      e. $[[\mathbf{buy}]]^{g,c} = f\colon D_e \to D_{<e,<i,t>>}$
         For all x and $y \in D_e$, and $t \in D_i$, $f(x)(y)(t) = 1$ iff y buys x at t

With standard composition rules, we derive the following truth conditions:

(21) $[[\mathbf{(19)}]]^{g,c} = 1$ iff there is a time t such that t < s* and there is an individual x such
      that x is a cat at t and white at t, and Junko buys x at t

These correctly predict that what Junko bought is a white cat at the time of her purchase.
The simultaneity is due to the fact that the object noun phrase is in the immediate scope of
the matrix past tense.

        This is not the case when a noun is modified by a relative clause. Relative clauses
(in English) are tensed, and therefore their temporal interpretation is determined by their
tense. The structure of the relevant part looks like the following:

(22) a.   cat which was white

b. $\lambda x \lambda t[cat(x)(t) \ \& \ white(x)(t_j)]$[10]

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              cat              CP: λx[white(x)(tᵢ)]

                       whichₖ        TP

                            pastᵢ         VP

                                    tₖ
                                         (be) white
```

The time argument of the relative clause predicate is saturated by the time variable, and therefore its value is determined by the assignment function. The structure yields a simultaneous interpretation when the relative clause tense is co-indexed with the matrix clause tense.

3.2. The hypothesis

Given the difference between relative clause and simple nominal modifications, my hypothesis to explain the availability of the simultaneous interpretation in present tense relative clauses in Japanese can be stated as follows: Japanese present tense relative clauses have a structure that looks more like (18b) than (22b) in the relevant respect. And therefore the time argument slot of a predicate in a present tense relative clause may be unsaturated, as in the denotation of (18b).

I will first argue that what we have been calling 'the present tense' (-*i*, -*na*, and -*u* endings) in Japanese has no semantic content. It is not tense at all. This is in accordance with traditional classification of these endings. They are called *rentai-kei* (noun moddifying form). They are considered to be part of conjugation of adjectives, adjectival nouns, and verbs respectively, which are used when a stem is followed by a noun. For instance, *siro* is the stem of the adjective 'white'. When it is followed by negation -*nai*[11], we have *siro-ku-nai*. When it is followed by the past tense -*ta*, we have *siro-kat-ta*. When it is followed by a noun, we have *siro-i N*. The middle part of the first two forms, i.e., *ku* in *siro-ku-nai* and *kat* in *siro-kat-ta*, are part of adjective conjugation, and are not associated with any meaning. Similarly, *i* in *siro-i* is considered to have a function parallel to *ku* and *kat*. Looking at these endings this way, there is no reason to believe that these endings are tense morphemes.

Semantically, this claim is probably impossible to prove in languages like Japanese, where a predicate with one of these endings can describe an event occurring at a past,

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[10]To get the intersection of *cat* and *which was white*, we need a rule like the following:
Individual identification (Cf. Kratzer 1994)
If α is a branching node and β and γ its daughters, and β denotes a function f of type $<e,<i,t>>$ and γ a function g of type $<e,t>$ then α denotes a function h of type $<e,<i,t>>$ such that for all $t \in D_i$ and $x \in D_e$, $h(x)(t) = 1$ iff $f(x)(t) = 1$ and $g(x) = 1$
[11]*Nai* is further decomposed into *na* (the stem) +*i* (conclusive ending) and is morphologically an adjective.

present, or future time, depending on a tense that takes scope over it. The hypothesis that says that these endings are the present tense but that they are relative tense, and my claim make the same prediction.

If these endings have no semantic content, what happens when predicates with these endings are not embedded? In such a case, sentences denote properties of times rather than truth values. How do we know that sentences like (23) makes the claim that the relevant boy has the property of crying at the speech time rather than some other time? I argue that full-fledged sentences have the speech time variable t^* as their evaluation time. Thus sentences like (23a) have the structure in (23b), and we correctly predict that when a present tense sentence appear unembedded, sentences are evaluated with respect to the speech time.

(23)   a. otokonoko-ga naiteiru
            boy-nom   cry-teiru-pres
            'A boy is crying'

    b.   TP
                 ╱‾‾‾‾‾╲
            VP t^*
        ╱‾‾‾‾╲
    NP   **naiteir-u**
 ╱‾‾‾‾╲
otokonoko-ga
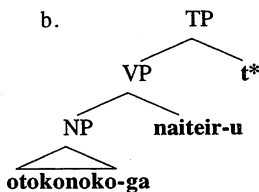
If this is the right way to analyze the present tense in non-SOT languages, we can attribute the observed difference between Japanese on the one hand and Polish and Russian on the other in the temporal interpretation of relative clauses to a structural difference of relative clauses between them. Relative clauses in Polish and Russian necessarily project up to CP and therefore involve the speech time variable whereas those in Japanese do not.

Is there any evidence to support this? It is easy to see the structure of relative clauses in Polish and Russian. Relative clauses in these languages are formed with a relative pronoun and the rest of a clause, as in (24) and (25). Under the standard assumption, relative pronouns move overtly to Spec CP. We can thus conclude that relative clauses in these languages are CPs.

(24)   Ania spotkala   člopca, ktory placze   (P)
        Ania meet/past/imp boy   who cry/pres
        'Ania meet a/the boy who is (now) crying'

(25)   Maša videla   čeloveka, kotoryi plačet   (R)
        M   see/past/imp man   who   cry/pres
        'Masha saw a/the man who is (now) crying'

What about Japanese? Japanese does not have an overt relative pronoun. Perlmutter (1972) and Murasugi (1991) argue that Japanese relative clauses may be formed without

movement of a relative pronoun at all. Their argument comes from Kuno's (1973) observation that relative clauses are not islands in Japanese. The example (26a) contains one relative clause that modifies the subject noun *yoohuku* 'suit'. In (26b), another relative clause is formed to modify the noun inside the original relative clause. Similarly, (27b) is a case of relativization out of an adverbial clause.

(26) a. [sono sinsi-ga   kiteiru]   yoohuku-ga yogoreteiru
         that gentleman-nom wear-teiru-pres suit-nom   dirty-teiru-pres
         'The suit which that gentleman wears is dirty'

      b. [[kiteiru]   yoohuku-ga yogoreteiru]   sinsi   (-ni atta)
         wear-teiru-pres suit-nom   dirty-teiru-pres gentleman (-dat meet-past)
         '(I met) a gentleman whose suit is dirty'
         (Lit. (I met) a gentleman who the suit (he) wears is dirty)

(27) a. [sono hito-ga   sinda] node   minna-ga naita
         that person-nom die-past because all-nom   cry-past
         'Everybody cried because that person died'

      b. [[sinda] node   minna-ga naita]   hito   (-wa Taroo-da)
         die-past because all-nom   cry-past person (-top T-copula)
         (Lit. The person who, because (he) died, everybody cried (is Taroo))

The corresponding English sentences are ungrammatical, as shown below:

(28) a. * I met the gentleman who$_i$ the suit t$_i$ wears is dirty
      b. * The person who$_i$ because t$_i$ died everybody cried is Taroo

The English fact is attributed to a constraint that prohibits movement out of an island. Assuming that such a constraint is universal, Perlmutter (1972) and Murasugi (1991) conclude that Japanese relative clauses are not formed by movement of (covert) relative pronouns, but by base-generating *pro*. If so, Japanese relative clauses do not have to have a full-fledged CP structure.

If not having a full-fledged CP allows the possibility of not projecting the speech time variable t^*, and what we call the present tense in Japanese has not semantic content, there is nothing to saturate the time argument slot of a predicate in relative clauses. So in this respect, Japanese present tense relative clauses are like tenseless clauses (such as English participles). We have already seen that the temporal interpretation of a tenseless predicate is determined by the tense immediately dominating it. Thus we correctly predict the availability of the simultaneous interpretation in present tense relative clauses in Japanese.

4.   Participles in Russian

I have argued that Japanese present tense relative clauses are like tenseless predicates. I.e., the time argument of the predicate is not saturated, and therefore its temporal interpretation

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is dependent. The analysis captures the similarity between participles in English and present tense relative clauses in Japanese in their temporal interpretation. It is further supported by an interesting contrast between relative clauses and participles in Russian. Like English, Russian relative clauses and participles are clearly overtly distinguishable. Participles have their own unique inflection, different from the ones we find in relative clauses, and they have Case agreement with their modifiees. Moreover, there are no overt elements like relative pronouns that fill the gap position. What interests us especially is that participles in Russian are 'tensed'. The following English sentence may be translated into Russian using present and past participles, as in (30).[12]

(29)   Mary met the child laughing from joy

(30)   a. Maša videla   rebjenka, smej-ušč-egosja   ot   radosti
           M   see/past/imp child   laugh-part/**pres**/act-sing/mas/acc from   joy

        b. Maša videla   rebjenka, smej-aš-egosja   ot   radosti
           M   see/past/imp child   laugh-part/**past**/act/imp-sing/mas/acc from joy

The participle used in the (a) example is called a present-active participle and the one in the (b) example is called a past-active participle. This present/past contrast should not be confused with present/past participles in English, i.e., the '-ing' form in phrases like *the boy crying like a baby* and the '-en' form in phrases like *the talk given by Barbara*. This English type contrast is called active/passive contrast in traditional Russian grammar, and the ones in (40) are both active participles. In Russian the difference in present and past participles results in a difference in temporal interpretations.

Interestingly, 'present tense' participles like (30a) do allow a simultaneous interpretation. (Past tense participles like (30b) allow a simultaneous interpretation, too.) This contrast with 'present tense' relative clauses, which only allow the speech time interpretation (cf. the contrast between (12a) and (12b)). This is expected under our analysis; it is not the present tense itself that induces the speech time interpretation but the presence of the speech time variable, which under our assumption depends on whether the relevant structure is a full-fledged CP.
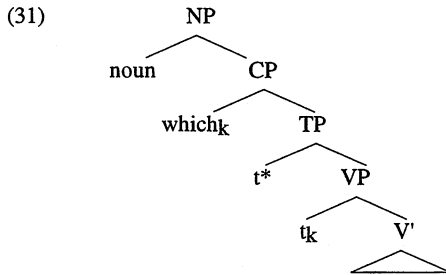
5.   Relative clauses vs. complement clauses

I have argued that the surprising difference between present tense relative clauses in Japanese on the one hand and Polish and Russian on the other is not due to semantic differences in the present tense in these languages. These languages are all non-SOT languages, and the present tense in these languages has the same property; it is semantically vacuous. What is different is the structure of relative clauses. In Polish and Russian, relative clauses are necessarily CPs while in Japanese they are not. I attributed the difference in the temporal interpretation of relative clauses in these languages to this particular difference. The analysis has a nice consequence; it captures the fact that Japanese

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[12]The data are from Kondrashova (1992). I thank natalia Kondrashova for discussion on the data.

relative clauses, Russian present tense participles, and English participles all exhibit the same range of temporal interpretations.

The analysis has a serious problem, however. If nothing more is said, it completely fails to capture the behavior of the present tense in clausal complements. Here is why: the speech time interpretation of relative clauses in Polish and Russian is attributed to the obligatory presence of the speech time variable in CPs, as shown below:

(31)

$$
\begin{array}{c}
\text{NP} \\
\text{noun} \quad \text{CP} \\
\text{which}_k \quad \text{TP} \\
t^* \quad \text{VP} \\
t_k \quad \text{V'}
\end{array}
$$

Now consider the structure of clausal complements. It should look like the following:

(32)

$$
\begin{array}{c}
\text{VP} \\
\text{V} \quad \text{CP} \\
\text{TP} \\
t^* \quad \text{VP}
\end{array}
$$
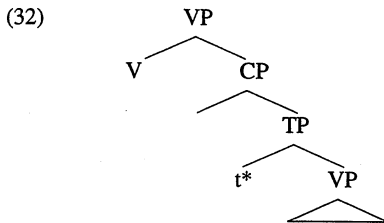
If CPs necessarily contain the speech time variable, whose value is determined by the context, it wrongly predicts that the simultaneous interpretation is not available in clausal complements in Polish and Russian (and Japanese).

In fact, the problem is not about yielding the interpretation we want. The above structure is not interpretable. This is because constituents like the CP in (32) denote truth values and they are not what propositional attitude verbs take as their object. For instance, Ogihara (1989, 1996) and Abusch (1994, 1997) among many others argue that propositional attitude verb require properties of times as their object, as shown in (33).

(33) $[[\textbf{say/believe}]]^{g,c} = f: D_{<i,<s,t>>} \rightarrow D_{<e,<i,<s,t>>>}$
For all $p \in D_{<i,<s,t>>}$, $x \in D$, $t \in D_i$ and $w \in D_s$, $f(p)(x)(t)(w) = 1$ iff for all w' and t' that are compatible with what x says/believes in w at t, $p(t')(w') = 1$

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We have to assume that we can abstract over t*.[13] Furthermore, we have to assume that this option is not available to relative clauses. Or else, we lose the correct predictions.

Let us for the moment forget about the very stipulative nature of this claim. Is this hypothesis any different than the hypothesis I considered briefly in section 2? There we encountered a puzzle about the behavior of the present tense in Polish and Russian, which is like Japanese in clausal complements and like English in relative clauses. The hypothesis says that children learning Polish or Russian learn the semantics of the present tense is sensitive to the distinction between clausal complements and relative clauses. The current hypothesis says exactly the same thing except that the relevant lexical item is not the present tense morpheme but $t*$. If so, the current hypothesis is nothing more than a restatement of the one considered in section 2.

I would like to argue that the current hypothesis in fact draws a different picture, when we consider the status of $t*$ in other languages. Typologically, what the current hypothesis should say is the following: (i) it maintains the two-way typological distinction among languages regarding the presence or absence of the SOT phenomena. Languages that exhibit the SOT phenomena have a non-vacuous present tense (instead they have a vacuous past tense) and languages that do not have a vacuous present tense. (ii) The speech time variable $t*$ has the same property in all languages. It can be bound in clausal complements and when it is not, it denotes the speech time.

The current hypothesis:
(i) 'the present tense' is semantically vacuous or non-vacuous (SOT or non-SOT)

English	Japanese/Polish/Russian
Non-vacuous	vacuous

(ii) t* may be bound or free

	All languages
Relative clauses	*
clausal complements	ok

Cf. The old hypothesis considered in section 2.

|	English	Japanese	Russian/Polish
Relative clauses	*	ok	*
Complement clauses	*	ok	ok

Part (i) of the hypothesis need not be defended. Data clearly show that this distinction exists. In one way or another, language learners have to learn whether a present tense sentence embedded under a past tense can have a vacuous interpretation in a given language. So if part (ii) is defended, i.e., if it is universal, the current hypothesis is a much simpler one. Parametric variation of languages regarding tense is limited. They either fall into SOT or non-SOT languages.

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[13]To allow abstraction, we also have to change the semantics of $t*$.

We have already seen that the facts in Polish and Russian follows if we stipulate (ii). In what follows, we will see how t^* should be treated in other languages. Recall that the variable t^* is different from the present tense. It acts as the evaluation time of a clause, and therefore it appears in past tense clauses, too. One empirical advantage to have an overt variable denoting the evaluation time is this. Consider the following examples:

(34)   a. Hillary married a man who became the president of the U.S.
       b. Who hired the person who wrote this article?

These examples have what I call a later-than-matrix interpretation.[14] We understand that the sentence (34a) is true in our world, i.e., in a world in which Hillary married a man who later became the president. Similarly, we most naturally understand from the question (34b) that the person wrote the relevant article after being hired. That is, in both examples, we understand that the matrix event time precedes the relative clause event time. In a system like ours, such intuitions can be accounted for in the following way: both matrix and embedded past tenses are interpreted relative to the speech time. This is done by generating the speech time variable t^* as the evaluation time of both tenses, as shown below. We get the truth conditions in (35b).

(35)   a.

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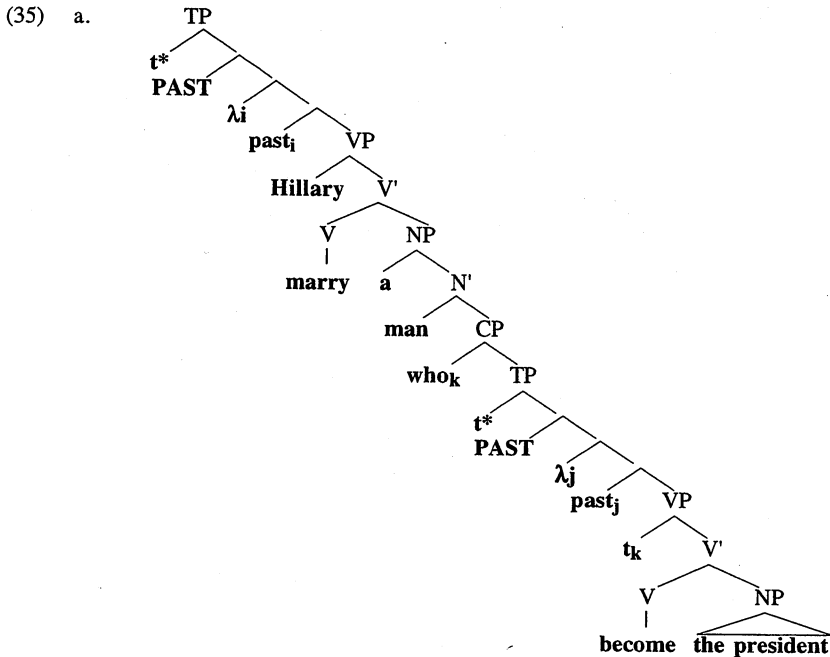
[14]The term is suggested by Barbara Partee (p.c.).

    b. $[[(\mathbf{35a})]]^{g,c} = 1$ iff there is a time t' such that $\underline{t' < s^*}$ and there is a man x at t'
       and Hillary marries x at t' and there is a time t" such that $\underline{t'' < s^*}$ and x becomes
       the president at t".

According to the truth conditions above, the matrix event time and the relative clause event time are ordered only with respect to the speech time, but crucially not with respect to each other. Thus, the situation in which the matrix event takes place before the relative clause event is compatible with the truth conditions, correctly predicting our intuition.

    If we did not have the object language evaluation time, and try to derive these truth conditions, we will have to move the object noun phrase containing the lower past tense above the matrix past tense. I argued in Kusumoto (1999) that such an analysis of tense in relative clauses faces scope paradox.

    What happens when we embed sentences like (34) under a propositional attitude verb?

(36)   a. Elliott said that Hillary married a man who became the president
        b. Ana asked who hired the man who wrote this article

The event time of the predicates of the most embedded clauses can still be understood to follow the event time of the intermediate predicates (the marrying time and the hiring time respectively). In order to derive the right truth conditions, we have to allow both occurrences of t^* in the embedded clauses to be bound by a lambda abstractor generated under the attitude verb.

    The same argument can be constructed in Japanese. The following sentences allow the same range of temporal interpretations as the English counterpart.

(37)   a. Elliott-wa [Hillary-ga (notini) daitooryo-ni natta   otoko-to
         E-top   H-nom   later   president-dat become-past man-with
         kekkon sita   to]   itta
         marriage do-past comp say-past

        b. Ana-wa [dare-ga   kono kizi-o   kaita   hito-o   yatotta ka]
         A-top   who-nom this article-acc write-past person-acc hire-past Q
         tazuneta
         ask-past

This shows that if our tense system is one in which the evaluation time is explicitly represented, the time variable t^* has to be bound in propositional attitude contexts in all these languages.

    This follows from interpretability. Unless a lambda abstractor is inserted and abstracts over t^*, structures like (32) are not interpretable. But if such an operation is freely admitted, we make the wrong prediction regarding relative clauses in Polish and Russian. We should not allow the speech time variable to be abstracted over in present

tense relative clauses in Polish and Russian. I do not have a good answer to this at this point. Perhaps the best way is to say that lambda abstraction is not free; it can only be allowed when interpretability calls for it.[15]

6. Concluding remarks

In this paper, I only looked at the behavior of the present tense under a past tense. This is partly because there is an interesting cross-linguistic pattern in this context. As I briefly mentioned, the present tense behaves very differently under the future. And interestingly, cross-linguistic difference (among English, Japanese, Polish, and Russian) disappears. Whether the current hypothesis makes the right prediction there depends on what feature that distinguishes clausal complements and relative clauses is relevant. In this paper, I argued that they differ in that the former is selected by a particular type of verbs (which require elements of type $<i,<s,t>>$ and that this is relevant to whether $t*$ behaves like an indexical. If this is the right distinction, we predict that a present tense relative clause under the future in Polish and Russian necessarily yields the speech time interpretation. This is wrong. A present in a relative clause under the future can have a simultaneous interpretation. But there is another relevant difference. Clausal complements are referentially opaque (intensional) contexts while relative clauses are not. Abusch (1994, 1997) argues that this distinction is relevant to tense interpretation. If this one is the right distinction, and if the future is an intensional operator, we expect that embedded contexts under the future and under propositional operator are similar. In Polish and Russian, this is correct. But we also predict that intensional transitive verbs behave like propositional attitude verbs, which is not the case in Polish and Russian. If neither argument/adjunct nor intensional/extensional distinction alone can make the correct prediction, how else can clausal complements and relative clauses differ? Much more work needs to be done to capture cross-linguistic pattern of tense interpretation in both past and future contexts.

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[15] Alternatively, we may be able to derive the difference between relative clauses and propositional attitude contexts in the following way. If Schlenker (1999) is right, and propositional attitude verbs quantify over sets of contexts, we will need a rule like the following (a version of Intensional Functional Application from Heim and Kratzer 1998) in order to combine a propositional attitude verb and its object clause.

(i)   If α is a branching node and $\{\beta, \gamma\}$ the set of its sisters, then for any context c and any assignment g if $[[\beta]]^{g,c}$ is a function whose domain contains $\lambda c'[[\gamma]]^{g,c'}$, then $[[\alpha]]^{g,c} = [[\beta]]^{g,c} (\lambda c'[[\gamma]]^{g,c'})$

Since the speech time variable $t*$ is a context dependent element, shifting context gives us the right result. Moreover, a rule like this is of no use in relative clause modification since nothing is a quantifier over sets of contexts. Thus we correctly predict that $t*$ cannot be shifted in relative clauses.

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