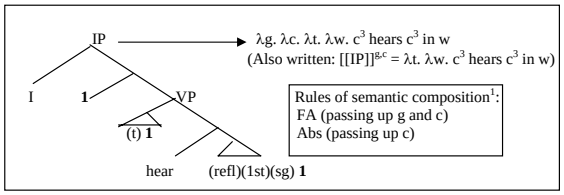
Orin Percus, University of Nantes / LLING EA3827
Attitude reports at the syntax-semantics interface
EALing, ENS, 2007

"De re" belief reports at the syntax-semantics interface

What we have at this point (hopefully): a theory of how syntactic structures are interpreted.

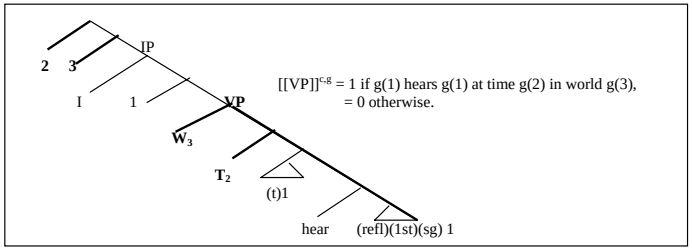


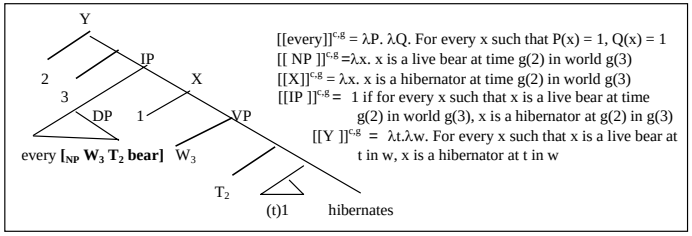
How we can use it for if we trust it: as a tool to learn about the syntactic structures of sentences (given facts about their interpretation).

What there is to be discovered (for example):

i. Unpronounced material.

In fact I will assume some from the outset: I will assume that world and time arguments get projected, that variables can occupy these positions, and that binders higher up can bind them. (I will write W_i and T_i rather than i for these variables, just so that it is clear what their role is.)





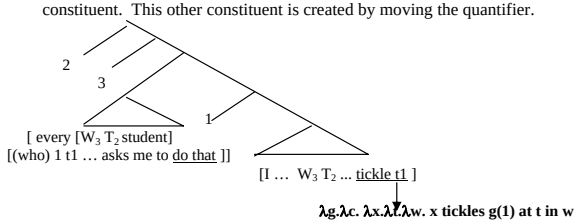
[1] I will also assume a version of Heim and Kratzer's rule of predicate modification (passing up g and c). I haven't talked about this.

ii. *Instances of unpronounced movement.*

That quantifiers move higher than the position in which they are pronounced has been argued to provide the best account of how sentences with VP ellipsis and VP anaphora are interpreted.

(1) I tickle every person who asks me to do that.

The idea: *do that* is interpreted as meaning *who asked me to examine him* due to a general principle that allows *do that* to have the same semantic value as another constituent. This other constituent is created by moving the quantifier.

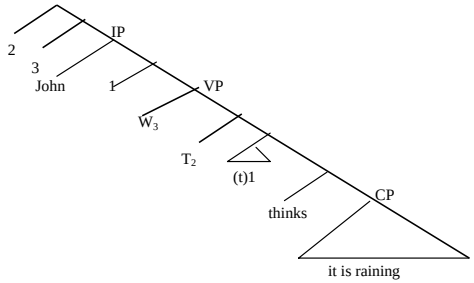


Belief reports: a first try, and its successes.

(2) John thinks it is raining.

If we take the kind of structure we expect...

(3)

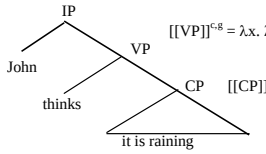


... we seem to arrive at the right result with a semantic value for *think* like the following:

(4) $[[\text{think}]]^{g,c} = \lambda p.\ \lambda x.\ \lambda t.\ \lambda w.$ all pairs <w',t'> among x's "candidate pairs" at t in w (i.e. his candidates for the world and time at which he situates himself) are such that $p(t')(w') = 1$.

(I'll drastically simplify the structure here, since in this case the additional details don't end up making any difference semantically.)

$[[\text{IP}]]^{c,g} = \lambda t.\ \lambda w.$ all pairs <w',t'> among j's "candidate pairs" at t in w are such that it is raining at t' in w'.



$[[\text{VP}]]^{c,g} = \lambda x.\ \lambda t.\ \lambda w.$ all pairs <w',t'> among x's "candidate pairs" at t in w are such that it is raining at t' in w'

$[[\text{CP}]]^{c,g} = \lambda t.\ \lambda w.$ it is raining at t in w

On this analysis, *John thinks p* roughly says that John's candidate pairs are just the way we would claim the actual world and time to be by using *p* on its own. But not precisely, which is good. Indexicals stay related to *our* here and now.

(5) ?? John thought that it was raining right now.

$[[\text{ it (was) raining right now }]]^{c,g} = \lambda t.\ \lambda w.$ it is raining at c^2 in w

What we generate is *not* that John thought "It is raining right now." We generate:

$[[\text{ (5) }]]^{c,g} = \lambda t.\ \lambda w.$ all pairs <w',t'> among j's "candidate pairs" at some time before[2] t in w are such that $[[\text{ it (was) raining right now }]]^{c,g}(t')(w') = 1$

$= \lambda t.\ \lambda w.$ all pairs <w',t'> among j's "candidate pairs" at some time before t in w are such that it is raining at $\mathbf{c^2}$ in w

Tentative suggestion: the sentence is bizarre because we prefer to use embedded future would to express this kind of meaning.

Another successful aspect of this analysis: it suffices to account for some ambiguities, taken together with our assumption that there are silent world and time variables...

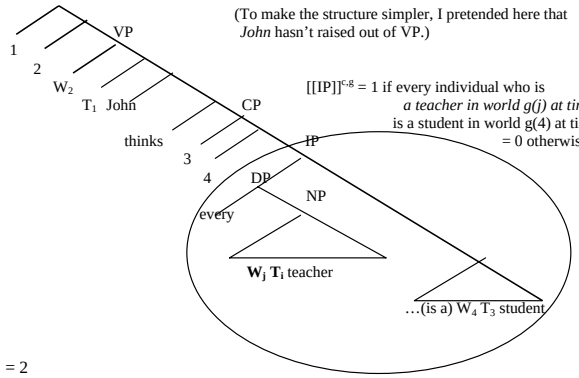
[2] The "some time before t" is the contribution of the past tense. I won't go into tense at all; for now, we can assume that $[[\text{thought}]]^{c,g}$ is $\lambda p.\ \lambda x.\ \lambda t.\ \lambda w.$ all pairs <w',t'> among x's "candidate pairs" at some time before t in w are such that $p(t')(w') = 1$.

(6) John thinks that every teacher here is a student.

I1. "...instead." John considers to be students those people who *we* know to be teachers. (*Teacher* is used "transparently," to talk about people who are teachers in the actual world.)

I2. "...as well." In John's view of the world, the teachers happen to be students too. (*Teacher* is used "opaquely," to talk about the teachers of John's candidate worlds.)

(7)[3]



(To make the structure simpler, I pretended here that *John* hasn't raised out of VP.)

$[[\text{IP}]]^{c,g} = 1$ if every individual who is *a teacher in world g(j) at time g(i)* is a student in world g(4) at time g(3), = 0 otherwise

(8) i = 1, j = 2

$[[\text{IP}]]^{c,g} = 1$ if every individual who is *a teacher in world g(2) at time g(1)* is a student in world g(4) at time g(3), 0 otherwise

$[[\text{CP}]]^{c,g} = \lambda t.\ \lambda w.$ every individual who is *a teacher in world g(2) at time g(1)* is a student in w at t

$[[(7)]]^{c,g} = \lambda t.\ \lambda w.$ all pairs <w',t'> among j's "candidate pairs" at t in w are such that every individual who is **a teacher in w at t** is a student in w' at t'

(9) i = 3, j = 4

$[[\text{IP}]]^{c,g} = 1$ if every individual who is *a teacher in world g(4) at time g(3)* is a student in world g(4) at time g(3), 0 otherwise

$[[\text{CP}]]^{c,g} = \lambda t.\ \lambda w.$ every individual who is *a teacher in w at t* is a student in w at t

$[[(7)]]^{c,g} = \lambda t.\ \lambda w.$ all pairs <w',t'> among j's "candidate pairs" at t in w are such that every individual who is **a teacher in w' at t'** is a student in w' at t'

[3] This structure abstracts away from some complications. First, if *teacher*, whose semantic value is $(\lambda g.\ \lambda c.)\ \lambda x.\ \lambda t.\ \lambda w.$ x is a teacher at t in w, projects all its arguments up to its world argument, as I've been assuming, then the structure of the NP *teacher* must be something like **[5 [W_j T_i X_5 teacher]]**, where $\mathbf{X_5}$ is a variable occupying the individual position. Also, I have also left out *here*. I would say that $[[\text{here}]]^{g,c}$ is $\lambda x.\ \lambda t.\ \lambda w.$ x, at t in w, is in the vicinity of the place that c^3 occupies at c^2 in c^1, and that **[6 [W_j T_i X_6 here]]** combines with *teacher*. The whole would be interpreted conjunctively (via the modification rule alluded to in fn. 1), yielding $(\lambda g.\ \lambda c.)\ \lambda x.$ x is a teacher at time g(i) in world t(j) and x, at g(i) in g(j), is in the vicinity of the place that c^3 occupies at c^2 in c^1.

Its failures (one of them, anyway).

Some information about my wife. Isabelle, my wife, teaches art history classes for the Franco-Italian Cultural Center in Nantes. One of her classes is about Venice, and in the brochure that the Franco-Italian Cultural Center distributes, to attract people, they emphasize that she came to Nantes from Italy, and that she has lived in Venice and knows the city well. Isabelle is French, of course (in fact she is from a little village in Picardie) -- she just spent a few years in Venice, and later in Milan with me before I came to France -- but this is a good way of advertising for the class. It's a little misleading, though, since it gives the impression that the class is being taught by an Italian. In fact, that is what Jean thought when he went to the Franco-Italian Cultural Center the other day to register for the class. Jean -- who, by the way, is from Picardie, just like Isabelle -- arrived at the Franco-Italian Cultural Center, all enthusiastic about this class and its instructor. Being of a dreamy nature, he fell into a kind of reverie, conjuring up canals and palazzi to himself, while waiting downstairs for the elevator to open. When the door opened, he walked in and immediately bumped into Isabelle, who was coming out of the elevator at the same time. "Excusez-moi, monsieur," said Isabelle, embarrassed. Jolted from his reverie, it took some time for Jean to react, and she sped off before he even realized what was happening. When he started to put the facts together while in the elevator, what he remembered most of all was the sound of her voice, and he detected something familiar in the accent. "What a nice girl," he thought. "And, what's more, she is Picarde too."

(10) Jean thinks that my wife is Italian.

Intuitively, this is true. (And it is true on the basis of the fact that if I were to ask John "Is the instructor of the Venice class Italian?" he would be disposed to answer yes.)

(11) Jean thinks that my wife is French.

Intuitively, this sentence is true too. (And it is true on the basis of a different fact -- that if I were to ask John "Is that nice woman French?", he would be disposed to answer yes.)

(If you prefer, you can consider *Jean thinks that Isabelle is Italian/ French*. I am trying to avoid names for the moment, but they might help to sharpen intuitions.)

We can't account for this as things stand now. The only way of potentially accounting for these facts would be by construing *my wife* transparently (since Jean has no beliefs at all about me, and in particular isn't convinced that I have a wife) and by construing *Italian / French* opaquely (since these are clearly being used to describe properties that people have in Jean's candidates for the actual world). This leaves just one kind of structure for the two sentences, (13).

(12) $[[\ [_{DP}$ ... my wife $W_j\ T_i$ ...] $]]^{c,g}$ = the individual who is the wife of c^3 in world g(j) at time t(i)

(13) [**1 2** $\mathbf{W_2\ T_1}$ John thinks [3 4 $W_4\ T_3$ [my wife $\mathbf{W_2\ T_1}$] is French/Italian]]

$[[$ (13) $]]^{g,c}$ = λt. λw. all pairs <w',t'> among j's "candidate pairs" at t in w are such that the individual who is the wife of c^3 in w at t is French / Italian in w' at t'

But -- given that we understand "French" and "Italian" here as properties that no individual can have at the same time[4] -- if one of these structures conveys something true, the other conveys something false.

[4] And I think the intuition is indeed that by *French* and *Italian*, we mean something like French/ Italian in origin. $[[\text{French}]]^{c,g}$ is thus something more along the lines of λx.λt.λw. x is alive at t in w and is of French origin in w.

A rough intuitive description:

(14) a. To say that *Jean thinks that my wife is Italian* is true
is (on one of its readings)
to say that, for some description D*, *Jean thinks that D is Italian* is true, where in actual fact D describes my wife.

* such as *the instructor of the Venice class*

b. In general,

to say that *x thinks that ... D ...* is true
is (on one of its readings)
to say that, for some description D', *x thinks that ... D' ...* is true, where in actual fact D' and D describe the same individual.

Terminology:

In cases like this, where to describe Jean's beliefs, we allude to properties of another individual we are mentioning, *my wife*, it is said that the sentence describes a "de re" belief of Jean about my wife.

Another locution: On this kind of reading of the sentence, *my wife* is "interpreted de re."

But this is too rough.[5]

Some more secret information about my wife. Isabelle happens to be a spy. (This is not unheard of for art historians, but, still, ssh.) She also (unrelatedly, of course) happens to be extremely ticklish -- much more ticklish, in fact, than any other spy you could find.

(15) Jean thinks that my wife is a spy.

The intuition given what I have related is that (15) is not true. But this is unexpected if our rough description is correct, since (16) is true, and we know that in actual fact the most ticklish spy is Isabelle.

(16) The most ticklish spy is a spy.

[5] David Kaplan's "shortest spy problem." (David Kaplan (1969), "Quantifying in," in D. Davidson and J. Hintikka, *Words and Objections*.)

A description à la David Lewis.[6]

(17) a. To say that *Jean thinks that my wife is Italian* is true
is (on one of its readings)
to say that for some relation R*, Jean thinks "the person I bear R to is Italian,"
where R is a relation that John bears to my wife (alone).

*such as the being-bumped-into-by-on-a-certain-occasion relation or the having-read-about-in-the brochure-one-received relation

b. a little more precisely:
... to say that for some relation R,
all John's candidates <w,t,x> are such that the person who x bears R to at t in w is Italian at t in w,
where R is a relation that John bears to my wife (alone).

c. a little more precisely still:
... for some acquaintance relation R.

What is an acquaintance relation?

Some involve direct sensory experience
like the seeing-on-a-certain-occasion relation
or the being-bumped-into-by-on-a-certain-occasion relation.
But there are also others like
the having-seen-the-footprints-of relation (cf. *Jean thinks that Isabelle is a man*)
or the having-had-one's-article-reviewed by relation (cf. *Jean thinks that Isabelle is a museum curator*).

Being-on-the-opposite-side-of-the-world-as is definitely not an acquaintance relation!
(Cf. *# John thinks that Mr. Chen is in China*)

I feel it would be useful to try to categorize the kinds of relations that we seem to have in mind when we use de re belief reports.[7]

How could this kind of interpretation arise from a syntactic structure for the sentence?

[6] Lewis 1979 ("Attitudes de dicto and de se") again.
[7] Further exploration might profitably start from the work of Maria Aloni (Maria Aloni (2000), *Quantification under Conceptual Covers*, PhD thesis, University of Amsterdam, and later articles).

Approach 1: Unpronounced movement.

Our old *think* combined with a world, a time, an individual (the believer) and a "proposition," i.e. a function that told us about world-time pairs.

It said that the function characterized all the candidate pairs of the individual in the world at the time.

Approach 1 proposes that *think* combines with a world, a time, an individual (the believer), another individual (the *res*), and a "property," i.e. a function that tells us about world-time-individual triples.

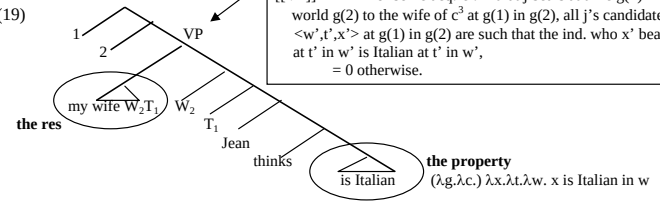
Think then says that for some acquaintance relation R, the believer thinks (in the world at the time) "the person I bear R to has the property," where R is a relation that the believer bears to the res.

Approach 1 thus directly implements the Lewis proposal (and probably could be refashioned to conform to any other explication of "aboutness").

(18) $[[\text{think}]]^{g,c}$ = **λP.** λx. λt. λw. **λy.** for some acquaintance relation R that x bears to y at t in w, all x's candidates <w',t',x'> at t in w are such that P(the individual who x' bears R to at t' in w')(t')(w') = 1.

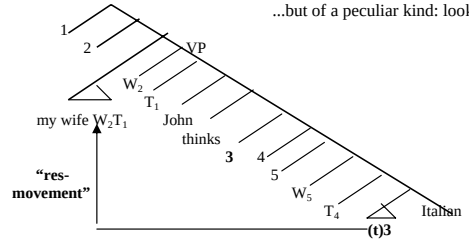
$[[VP]]^{c,g}$ = 1 if for some acq.rel. R that $[[Jean]]^{c,g}$ bears to $[[\text{my wife } W_2T_1]]^{c,g}$ at $[[T_1]]^{c,g}$ in $[[W_2]]^{c,g}$, all $[[Jean]]^{c,g}$'s candidates <w',t',x'> at $[[T_1]]^{c,g}$ in $[[W_2]]^{c,g}$ are such that $[[\text{is Italian}]]^{c,g}$ (the ind. who x' bears R to at t' in w')(t')(w') = 1,
= 0 otherwise.
i.e.
$[[VP]]^{c,g}$ = 1 if for some acq.rel. R that j bears at time g(1) in world g(2) to the wife of c^3 at g(1) in g(2), all j's candidates <w',t',x'> at g(1) in g(2) are such that the ind. who x' bears R to at t' in w' is Italian at t' in w',
= 0 otherwise.

(19)



How do we get this structure? Movement ...

(20) ...but of a peculiar kind: look where the binder is!



Connections to other cases where DPs seem to behave simultaneously as though inside and outside an embedded clause? ECM?

Approach 2: Unpronounced material.

Caricature of Approach 2: the embedded clause contains a little marker next to the *res* that says "substitute with a description, please."

(21) a. The desired semantic value for our sentence:

λt. λw. for some acquaintance relation R that j bears at t in w to c^3's wife at t in w,
all j's candidates <w',t',x'> at t in w are such that
the individual who x' bears R to at t' in w' is Italian at t' in w'.

b. A near[8] paraphrase:

λt. λw. for some mapping G* of individuals to concepts,
all j's candidate pairs <w',t'> at t in w are such that
G(c^3's wife at t in w)(w') is Italian at t' in w'

Terminology: A concept (or individual concept) is a function that takes a world and yields an individual in that world.

*more precisely: some mapping G that is "acquaintance-related for j at t in w":
given an individual that j is acquainted with at t in w, it finds an acquaintance relation R that j bears to that individual, and gives us a concept C^R with the following property:
for each of j's candidate triples <w',t',x'> at t in w, C^R(w') gives us the individual that x' bears R to at t' in w'.

For instance, if j read about i in the brochure he received yesterday, one such G could take i and give us a concept C with the following property: for each of j's candidate triples <w',t',x'>, C(w') gives us the individual that x' read about in the brochure that he received the day before t' in w'.

Approach 2[9] implements this paraphrase.

On our old analysis, the complement of *think* was a "proposition," i.e. a function that told us about world-time pairs.

Approach 2 proposes that the complement of *think* is a function that *takes* concept-individual mappings and *gives* us a proposition.

(22) Jean thinks that my wife is Italian

a. old analysis:
[[that my wife is Italian]]^{g,c} = λt. λw. c^3's wife at ... in ... is Italian at t in w

b. Approach 2:
[[that my wife is Italian]]^{g,c} = **λG.** λt. λw. **G(**c^3's wife at ... in ...**)(w)** is Italian at t in w

[8] But not completely equivalent. To find cases where the paraphrase begins to break down, think of situations in which Jean's candidate worlds contain more than one candidate for himself. You might think about whether you can show that one of these semantic values makes better predictions than the other.
[9] Orin Percus and Uli Sauerland (2003), "On the LFs of Attitude Reports," Proceedings of *Sinn und Bedeutung*.

On the old analysis, *think* said that its complement characterized the candidate pairs of its subject.

On Approach 2, *think* says that, *when we give its complement some mapping G* (that is acquaintance related for the subject), *we get* a proposition that characterizes the candidate pairs of the subject.

(23) Jean thinks that my wife is Italian

a. old analysis:
[[thinks]]^{g,c} = λp. λx. λt. λw. all pairs <w',t'> among x's "candidate pairs" at t in w are such that p(t')(w') = 1.

b. Approach 2:
[[thinks]]^{g,c} = **λF**. λx. λt. λw. **for some mapping G of individuals to concepts** (that is acquaintance related for x at t in w), all pairs <w',t'> among x's "candidate pairs" at t in w are such that **F(G)**(t')(w') = 1.

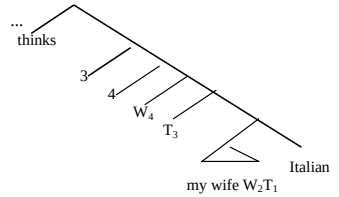
What kind of structure will give us this? One not so different from our old one.

All we need to do is to add:

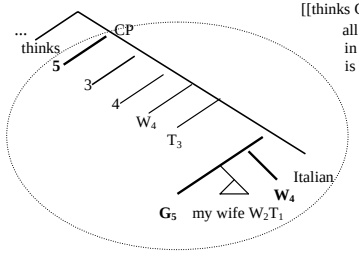
a silent variable over concept-individual mappings, with a binder for it at the top of the embedded clause (this will give us the "**λG....G...**," the function from mappings);

a silent variable over worlds that gets bound by the world variable binder already present in the embedded clause (this will give us the **w**, the world at which the concept is evaluated).

(24) a. old analysis:



b. Approach 2:



[[thinks CP]]^{g,c} = λx. λt. λw. for some mapping G ..., all pairs <w',t'> among x's "candidate pairs" at t in w are such that G(c^3's wife at g(1) in g(2))(w') is Italian at t' in w'

[[CP]]^{g,c} = **λG.** λt. λw. **G(**c^3's wife at g(1) in g(2)**)(w)** is Italian at t in w

Appendix

Approach 3: Just a clever semantic value for *think*.

Caricature of Approach 3: *think* says "My complement is something you get by taking a sentence that my subject would say 'true' to, and replacing *I* with a term that picks out my subject (and doing similar things with other indexicals).'

According to this idea, when John would say true to *I am happy*, this permits us to say *John thinks he is happy*, where *he* picks out John.

Terminology:
A character is the kind of object that we have as the semantic value of a sentence, once we provide an assignment. I.e. a function that we would write λc. λt. λw. ...

Some examples of characters:

λc. λt. λw. c^3 is happy at t in w
λc. λt. λw. the person in w that c^3 bumped into in w two minutes before t is Italian at t in w
λc. λt. λw. the person in c^1 that c^3 bumped into in c^1 two minutes before c^2 is Italian at t in w

In fact, Approach 3[10] talks not about sentences that the subject would say 'true' to but about characters -- characters that, *if* they were the values of sentences, *would* lead to a 'true' judgment.

A better description of Approach 3: *think* says "My complement is something you get by taking 'a character that my subject would judge true,' and feeding it the context <my world argument, my time argument, my subject>."

(25) $[[\text{think}]]^{g,c}$ = λp. λx. λt. λw. there is some character χ such that
(i) for all c among x's "candidate triples" at t in w, $\chi(c)(c^2)(c^1) = 1$
(i.e. x "takes χ to be true at t in w")
(ii)[11] $\chi(<w,t,j>) = p$

[10] Due to David Kaplan (1977), "Demonstratives," ms. later published in J. Almog, J. Perry and H. Wettstein, *Themes from Kaplan*, 1989.
[11] The way this condition is formulated presumes that individuals exist across worlds. If they don't, some other relation between p and χ might have to be found.

Reconsider our examples in light of this proposal.

(26) $[[\text{Jean thinks that my wife is French / Italian }]]^{g,c}$

= λt. λw. there is some character χ such that
(i) j takes χ to be true at t in w
(ii) $\chi(<w,t,j>)$ = λt'. λw'. c^3's wife at t in w is French/ Italian at t' in w'

This proposal predicts: I will take the sentence *Jean thinks that my wife is French* to be true
if for all my candidate triples <w*,t*,x*>:
there is some character χ such that
(i) j takes χ to be true at t* in w*
(ii) $\chi(<w*,t*,j>)$ = λt'. λw'. x*'s wife at t* in w* is French at t' in w'

Now, the scenario establishes that j takes the following character to be true:

λc. λt. λw. the person in c^1 that c^3 bumped into in c^1 is French at t in w

For all my candidate triples <w*,t*, x*>, this character applied to <w*,t*,j> will be

λt. λw. the person in w* that j bumped into in w* is French at t in w

The scenario also establishes that my wife is the person that j bumped into in the actual world, so, for all my candidate triples <w*,t*,x*>, this is no different from

λt. λw. x*s wife at t* in w* is French at t in w.

So the proposal predicts that I will take the sentence to be true on the basis of this character.

Similar remarks apply to *Jean thinks that my wife is Italian*.

Now, the scenario establishes that j takes the following character to be true:

λc. λt. λw. the person who is the instructor of the Venice class in c^1 is Italian at t in w

For all my candidate triples <w*,t*, x*>, this character applied to <w*,t*,j> will be

λt. λw. the person who is the instructor of the Venice class in w* is Italian at t in w

The scenario also establishes that my wife is the instructor of the Venice class in the actual world, so, for all my candidate triples <w*,t*,x*>, this is no different from

λt. λw. x*s wife at t* in w* is Italian at t in w.

So the proposal predicts that I will take the sentence to be true on the basis of this character.

But unfortunately... there is no mention of acquaintance relations in this proposal, and no simple way of modifying the analysis to include them. So it is certainly headed for problems.

Exercise. This approach, like our initial one, will predict the wrong judgment for *Jean thinks my wife is a spy*. Why?

Some exercises and questions to think about.

Q1. Bill the paranoiac was right about the existence of the cruel experiment, but wrong about the people involved. In fact, Jean, the guy who Isabelle bumped into, is the person whose brain is being monitored and François, a poor patient at the hospital in Nantes, is the person on the operating room table whose brain is being controlled. Jean and François have just the same "candidate triples." At least in my intuition, *François thinks my wife is French* sounds more bizarre than *Jean thinks my wife is French*. Can we explain why?[12]

Q2. We considered belief reports with only one description "interpreted de re." How do our approaches fare with sentences like *Jean thinks that my wife attacked my daughter* ? If there are problems, how could we modify our approaches to deal with them?

Q3. In the sentences we considered, there were a bunch of variables W_j and T_i around, and a bunch of binders that could potentially bind them. We considered structures that exhibited only a few of the potential binding possibilities that exist. Imagine structures that exhibit others. What kinds of readings are these structures predicted to lead to? Do the sentences have these readings?

[12] This scenario is based loosely on Putnam's Twin Earth scenario.