Tense in compositional semantics: introduction

Some basic questions

• What are sentence meanings, given that truth-value varies with utterance time?
• Tense morphemes, temporal auxiliaries: what do they mean?
• Lexical entries for verbs: where and how does time come in? Different answers for different classes of verbs?
• Non-verbal predicates (nouns, adjectives, prepositions): same questions as for verbs
• Temporal adverbs and adverbials: What kinds are there? What do they mean? What is their internal structure/composition?
• Temporal adverbials: Where do they fit in the structure, what do they contribute?
• Combinations of tense morphemes/temporal auxiliaries in the same clause: syntactic or semantic constraints on possible combinations
• Embedded tenses: are they syntactically and semantically like unembedded ones?

A first proposal

Meanings for verbs and other predicates:
Verbs etc. have an extra argument place for a time, e.g.

\[
[[\text{asleep}]] = \lambda t \in T. \lambda x \in D. x \text{ is asleep at } t
\]

\[
[[\text{arrive}]] = \lambda t \in T. \lambda x \in D. x \text{ arrives at } t
\]

\(T := \text{the set of all moments of time}\)

The elements of \(T\) are ordered by the relation \(<\) (read 'precedes').

Alternatives?

1. \(T = \text{the set of all time intervals}\)

What does "at t" mean in this case?

2. Time-argument is the outermost argument instead of the innermost one:

\[
[[\text{asleep}]] = \lambda x \in D. \lambda t \in T. x \text{ is asleep at } t
\]
3. Verbs have an argument place not for a time, but for something which uniquely determines a time, e.g. an eventuality (event or state) (Davidson).

\[[\text{asleep}]\] = λe. λx ∈ D. e is a state of x being asleep

4. Extension-at-a-time as the basic semantic relation:

\[[\text{asleep}]\]t = λx ∈ D. x is asleep at t

Semantic composition inside the tenseless clause:

The verb's time argument is projected in the syntactic representation as a phonetically empty time-variable.

```
VP
  \[
    \text{John} \ 
    \text{be} \ 
    \text{asleep \ t}
  \]
```

By standard principles (semantics for variables, functional application, vacuity of *be*), this structure is true under a given assignment \(g\) iff John is asleep at \(g(t)\).

Alternatives?

1. If time-argument is outermost, it may not have to be projected. VPs are predicates of times then (they denote functions from times to truth-values).
2. If all extensions are relativized to times ....

Temporal affixes and auxiliaries:

Syntax (after Chomsky 1957):

```
Tense
  Modal
    have (+en)
      be\text{PROG} (+ing) VP
```

Indexing convention: Each head binds a time-variable in the head right below.
Relevant morphemes in each syntactic category:

Tense: \textbf{PAST}, \textbf{PRES}

Modal: \textit{woll}

Lexical entries:

\begin{align*}
[[ \text{PAST} ]] &= [[ \text{have} ]] = \lambda t \in T. \lambda P \in \{0,1\}^T. \exists t' < t: P(t') = 1 \\
[[ \text{woll} ]] &= \lambda t \in T. \lambda P \in \{0,1\}^T. \exists t' > t: P(t') = 1 \\
\text{PRES}: \text{semantically vacuous}
\end{align*}

Morphological spell-out:

\begin{align*}
\text{PRES} + \text{leave} &\not\in \text{leave or leaves} \\
\text{PAST} + \text{leave} &\not\in \text{left} \\
\text{PRES} + \text{woll} &\not\in \text{will} \\
\text{PAST} + \text{woll} &\not\in \text{would} \\
\text{PRES} + \text{have} &\not\in \text{have or has} \\
\text{PAST} + \text{have} &\not\in \text{had}
\end{align*}

Time-sensitive sentence meanings:

Free time-variables refer to the utterance time (cf. pronouns).

Alternatives?

1. Sentences express \textit{predicates of times}. Pragmatic convention: If you utter a predicate of times assertively, you thereby claim that it is true of the utterance time.
Syntax(?): all clauses, including root clauses, contain a complementizer which binds a time-variable.

2. Truth-at-an-instant as the primitive semantic relation.

Temporal adverbials:

Temporal adverbials are predicates of times. Their internal structure and semantic composition varies. Simplest case: preposition + referring term.

- **on my birthday**
- **in 1967**

Preposition need not be overt: 'yesterday' = ON yesterday, 'last year' = IN last year.

Syntax: adverbial phrase has an internal subject, which is a time-variable.

Modification = conjunction.

This structure is true under an assignment g iff John is asleep at g(t) and g(t) is located on my birthday.
1. Preliminaries and clarifications

1. Why do we need intervals?

Standard argument for interval semantics, based on accomplishments. (See e.g. Bennett & Partee, Dowty, Cresswell ch. III.)

(1)  John build(t) a house

Suppose John builds exactly one house in his life. He starts building at $t_0$ and finishes at $t_1$.

Which values for $t$ make the tenseless clause (1) true?

First answer: $t_0$, $t_1$, and every moment in between

(2)  John built a house.

LF: \[ \text{PAST}(t') \ \lambda t [\text{John build}(t) \ \text{a house}] \]

predicted truth-condition: \[ 1 \leq t < s^*: [[\text{John build}(t) \ \text{a house}]]_{[t \otimes t]} = 1 \]

Given the first answer, we incorrectly predict that (2) can be uttered truly before the house is finished.

Second answer: only $t_1$

Given the second answer, we derive wrong predictions for (3).

(3)  John will build a house.

LF: \[ \text{PRES} \ [\text{woll}(t') \ \lambda t [\text{John build}(t) \ \text{a house}]] \]

predicted truth-condition: \[ 1 \leq t > s^*: [[\text{John build}(t) \ \text{a house}]]_{[t \otimes t]} = 1 \]

Solution: Only the complete interval $(t_0, t_1)$ is a verifying value for $t$ in (1).

Another argument is due to Stump, who considers example (4):

(4)  John averaged 60 mph.

More reasons for interval semantics emerge when we consider quantification. See Cresswell and below.

\[ ^1 s^* := \text{the utterance time (see Ogihara)} \]
1.2 Relative scopes of tense and the subject

The LFs I drew last time presuppose that the subject is generated inside VP and reconstructed back there at LF. The reconstruction is presumably not obligatory. In the simple examples we have looked at so far, leaving the subject above tense and having it bind a variable in its base position would yield an equally interpretable LF with identical truth-conditions.

Aside from standard reasons for VP-internal subjects, there are specific arguments for the claim that tense takes scope over the subject position. Ogihara's analysis of SOT provides one such argument. See below.

1.3 How many different time variables do we need?

Suppose the language of LFs contained just one time-variable. All the LFs we have written so far could be equivalently rewritten in accordance with this constraint. There would even be a potential advantage: It would be automatic that the time-argument of a verb and the implicit subject of its PP-modifier are "coindexed".

Is there evidence that we really need more than one time-variable?

.....

2. Achievements of the current analysis

2.1 Semantic compatibility of tense and time adverbial

(5) *John left tomorrow.

(6) \exists t < s*: [John leaves at t & t is on the day after s*]

contradiction!

Even though we analyzed the present tense as vacuous, we correctly predict that it, too, imposes compatibility requirements on cooccurring adverbials.

(7) *John is asleep yesterday.

(8) John is asleep at s* & s* is on the day before s*
We also predict that the negations of these deviant sentences (e.g. 'John didn't leave tomorrow') are tautologies. Is that okay? Shouldn't both (5) and its negation come out as deviant somehow, perhaps presupposition failures?

Suppose you don't know whether Mary's housewarming party was last weekend or is coming up next weekend. You do know that there was or will be food at the party.

(9) There won't be food at the party.

(9) is predicted to convey the information that the party is past. Compare:

(10) It is not the case that there WILL be food at the party - there WAS food at the party.

What sort of syntax/semantics would we need to derive appropriate presuppositions?

Semantics: Tenses are presupposing restricted existential quantifiers. They presuppose the non-emptiness of their restrictor set.

Syntax: Time adverbial is not conjoined with the nuclear scope of the tense, but appears in its restrictor.

2.2 Multiple time adverbials

(11) He called at 5 o'clock on a Monday when I was in the hospital.

There are actually many different ways to generate the right meaning for (11). We can have three separate adverbials, each adjoined to VP. Or we can generate some of the adverbials as parts of another adverbial. The results are equivalent.

2.3 Complex tenses and attachment of adverbials

(9) She had left at 3pm.
(10) expresses "event time modification": its truth requires a leaving at 3 pm.

(11) expresses "reference time modification": its truth requires a leaving before 3 pm.

(Question raised by Hornstein, Thompson: What rules out "speech time modification"? In our terms: why can't the adverbial adjoin to TP?)

Some of Thompson's data:

VP-fronting:

(12) ... and left the store at 6 pm he had.

only event time modification

Condition C:
Mary had seen him at the time that John presented his paper.
only Reference time modification with coreference

3. Tense without existential quantification?

3.1 Partee's stove and the "referential" theory of tense

"The deictic use of the Past tense morpheme appears in a sentence like (3):

(3) I didn't turn off the stove.

When uttered, for instance, halfway down the turnpike, such a sentence clearly does not mean either that there exists some time in the past at which I did not turn off the stove or that there exists no time in the past at which I turned off the stove. The sentence clearly refers to a particular time - not a particular instant, most likely, but a definite interval whose identity is generally clear from the extralinguistic context."
(Partee 1973, pp. 602 - 603)

Partee's example has sometimes been taken to indicate that past tense sentences do not involve existential quantification over times, but instead involve reference to a particular time. (Enç? Abusch 1994 and forthcoming?) Here is an implementation of this idea: The past tense morpheme is a time variable. It occupies the verb's time argument slot at LF. If it remains free, it receives a value from the utterance context. Its possible values are constrained to times preceding the speech time. (Analogy: free personal pronouns, constrained by their gender, person, number features to referents with certain properties.)

(a) I turned off the stove.
(b) LF: I [ [ turn-off PASTt ] the stove]

An utterance of (14b) is felicitous in a context c only if c supplies a variable assignment gc such that gc(t) is an interval which precedes the time of c. If felicitous in c, the utterance of (14b) in c is true if the speaker of c turns off the stove at gc(t), and false otherwise.

Problem: The intervals at which someone turns off the stove (if any) are very short intervals (perhaps moments). It is not intuitively correct that a felicitous utterance of (14a) requires the speaker to have a particular such short interval in mind (and the hearer be able to identify it). Partee, in fact, notes this explicitly.

There are (at least) two possible solutions to this problem:
First solution: Change lexical entries for verbs (such as turn off), so that \([\text{turn-off}]_{(t)(y)(x)} = 1 \text{ iff } x \text{ turns } y \text{ off in } t\). ("in t" as opposed to "at t".) This amounts, in effect, to building existential quantification over times into the lexical meaning of the verb. ("in t" means "at some time in t".)

Second solution: Return to the existential analysis of the tense. But to account for Partee's observation, assume that the existential quantifier has an implicit contextually supplied restriction. (This is familiar from the study of quantificational determiners. See Westerståhl, von Fintel.) Here is one implementation (based on v. Fintel): Tense morphemes take an additional argument, which is a free variable ranging over sets of times. This free variable receives a value from the utterance context. Typically, it will pick out the set of times that are part of a certain salient interval.

\[
(15) \quad [[\text{PAST}]] = \lambda P. \lambda t. \lambda Q. \exists t' < t \ [ P(t') = 1 \& Q(t') = 1 ]
\]

\[
(16) \quad \text{LF:}
\]

\[
\begin{align*}
\text{Tense} & \quad \lambda t' \quad \lambda Q. \exists t' < t \ [ P(t') = 1 \& Q(t') = 1 ] \\
\text{PAST } & \quad \lambda t' \quad \lambda \text{VP} \\
\text{I} & \quad \lambda t \\
\text{turn-off} & \quad \lambda t' \quad \lambda \text{the stove} \\
\text{the stove} & \quad \lambda t'
\end{align*}
\]

If each temporal morpheme comes with its own contextual restriction, we can also give a better description of the meanings of complex tenses.

(17) John had left.

\[
PAST_{C_1}(t) \lambda t' [ \text{have}_{C_2}(t') \lambda t'' [\text{John leave}(t'')] ]
\]

3.2 Bäuerle & v. Stechow against the existential analysis of tenses

(18) John called yesterday.

(19) John called exactly once yesterday.

\[2\text{See Ogihara, p. 44ff.}\]
If the past tense comes with its own built-in existential quantifier, then (19) contains two quantifiers: the covert one in PAST and the overt 'exactly once'. This looks problematic. Consider the following paraphrases:

(18') There is a past time in yesterday at which John calls.

(19') There is exactly one past time in yesterday at which John calls.

(19') seems to contain just one quantifier. It looks as if the overt adverb in (19) takes the place of the existential quantifier that is understood in (18). This suggests that the tense perhaps contributes only a predicate, which then restricts either an overt adverb or - if there is none - a default existential quantifier. This implies a rather different syntax and semantics for tense than we have been assuming.

But before we change the analysis, let us take a closer look at what it really predicts for (19).

We have to make several decisions here: (a) What does \textit{exactly once} mean? (b) What is the structural relation between \textit{exactly once} and \textit{yesterday}? (c) What are the scope-relations among the various elements?

There is a least one plausible structure for (19) that correctly expresses the desired meaning. Suppose that 'exactly once yesterday' is a single complex adverbial, and that it has essentially the internal structure of 'at exactly one time(-interval) in yesterday.' Suppose further that the quantifier 'exactly one time in yesterday' takes maximal scope. Then we get the LF in (20).

(20)

![Diagram]

Interpretation of (20):
(21) there is exactly one time t'' in yesterday such that:
   \[ \exists t < s^*: \text{[John calls at t & t is at t']} \]

If 'is at' amounts to '=' , then this reduces to:

(22) there is exactly one time t'' in yesterday such that t'' < s^* & John calls at t''

We see here that even though the tense contributes its own existential quantifier, the predicted meaning is the one of the paraphrase in (19'). The extra tense-inherent quantifier is not necessarily a problem.

Excursion on Ogihara's discussion of 'exactly once': Ogihara seems to take for granted that 'exactly once' means 'in exactly two intervals' rather than 'at exactly two intervals'. This is why he immediately dismisses an LF analogous to my (20) above. Indeed, if at in (20) were replaced by in, the resulting structure could not possibly be true. (Every calling-time is included in infinitely many larger intervals.)

Is there evidence that the silent preposition in exactly once is at rather than in? Consider:

(25) He called on exactly one weekend.

(26) Every weekend I waited for him to call, and almost every weekend I was disappointed. Only once did he actually call. (In fact, on that exceptional weekend, he called twice.)

End of excursion.

(20) correctly represents the meaning of (19), but this, of course, does not suffice to show that our analysis has no problem with this sentence. What happens if yesterday is generated in a different position, and/or the exactly-quantifier is construed with narrower scope? As it turns out, generating yesterday as a separate adjunct of VP doesn't lead to any new readings. But giving exactly one time narrow scope (below the tense) makes a difference, and the additional reading obtained in this way is not one that sentence (19) has.
It takes a bit of calculation to see what (23) means. As it turns out, it means (24), so **exactly once** ends up making no semantic contribution at all.

(24) \( \exists t < s^* \ [ \text{John calls at } t \land t \text{ is in yesterday}] \)

To summarize: The correct meaning is obtained if the frequency adverb takes scope over the tense. But why a lower scope is not available is not obvious.

If we look at more examples, it turns out that all quantifiers (not just adverbial ones) seem to unambiguously take wider scope than tense. Consider Cresswell's example (27).

(27) John polished every boot.

If we give **every boot** maximal scope, we obtain (28).

(28) \( \forall x [\text{boot}(x) \land \exists t < s^*: \text{John polishes } x \text{ at } t] \)

If, on the other hand, we keep the scope of **every boot** below the tense, we get (29).

(29) \( \exists t < s^*: \forall x [\text{boot}(x) \land \text{John polishes } x \text{ at } t] \)

(29) can only be true if John polished all the boots at exactly the same time. The English sentence does not have a reading which requires this.
3.3 Non-symmetric quantifiers

(30) John called every Monday.

Our analysis allows two LFs, (31) and (32).

Widest scope for past tense:

(31) \( \text{PAST}(t) \lambda t'[\text{every Monday} \ \lambda x [\text{John call}(t') \ & \ t' \ on \ x] ] \)

(31) says that there is a past time at which John called and which contains every Monday. This is clearly a non-starter.

So far, this is just another example that shows that quantifiers always scope over tense. But in this case, we find that the other possible LF is also not quite right to represent the intuitive meaning of (30). See Ogihara 1994.

Widest scope for every Monday:

(32) \( \text{every Monday} \ \lambda x [\text{PAST}(t) \lambda t'[\text{John call}(t') \ & \ t' \ on \ x] ] \)

(32) says that every Monday contains a time before the utterance at which John calls. Problem: This entails that every Monday precedes the utterance time.

If the every-phrase happens to be contextually restricted to Mondays in the past, the structure in (32) is adequate. But why does it have to be so restricted? The past tense is somehow responsible for this, but our analysis does not explain how.

3.4 Quantifiers and present tense

(33) John calls every Monday.

Here we get a more severe problem. On our current assumption that \( \text{PRES} \) is semantically vacuous and that free time-variables refer to the utterance time, the relative scope of \( \text{PRES} \) w.r.t. to every Monday is irrelevant, and the only meaning we generate for (33) is (34).

(34) \( \forall x [x \text{ is a Monday} \ O [\text{John calls at s*} \ & \ s* \ is \ on \ x] ] \)

This means that John calls at the utterance time and the utterance time is part of every Monday.

Would it help to revise the analysis of \( \text{PRES} \)? Maybe it is not, after all, vacuous. But what should we take it to mean?


(35) \[ [[\textsc{PRES}]] = \lambda t. \lambda P. \exists t' \in t: P(t') = 1 \]

This is no help. Ditto if we replace "\(\in\)" by "\(=\)", "\(]\)", or "overlaps". Nothing short of (36) would help us get the truth-conditions of (33) right.

(36) \[ [[\textsc{PRES}]] = \lambda t. \lambda P. \exists t': P(t') = 1 \]

But with (36), we would lose the desirable predictions we have been making about compatibility of present tense with time adverbials. Recall (7).

(7) John is asleep yesterday.
I. Tense, adverbials, and quantifiers continued

1. Observations we have arrived at

1. When there is quantification (whether adverbial or determiner quantification), there is an existential quantifier over event-times that takes scope below all other quantifiers.

2. Tense constrains the interval in which the entire quantificational generalization obtains, not the individual times that are being quantified over.

2. Existential quantification over event-times in the lexicon?

Official lexical entries:

(1) \[[\text{call}]\] = \(\lambda t. \lambda x. x \text{ calls at } t\)

Alternative lexical entries:

(2) \[[\text{call}]\] = \(\lambda t. \lambda x. \exists t' \ (t \text{ calls at } t')\)
   i.e., \[[\text{call}]\] = \(\lambda t. \lambda x. x \text{ calls in } t\)

Where does it make a difference?

(3) call on that day
   'call at a time on that day'
   'call in a time on that day'

(4) call before that day
   'call at a time before that day'
   'call in a time before that day'

(5) call one minute before the deadline
   'call at a time which is one minute before the deadline'
   \(\neq\)? 'call in a time which is one minute before the deadline'

(6) call exactly once (see above)

Lexical existential quantifier gives us (7). What we would like is (8).
3. What's the solution?

Ogihara's always (from Salt 4 paper, with trivial change of order of arguments):

\[
[[\text{always}]] = \lambda t. \lambda C. \lambda P. \forall t' \big[ \exists t'' \big] t' \cap C(t') = 1 \cup P(t') = 1
\]

If always is at every time in \( C \), how does (6) come about compositionally from at and every?

(7) he call at every time (in \( C \))

LF structure:

(8) every (C) time \( \lambda t'. \exists t'' [\big[ t \text{ he call}(t'') \cap t'' \text{ at } t' \big] ] \)

Standard meaning of every:

(9) \([[[\text{every}]]] = \lambda P. \lambda Q. \forall x \left[ P(x) \cup Q(x) \right] \)

Given (9), and if 'P' abbreviates \( \lambda t. [[\text{call}])(t)(j), (8) should mean (10):

(10) \( \forall t' \left[ C(t') = 1 \cup \exists t'' \big[ P(t') = 1 \cap t'' \text{ is at } t' \big] \right] \)

Given the meaning of at, (10) reduces to (11).

(11) \( \forall t' \left[ C(t') = 1 \cup \exists t \big[ t \cap P(t') \big] \right] \)

So what in (6) is unaccounted for? The portion of the restrictor that says that \( t' \big[ t \).
An meaning for on every Monday analogous to (6) would be (14):

(14) \[
[[\text{on every Monday}]] = \lambda t. \lambda P. \forall t' \quad \square t \land t' \text{ is a Monday} \quad \exists t''[t \land P(t'') = 1 \land t'' \text{ is on } t']
\]

equivalently (because t'' \square t follows from t'' is on t' \square t):

\[
\lambda t. \lambda P. \forall t' \quad [t \land t' \text{ is a Monday} \land \exists t'' [P(t'') = 1 \land t'' \text{ is on } t']]
\]

Again, the restriction t' \square t is unaccounted for by standard lexical meanings and composition principles.

Examples, with tense taking widest scope, and with quantifiers taking scope below tense and above existential closure.

(15) he called every Monday

(16) LF:
\[
PAST(t)
\lambda t' \quad [\text{every } t'' [\text{Monday}(t'') \land t'' \square t'] \land \\
\exists t''[t' \land \text{he call}(t'') \land t'' \text{ on } t'']]
\]

If t refers to speech time, (16) means the following: There is an interval before the speech time such that he called on every Monday within that interval.

(17) he polished every boot

(18) LF:
\[
PAST(t)
\lambda t' \quad [\text{every } x [\text{boot}(x)] \land \\
\exists t''[t' \land \text{he polish}(t'') \land x]]
\]

Interpretation: there is an interval before the speech time in which he polishes every boot.

Can we explain away the unexpected clause (t' \square t) the restrictor in (6) and (14)? Compare:

(12) (Last year) John called (on) every Monday.

(13) (Last year) John talked about every Monday.

In (12), every Monday is restricted to Mondays last year, in (13), it doesn't have to be. Why?
Sketch of an explanation: x call at t on t' presupposes that t is on t'. x talk at t about t' presupposes no particular relation between t and t'. Appropriate assumptions about presupposition projection in quantified structures ...

4. What about the present tense?

Option 1: PRES is vacuous, as before. Free time variables refer not to the utterance time, but to the "speaker's now". The speaker's now is an interval which surrounds the utterance time, but may be of any length.

Option 2: Free time variables refer strictly to utterance time, but present tense is not vacuous:

\[
[[\text{PRES}]] = \lambda t. \lambda P. \exists t' : P(t') = 1
\]

II. Tense in temporal adverbial clauses

1. 'when'-clauses as wh-clauses

when he called = (at/in) the/a time at/in which he called.

at which he called is a relative clause:

\[
\text{which}_{t_1} \ PAST(t_2) \ \lambda t_3 \ \exists t_4 \ \[\text{he call}(t_4) \ & t_4 \text{ at } t_1\]
\]

Interpretation:

\[
\lambda t_1. \exists t_3 < t_2. \exists t_4 \ [\text{he calls at } t_4 \ & t_4 \text{ is at } t_1] \\
\lambda t_1. \exists t_3 < t_2. \ [t_1 \ [\text{he calls at } t_1]] \\
\lambda t_1 \ [\text{he calls at } t_1 \ & \exists t_3 < t_2; t_1 \ [\text{he calls at } t_1]] \\
\lambda t_1 \ [\text{he calls at } t_1 \ & t_1 < t_2] \\
\text{the set of times before } t_2 \text{ at which he calls}
\]

after he called = after the/a time when he called

First hypothesis: The tense in the adverbial clause is interpreted relative to the utterance time. I.e., its time argument is a free variable, which refers to the utterance time. Then we derive the following predictions.
(20) He was home when I called.
′he was home at the time at which I called′
′there is a past time at which he is home and which is (at) the past time at which I call′  (ok)

(21) He left after I called.
′there is a past time at which he leaves and which is after the past time at which I call′  (ok)

(22) He left before I called.
′there is a past time at which he leaves and which is before the past time at which I call′  (ok?)

(23) He will be home when I call.
′he will be home at the time at which I call′
′there is a future time at which he is home and which is (at) the present time at which I call′ (bad)

(24) *He will be home after I called.
′there is a future time at which he is home and which is after the past time at which I call′  (bad)

Second hypothesis: The adverbial clause is in the scope of the matrix tense, and the time argument of the tense in the adverbial clause is bound by the matrix tense. This implies that the tense of the adverbial clause "counts from" the event time of the matrix clause.

(25) He was home when I called.
′there is a past time t at which he is home and which is (at) the time before t at which I call′  (bad)

(26) He left after I called.
′there is a past time t at which he leaves and which is after the time before t at which I call′  (ok)

(27) He left before I called.
′there is a past time t at which he leaves and which is before the time before t at which I call′  (bad)
(28) He will be home when I call.
   'there is a future time $t$ at which he is home and which is (at) the time simultaneous with $t$ at which I call'  (ok)

(29) *He will be home after I called.
   'there is a future time $t$ at which he is home and which is after the time before $t$ at which I call'  (bad)

Neither hypothesis makes all the right predictions.

Japanese (paradigm (16) in Ogihara 1994):

(30) lit.: He called her before he meets her.
   'he called her before he met her'

(31) lit.: He called her after he met her.
   'he called her after he met her'

(32) lit.: He calls her before he meets her.
   'he will call her before he meets her'

(33) lit.: He calls her after he met her.
   'he will call her after he meets her'

(34) lit.: He remembered his home town when he is sad.
   'he remembered his home town when he was sad'

(35) lit.: He probably remembers his home town when he is sad.
   'he will probably remember his home town when he was sad'

The Japanese pattern can be accounted for by the following two assumptions:

(i) PAST has the same meaning as we assumed for English, PRES means non-past (i.e., the disjunction of English present and future).

(ii) The time argument of the tense in the adverbial clause is always bound by the matrix tense.

What would the English paradigm look like if the only relevant differences between the languages were the following three?

(iii) Since English PRES does not allow futurate readings, some instances of Japanese PRES must be rendered as will in English.
(iv) English has a "Sequence of Tense" rule, which deletes PAST in the scope of PAST, and PRES in the scope of PRES. (Deletion takes place at LF and is optional.)

(v) Undeleted PRES in English always counts from the speech time.

It seems that we should then expect the following paradigm in English. (Where two possible forms are predicted, this is because of the optionality of SOT.)

(30') He called her before he would meet her.  
'he called her before he met her'

(31') (a) He called her after he had met her. 
(b) He called her after he met her.  
'hе called her after he met her'

(32') He will call her before he will meet her.  
'hе will call her before he meets her'

(33') (a) He will call her after he has met her. 
(b) He will call her after he met her.  
'hе will call her after he meets her'

(34') He remembered his home town when he was sad.  
'hе remembered his home town when he was sad'

(35') He probably will remember his home town when he is sad.  
'hе will probably remember his home town when he was sad'

III. Tense in complement clauses

Does the tense in the complement clause count from the utterance time or from the event time of the matrix clause? When the matrix is present, we can't see the difference. When the matrix is future, the second hypothesis fits the facts straightforwardly.

(1) He will say that he was sick.

(2) He will say that he is sick.

(3) He will say that he will call.
Attitude verbs and tenseless complement clauses

What happens to the time-argument of the verb in a tenseless clause? Consider ECM complements to verbs of believing:

(1) John believed it to be raining.

Evidently, the time-argument of *raining* does not remain free and refer to the utterance time. Something seems to bind it. What?

Proposal 1: the higher tense (or whatever binds the time-argument of *believe*)

Proposal 2: the verb *believe* itself, or the COMP it selects

Proposal 1

On this view, (1) amounts to (2). (tu := utterance time, wu := utterance world)

(2) $\exists t < t_u \ [ \text{believe}(w_u)(t)(\lambda w[\text{raining}(w)(t)](John))]$

In other words: there is a past time $t$ such that it is raining at $t$ in all worlds which conform to what John believes at $t$.

Consider these four worlds:

- $w_u$: rain from 3:55 to 4:05 am, John awakes at 4 am
- $w_1$: rain from 3:55 to 4:05 am, John awakes at 5 am
- $w_2$: rain from 4:55 to 5:05 am, John awakes at 4 am
- $w_3$: rain from 4:55 to 5:05 am, John awakes at 5 am

Assume that in all four worlds, when John wakes up, he has no idea what time it is, he hears a dripping noise, and he says to himself "it's raining (now)".

Which worlds conform to what John believes at 4 am in $w_u$? -- $w_u$ and $w_3$.

In which worlds is it raining at 4 am? -- In $w_u$ and $w_1$.

Are the former a subset of the latter?

No!

We predict, therefore, that (2) is false. (Suppose that $t_u$ is 6 am.) But (1), spoken in $w_u$ at 6 am, is intuitively true, given the facts specified. This suggests that (2) is not the correct analysis of (1).
Consider a variant of the story. Everything is the same as above, except that John, when he wakes up, thinks it is 5 am and says to himself: "It was raining at 4 am."

Fact: Sentence (1) is not a true report of John's beliefs in $w_u$ in this second story. Why not? There is a time $t$, namely 4 am, such that in every world which conforms to what John believes at $t$, it is raining at $t$.

Conclusion: Sentence (1) unambiguously means that there is a past time $t$ such that John at $t$ ascribes rain to $t$ under the description "now". Proposal 1 does not capture this fact.

Analogy: controlled PRO. (See J. Morgan, CLS 1970)

(10) Ernie Banks wants to play.

(11) Ernie Banks wants Ernie Banks/himself to play.

(12) For every world $w$ which conforms to what Banks wants in $w_u$, Banks plays in $w$.

Morgan considers a story in which Banks has lost his memory and doesn't know who he is. He reads about Banks in the newspaper and says: "I want him to play," using him to refer to Banks. As Morgan notes, (10) is not an accurate report in this situation.

Conclusion: (10) unambiguously describes a desire that Banks would express by saying "I should play." This is not captured if (10) is analyzed as (12).

Proposal 2

Background references:

David Lewis (1979b) "Attitudes de dicto and de se.


belief and other attitude verbs, or perhaps the COMPs they select, bind not just the world variable of their complement, but also the time variable.

\[
[[\text{believe}]](w)(t)(P)(x) = 1 \text{ iff for every world } w' \text{ and time } t' \text{ such that for all that } x \text{ can tell in } w \text{ at } t, x \text{ might be located in } w' \text{ at } t', P(w')(t') = 1.
\]
On this analysis, (1) means essentially that John located himself at a raining-time. This is intuitively correct.

Generalization: The topmost time-argument in the complement clause of an attitude verb receives a "de se" interpretation.

**Tensed complement clauses**

Ogihara hypothesizes that the generalization just stated holds for all complement clauses to attitude verbs, not just tenseless ones. With no further assumptions, this would predict the following equivalences:

1. **present under future:**
   - He will believe that it is raining.
   - $\Leftrightarrow$ He will believe it to be raining.

2. **past under future:**
   - He will believe that it was raining.
   - $\Leftrightarrow$ He will believe it to have been raining.

3. **present under past:**
   - He believed that it is raining.
   - $\Leftrightarrow$ He believed it to be raining.

4. **past under past:**
   - He believed that it was raining.
   - $\Leftrightarrow$ He believed it to have been raining.

For (1) and (2), the predictions are correct. For (4), the predicted reading ("backward shifted") exists, but is only one of two attested readings. There is also a "simultaneous" reading. For (3), the prediction is wrong: present under past does not give the rise to the "simultaneous" reading predicted here.

To rectify these problems, Ogihara introduces three amendments:

First amendment: optional LF-deletion of PAST under PAST. This predicts the second ("simultaneous") reading for (4), on which it is equivalent with "He believed it to be raining."
Second amendment: stipulate that PRES is "indexical", i.e., must take the utterance time as its argument. This eliminates the bad prediction re (3). However, it also creates a new problem: The equivalence in (1) is no longer predicted.

Third amendment: optional LF-deletion of PRES under PRES. This restores the welcome prediction re (1).

Given these three amendments, the theory also accounts for the following paradigm. Imagine all of the following sentences to be spoken on April 2nd.

(5) * I suspected on March 13th that there is snow on the ground today. 
   (OK: ... would be snow ...)

(6) * I suspected on March 13th that there was snow on the ground on March 31st. 
   (OK: ... would be ...)

(7) * I suspected on March 13th that there will be snow on the ground on May 1st. 
   (OK: ... would be ...)

These examples confirm the view that an attitude verb must bind a time argument in its complement.

Alternative: "independent tense" theory

It seems at first that (4) could also be accounted for if the embedded PAST tense could be interpreted in relation to the utterance time. Suppose we made this assumption and dispensed with the PAST deletion rule. Two problems would arise (see Abusch 1988, 1996):

Absence of "forward shifted" reading for PAST under PAST:

Consider another variant of our story above: John, when he wakes up, thinks: "It is 4 am now. It will be raining at 5." Fact: John's belief in this story cannot be reported by sentence (4) on any reading. This is predicted by Ogihara's analysis. It would not automatically be predicted by an analysis which evaluates each past tense in relation to the utterance time. See also example (6) above.
PAST tense marking on verbs whose event times are not in the past of anything:

(26) I told Bill that you would say that you only had three magic tricks to do.  
(Baker, cited by Ogihara)

(27) (A week ago,) John decided that (10 days later at breakfast) he would tell his 
mother that they were having their last meal together.  
(Abusch)

(28) John thought he would buy a fish that was still alive.  (Ogihara)

Triggers for PAST deletion

(17) George seems to have thought that Bill would win the competition.  (Baker,  
p. 457)

(18) Has he ever claimed that he was sick when he wasn't?

(19) This contradicts John's earlier claim that he would be in Israel.

(20) This contradicts John's claim that he would be in Israel.

(21) You are accused of saying that you would tear down the temple and rebuild 
it in three days.

(22) He is best remembered for predicting that no computer program would ever 
beat him at chess.

The class of triggers apparently should be characterized in semantic terms rather than 
morphological terms.  (Analogy: triggers for negative polarity?  -- see Stowell)
**Present under past, "double-access" reading**

Context: We are wondering why John isn't here.

1. I talked to him last night, and he said that he has the flu.
2. ... and he said that he has a hangover.
3. ... and he said that he is having his fifth glass of wine.
4. ... and he said that he is talking to a student.

All accounts agree that the simplest LFs, with PRES in the scope of PAST, are ill-formed.

Ogihara: PRES is indexical, i.e., its time-argument must denote the speech time. At the same time, if PRES is the topmost tense in a complement, its time-argument must be bound by COMP. Contradiction. PRES-deletion is not a way out, since PRES is not in the scope of another PRES. Therefore, PRES (or a constituent containing it) must raise out of the scope of COMP.

Abusch: PRES is disallowed wherever PAST can delete. (Or rather: where the semantically vacuous homophone of PAST is allowed.) PAST can delete inside an intensional argument of a verb that is in the scope of a (non-vacuous) PAST. If PRES is in this environment, it is therefore necessary to raise it (or a constituent containing it) out of the intensional argument.

Stowell: PRES is disallowed wherever PAST can delete. (Or rather: where the semantically vacuous homophone of PAST is allowed.) PAST can delete anywhere in the scope of a (non-vacuous) PAST. If PRES is in this environment, it is therefore necessary to raise it (or a constituent containing it) out of the scope of PAST.

Stowell (and Enç): the whole that-clause raises. The time-argument of PRES then refers to the utterance time. Problem: How does this account for the meaning?

Abusch and Ogihara: raising of the whole that-clause wouldn't help. Must get PRES out of that-clause. Where can it move to?
Res-movement (Cresswell & v. Stechow 1982): (i) Attitude verbs are systematically ambiguous between their basic and "relational" meanings. (ii) Phrases from inside the complement clause can move into the extra argument slots of the attitude verb.

\[
\text{[[believe]](w)(t)(P)(y)(x) = 1 \iff \\
\text{there is a "suitable" function } f \text{ from world-time-pairs to individuals such that} \\
\text{(i) } f(w,t) = y, \text{ and} \\
\text{(ii) for every } w', t' \text{ that conform to what } x \text{ believes in } w \text{ at } t:} \\
P(w')(t')(f(w',t')) = 1.
\]

Informally: x believes of y that it is P iff there is an individual concept f such that

(i) f actually picks out y, and

(ii) x believes that whatever f picks out is P.

**Tense and NP scope**

(11) He suspected that there wasn't anybody who had a gun in the car.

(12) He was afraid that there wasn't anybody who survived the explosion in the building.

(13) He assumed that there wasn't anything that would leak out in the drum.

A. If a tense or verb is in the scope of an attitude verb, the tense's or verb's time-argument cannot be free in the attitude verb's scope.

(14) You will see a man who is holding a copy of L&P.

(15) She's interviewing candidates next week, and she'll employ whoever impressed her the most. (Reed, handout London Sept. 1994)

B. *woll* seems to be able to bind time-variables that are free in relative clauses in its scope.

(16) You will be the first person who climbs this mountain.

(17) They 'll be boring people who graduated from M.I.T.

C. *woll* must bind time-variables that are free in relative clauses on predicate nominals in its scope.
(18) He often eats a roll that is (still) hot.
    There are many t (in the relevant present period) such that:
    \[ \exists x \ [ \text{roll}(x) \land \text{hot}(t)(x) \land \text{eat}(t)(x)(\text{he})] \]

(19) I often end up with a car that was stolen (the day before).  (adapted from Reed)

D. A time-variable free in a relative clause seems to be able to be bound by an adverb.\(^3\)

(20) He has eaten rolls that were (still) hot.

E. \textbf{have} (or a silent \(\exists\)-quantifier?) seems to bind the free time-argument of the relative clause here. PAST-deletion seems to apply in this environment.

\[ \text{Complications:} \]

(i) He ate a lot of rolls that were still hot.
    \[ \text{?? There are many } x \text{ such that: } [\text{roll}(x) \land \exists t'[t' \text{ in the past} \land \text{hot}(t')(x)] \land \exists t [t \text{ in the past} \land \text{eat}(t)(x)(\text{he})]] \]

(ii) He ate almost every roll that was still hot.

(iii) He ate almost every roll that was still hot very slowly.
Present under past

Sketch of Abusch's analysis:

(1) He said he has the flu.

(2) S-structure:
(3) after res-movement of the embedded tense:
(4) after QR of res-argument:

\[
\begin{align*}
\text{PRES}(t_u) \\
\lambda t'' \\
T \\
\text{PAST}(t_u) \\
\lambda t' \\
\text{VP} \\
\text{he} \\
\text{"res"} \\
t'' \\
\text{say}(t') \\
\lambda t'' \\
\text{CP} \\
\text{C} \\
\lambda t_0 \\
T(t_0) \\
t' \\
\lambda t \\
\text{VP} \\
\text{he have}(t) \text{ the flu}
\end{align*}
\]
(5) Interpretation:
"x ascribes P to y" is short for the definition of the relational meaning of 'say'. (Compare relational 'believe' on last handout.)

(6) \( [[\text{say}]](w)(t)(P)(y)(x) = 1 \) iff there is a "suitable" function \( f \) from world-time-pairs to individuals such that

(i) \( f(w,t) = y \), and

(ii) for all \( w', t' \) that conform to what \( x \) says in \( w \) at \( t \):

\[
P(w')(t')(f(w',t')) = 1.
\]

Applied to example at hand: The matrix VP is true in \( w_u \) under the assignment \( g \) iff there is a suitable \( f \) such that

(i) \( f(w_u, g(t')) = g(t'') \), and

(ii) for all \( w, t \) that conform to what he says in \( w_u \) at \( g(t') \):

\[
\neg f(w, t) > t \text{ & he has the flu in } w \text{ at } f(w,t).
\]

For example, suppose \( f \) is the function that maps each \( w, t \) to the (maximal) interval during which he is in the same medical condition that he is in at \( t \) in \( w \). Intuitively, this is the meaning of the description "while my present medical condition lasts" as uttered by him. Then conditions (i) and (ii) amount to the following:

(i') \( g(t'') \) is the interval for which his medical condition in \( w_u \) at \( g(t') \) lasts in \( w_u \).

(ii') for all \( w, t \) that conform to what he says in \( w_u \) at \( g(t') \):

the interval for which his medical condition in \( w \) at \( t \) lasts in \( w \) is not after \( t \), and he has the flu in \( w \) at that interval.


**Present perfect**

The "present perfect puzzle": why is (1) bad?

(1) *He has called yesterday.

Adverbials with the present perfect are bad if they denote a definite interval that has ended before the speech time:

(2) He has called on a Sunday.

(3) Joe has written you a letter this morning.
    (Baker: okay, provided it's still morning at speech time\(^4\))

(4) He has called on Christmas.
    (okay only when "Christmas" means "some Christmas")

Klein: The following facts are related to the ones above.

(5) Chris had left at six. (okay with "event time modification" reading)

(6) Mary arrived at seven, but Chris had left at six.

(7) (a) *At seven, Chris had left at six.
    (b) At seven, Chris had left.

(8) (a) *When Mary arrived, Chris had left at six.
    (b) When Mary arrived, Chris had left.

(9) <?> When I finally called his office, he had left that very morning.

(10) <?> At that time, he had (already) worked on a Sunday.

Are the following facts also related?

**Individual-level predicates:**\(^5\)

---

\(^4\) According to Giorgi & Pianesi, this judgment is subject to variation.

\(^5\) References:

(11) At that moment, I spotted a cat. It had black fur and green eyes.
(no implication that the cat no longer has these properties)

(12) (a) # At that moment, the cat had black fur and green eyes.
(b) ... # it had black fur and green eyes then/at the time.

Speculations:
1. **having [left at six]** shares a relevant property with individual-level predicates, which accounts for the impossibility of a time adverbial.

2. The English present in the combination PRES + **have** is like a time adverbial (an explicit **now**).

Re 2.: PRES does not always behave like an explicit adverbial. If it did, present tense individual-level predication should be bad.

Quotes from Klein: "[(7a)] gives the somewhat unfortunate impression that, at some other time yesterday, Chris had not left at six." ... "Suppose it is claimed that Chris left at six. It is then clear that any time span after six falls into the posttime of Chris's leaving. Hence, it would be pointless to single out some particular time span, in contrast to some other one, and to claim for this time span that it falls into the posttime of Chris's leaving. If, however, the claim extends only over Chris's leaving, as for example in Chris had left, then the position of the poststate of TSit is not lexically fixed. Therefore, it makes sense to single out some TT, in contrast to some other TT, for which this claim is made, as in [At seven, Chris had left]. It may well be that at five he had not left. So there is a reasonable contrast."

**Necessarily permanent properties**

Lexical entries for individual-level predicates (see Musan):

(13) \([\alpha \text{ be from America } (t)]^g\) is undefined unless \([\alpha]^g\) exists (=is alive) at \(g(t)\).

Where defined, \([\alpha \text{ be from America } (t)]^g\) = 1 iff \([\alpha]^g\) is from America.

Observation: If $[[\alpha \text{ be from America (t)}]]^g$ is defined, then $\forall t': [[\alpha \text{ be from America (t)}]]^g \frac{t'}{t} = [[\alpha \text{ be from America (t)}]]^g$.

In other words, $\lambda t. \alpha \text{ be from America at t}$ expresses a property of times which cannot be true of some times and false of others. Let's call such a property a "non-discriminating" property of times.

Meaning of have [left at six], on the syntax/semantics we entertained earlier in the course:

(14) $[[\text{have (t) } \lambda t'[\alpha \text{ leave (t') } \& t' \text{ at six}]]^g = 1$ iff $\exists t' < g(t) [[[\alpha]]^g \text{ leaves at t' } \& t' \text{ is at six}]$

On this analysis, $\lambda t. \alpha \text{ have(t) left at six}$ is not a "non-discriminating" property of times: It is false of all times before six, and it therefore can be false of some times and true of others (namely when $\alpha$ does leave at six, in which case it is true of all times after six).

But recall an alternative that I mentioned briefly: Perhaps tenses and temporal auxiliaries express presuppositional existential quantifiers, and time-adverbials are part of their restrictors rather than their nuclear scopes. The appropriate syntax for this proposal remains to be figured out. But it would yield the following prediction:

(15) $[[\alpha \text{ have(t) left at six}]]^g$ is undefined unless there are times before $g(t)$ that are at six. (in other words: unless six is before $g(t)$).

Where defined, ... (as before)

On this alternative semantics, $\lambda t. \alpha \text{ have(t) left at six}$ does turn out to be a "non-discriminating" property of times: For times up to six, it is undefined. For times after six, it is either true throughout (if $\alpha$ does leave at six), or else false throughout (if $\alpha$ doesn't leave at six).

Hypothesis: Non-discriminating properties of times cannot be modified by time-adverbials. More specifically: Modification by a time-adverbial gives rise to the implicature that the time-predicate that is modified expresses a discriminating property.

Why should this be so? I don't know.

A possible answer entertained and dismissed by Musan: all time adverbial are contrastive topics.
Possibly related: Implicature of 'if ... then' conditionals, as described by Iatridou.

No event-time adverbial.

Even on an analysis of \textit{have} as a presuppositional existential quantifier, \( \alpha \text{ have}(t) \textbf{ left} \) merely has a trivial presupposition (viz. that there are times before \( g(t) \)). So \( \lambda t. \alpha \text{ have}(t) \textbf{ left} \) expresses a discriminating property: Given that \( \alpha \) does leave (at least once), this property is false of the times up to his (first) leaving, and true of the times thereafter.

Event-time adverbial with "indefinite" reading

What would be the analysis of \( \alpha \text{ have}(t) \textbf{ left on a Sunday} \) on the presuppositional semantics for \textit{have}? Suppose the adverbial here is \( t' \textbf{ on a Sunday} \), or more precisely: \( \exists t'' [\text{Sunday}(t'') \& t' \sqcap \]

(17) \( \exists t' [t' < t \& \exists t'' [\text{Sunday}(t'') \& t' \sqcap \]

This says, in effect, that \( t \) is preceded by at least some part of some Sunday. In other words, \( t \) is not before the first Sunday ever.

This presupposition, though not completely trivial, is not so strong as to make \( \lambda t. \alpha \text{ have}(t) \textbf{ left on a Sunday} \) a non-discriminating property. Suppose that \( \alpha \) left (for the first time) on the second Sunday in history. Then there are times for which \( \lambda t. \alpha \text{ have}(t) \textbf{ left on a Sunday} \) is defined, but false -- namely the times between the beginning of the first Sunday and his leaving. And there are also times for which \( \lambda t. \alpha \text{ have}(t) \textbf{ left on a Sunday} \) is true -- namely the times after his leaving.

A potential problem for this analysis:

(18) He has gone out on days when the temperature was below \(-120^\circ\text{F}\).

Does (18) really presuppose that the temperature has ever been that low? If not, what determines whether an adverbial contributes to presuppositions?

---

6in \textit{Natural Language Semantics} 2.3, 1994
Adverbial that includes evaluation time

Let's change at six in example (15) to (on) yesterday. Then the presupposition of α have(t) left yesterday is this:

(19)  ∃t' [t' < t & t' ∈ yesterday]

I.e.: t is preceded by at least a part of yesterday. Does λt. α have(t) left yesterday denote a non-discriminating property? No! Suppose he leaves yesterday at 10 am. Then λt. α have(t) left yesterday is defined and false for times between 0 am and 10 am yesterday, and it is true for times after 10 am yesterday.

Here we have a serious problem. (20) should be fine.

(20)  *At that time, he had left yesterday.
Readings of *when*-questions:

() When did he call in the morning?
(ambiguous)

(a) At which time within the (contextually definite) morning did he call?
("internal" reading)

(b) For which relevant interval x (e.g., on which day x) did he call in the morning of x?
("external" reading)

() When did he call yesterday/on that morning?
(only internal reading)

Klein's explanations

"*[The door has been wooden]* is definitely odd. Under the analysis of the perfect given above, the reason is immediately clear: being wooden is a permanent property of the door, so there is no time after [a time at which the door is wooden] for which it is imaginable that the door is not wooden. Therefore, it makes no sense to make such a claim for some [topic time] after [a time at which the door is wooden], since no reasonable contrast is imaginable for such a claim."

"Reasonable contrast"

A sentence of the form (), where $\alpha$ is a time-adverbial and $\phi$ the VP or AspP it modifies conveys the implicature ()

() $\exists t \ [ t < s^{\ast} & t \prod r^{\ast} & \phi(t) & \alpha(t) ]$

() For some $\alpha' \neq \alpha$, it is possible that $\neg\exists t \ [ t < s^{\ast} & t \prod r^{\ast} & \phi(t) & \alpha'(t) ]$

**since** adverbials

**since last week** means roughly 'from last week to now'. Are the end-points (last week, now) included or excluded?

() Hm, das schmeckt gut. Ich habe seit gestern früh nichts gegessen.

hm, this tastes good. I haven't eaten anything since yesterday morning
()  #Hm, das schmeckt gut. Ich esse seit gestern früh nichts.
... I don't eat anything since yesterday morning
Debris

When he was a kid, he only had playmates that were poor.

... he only had playmates that are now in jail.

(1) John suspected that a man who killed him was behind the door. (Abusch)

(2) John looked for a woman who married him. (Abusch, *de dicto + forward shifted)

(3) John bit a donkey which kicked him. (forward shifted ok)

(4) John looked for a student who understands the Incompleteness Theorem. (de dicto okay)

(5) John looked for a student who understands the Incompleteness Theorem. (=understands now)

(6) Jeffery looked for a studio which will go Co-op. (de dicto okay, time of going Co-op follows both looking for and utterance time) ('would' also okay)

(7) John will try to find a man who is walking now. (Ladusaw; okay de dicto)

(8) John sought a man who saw "Schindler's List". (Ogihara; if de dicto, seeing must precede search)

(9) John looked for a person who was/is on a diet.

(10) He looks like a clown.

(11) He looks like one of the clowns/a clown I used to work with.

(12) He looks like someone who lives next door from me.

(13) He looks like someone who lives in Beverly Hills.

(14) He looked like someone who lived in Beverly Hills.

(15) He looked like someone who lives in Beverly Hills.
He turned into a someone who is/was kind to animals.

John was a scholar who had very high standards.

John was a scholar who has very high standards.

*Er war ein Pianist, der alles auswendig spielt.
Er war ein Pianist, der alles auswendig spielte.
Er war wie ein Pianist, der alles auswendig spielt.
Er ähnelte einem Pianisten, der alles auswendig spielt.

Durch dieses Erlebnis wurde er zu einem Menschen, der niemandem mehr trauen kann/konnte.

He was the first one who understood the semantics of counterfactuals.

*He was the first one who understands the semantics of counterfactuals.

*Er war der erste, der die Quantifikation versteht.

Da waren Bäume, die über 300 Meter hoch sind/waren.

Five days ago, he promised to talk during a seminar a week later about the topic that the participants were moist interested in.
\[ \exists t''' \geq t_u. \exists t' < t_u. \text{he ascribes } [\lambda t''. \lambda t_0. t'' \leq t_0 \& \text{he has the flu at } t'' ] \text{ to } t''' \text{ at } t' \]

\[ \text{PRES}(t_u) \]

\[ \lambda t'' \exists t' < t_u. \text{he ascribes } [\lambda t''. \lambda t_0. t'' \leq t_0 \& \text{he has the flu at } t'' ] \text{ to } t''' \text{ at } t' \]

\[ \text{PAST}(t_u) \]

\[ \lambda t' \text{he ascribes } [\lambda t''. \lambda t_0. t'' \leq t_0 \& \text{he has the flu at } t'' ] \text{ to } t''' \text{ at } t' \]

\[ \text{"res"} \]

\[ \text{say}(t') \lambda t''. \lambda t_0. t'' \leq t_0 \& \text{he has the flu at } t'' \]

\[ \lambda t'' \lambda t_0. t'' \leq t_0 \& \text{he has the flu at } t'' \]

\[ \text{C} \]

\[ t'' \leq t_0 \& \text{he has the flu at } t'' \]

\[ \lambda t_0 \text{P. } t'' \leq t_0 \& \text{P}(t'') \lambda t. \text{he has the flu at } t \]

\[ \lambda t \text{. he has the flu at } t \]

\[ \text{he have(t) the} \]

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