Proper Names in Propositional Attitudes

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1 The two goals of this talk

This talk has two quite different themes and goals:

1. What are our different options for setting uo a framework for natural language semantics?

2. How to describe the semantic contributions made by proper names?

In particular: How can proper names be used in the content specifications of propositional attitude attributions (aka *attitude reports*)?

2 Ways of doing formal semantics for natural languages

2.1 I: Direct Value Semantics

• The 'classical' way of doing formal semantics for a natural language fragment L is to:

1. describe L as a set of well-formed expressions with each one or more syntactic structrures, and

2. developing a model-theoretic semantics, consisting of

(a) a *class of models* and

(b) a *semantic value definition*, which assigns to each pair $<\gamma,M>$, where γ is the syntactic structure of a well-formed expression of L and M is a model from the model class, a value suitable for the logical type of the expression.

In particular, the values assigned to the syntactic structures of sentences from L are *truth values*.

This 'classical' way of doing formal semantics is often referred to as *Direct Value Semantics*.

N.B In most current applications of this kind of semantics, the models are *intensional models*. Intensional models are indexed families of extensional models. Expressions are assigned values in such models *at indices*.

The paradigm of direct value semantics is *Montague Grammar*, exemplified in the seminal papers on natural language semantics written by Montague in the late sixties and early seventies (Montague 1970a), (Montague 1970b), (Montague 1973).

2.2 II: Logical Form Semantics

• Distinct from the method of direct value semantics is that of *Logical Form semantics*.

Logical Form semantics makes use of *Logical Form Languages* (LFLs) as intermediaries between syntactic structures and semantic values in models:

Syntactic structures of well-formed expressions from L are 'translated' into expressions of some given LFL.

In particular, sentences (and multi-sentence discourses) from L are translated into formulas of LFL

This LFL is defined by way of a recursive syntax and a model-theoretic semantics building on that syntax, along the lines of the now standard presentations of classical first and higher order Predicate Logic.

By stipulation the semantic values of expressions from L in models (at indices) are the values of the LFL expressions into which they are translated.

N.B. Most of the work that goes into the development of Logical Form Semantics for non-trivial natural language fragments L is taken up with defining translation algorithms, which translate well-formed expressions of L into expressions of LFL. (It is the translation algorithm that captures most of the details of the *syntax-semantics interface* for L.)

A well-known example of Logical Form semantics is *Discourse Representation Theory* (DRT).

DRT was developed to deal with certain semantic connections between sentences that are part of multi-sentence discourses.

These had to do with the aspectual properties of tense forms (in French and English) and the anaphoric possibilities for anaphoric pronouns, whose antecedents are often found in earlier sentences.

For an impression, compare (1.a,b,c).

(1) a. Josef turned around. The man was pulling his gun from its holster.

b. Josef turned around. The man pulled his gun from its holster.

c. Josef turned around. The man had pulled a gun from his pocket. He was pointing it at Joseph.

(2), (3), (4) show how a semantic representation from LFL can be constructed for (1.c).

(2) is the semantic representation for the first sentence of (1.c), (3) is for the first two sentences, and (4) for the three sentences together.

The construction of (3) uses (2) as *discourse context* and the construction of (4) uses (3).

The LFLs of DRT are called 'DRS-languages' and their formulas 'DRSs' (short for 'Discourse Representation Structures').

(2) (DRS for 1st sentence of (1.c))

e j
$e \prec n$ Joseph'(j) e: turn-around'(j)

(3) (DRS for 2nd sentence of (1.c))

e' m g p u
$e' \prec n$ $e' \prec e$ $[the\ man](m)$ $u = m$ gun'(g) pocket'(p) POSS(u,p) e': pull-from'(u,g,p)

(4) (DRS for 1st and 2nd sentence of (1.c))

e j e' m g p u
$e \prec n$ $e' \prec n$ $e' \prec e$ Joseph'(j) $[the\ man](m)$ $u = m$ gun'(g) pocket'(p) POSS(u,p) e: turn-around'(j) e': pull-from'(u,g,p)

Note well: a DRS consists of:

(i) its *Universe*, which is a set of *discourse referents* (Karttunen 1976); this is the part above the horizontal line in the middle and

(ii) a set of *DRS Conditions*, the part below the line in the middle.

(DRS Conditions are simple and complex predications with discourse referents in argument positions), .

3 MSDRT

One of the problems that the original versions of DRT had nothing to say about is the semantics of attitude reports.

There is a particular type of problem in this domain that has had little attention, but is of great importance:

a single attitude report often attributes several attitudes of different mode but with referentially connected contents.

Example

(5) Ponce de Leon believed that there was a rejuvenating spring in Florida; and he wanted to find it.

The solution to this problem proposed by MSDRT:

Provide a mode of description of complex mental states that is attuned to such attitude reports.

We refer to the mental state descriptions of MSDRT as 'MSDs'.

• An MSD is a set of consisting of:

(i) Propositional Attitudes – constituents of the form $<MOD,K>$, where MOD is an *attitudinal Mode Indicator* (such as BEL for belief, DES for wanting, INT for intention and many more), and K is a DRS.

(ii) Entity Representations.

(6) is an MSD for relevant part of Ponce de Leon's mental state at the time talked about by the attitude report (5)

(5) Ponce de Leon believed that there was a rejuvenating spring in Florida; and he wanted to find it.

(6)

$$\left\{ \begin{array}{l} \left\langle [ENT, f], \boxed{\begin{array}{|c|}\hline \\ \hline \text{Named}(f,\ \textit{Florida}) \\ \hline \end{array}}, \mathcal{K} \right\rangle \\ \\ \left\langle BEL, \boxed{\begin{array}{|c|}\hline b \\ \hline s_3\text{: rejuvenating-spring'}(b) \\ \text{in'}(b,f) \\ \hline \end{array}} \right\rangle \\ \\ \left\langle INT, \boxed{\begin{array}{|c|}\hline t \quad e \\ \hline n < t\ e \subseteq t \\ e\text{: find'}(i,b) \\ \hline \end{array}} \right\rangle \end{array} \right\}$$

According to this MSD, Ponce de Leon had an entity representation for Florida. It was about the entity represented by this ER that he had his belief that there was a rejuvenating spring there.

• i is a special dref that represents agents to themselves as their own self. In MSDRT it only occurs within MSDs.

Similarly the occurrence of n in the Intention DRS in the MSD of (6) represents the agent Ponce de Leon's psychological present at the time that he was in the mental state described by this MSD.

• Each ER has a *distinguished discourse referent*.

This dref occurs in the first component of the ER, directly behind 'ENT'.

It uniquely identifies the ER whose distinguished dref it is, and serves to represent the entity represented by the ER in argument positions of DRS Conditions.

(See the Condition 'in'(b,f)' from the belief content in (6).)

• Most Entity Representations have *anchors*.

These anchors determine what entity is represented by the ER.

For instance, the ER can be result of the agent a perceiving the entity $\mathbf{d}$ represented by it.

In that case there will be a *perceptual anchor* for the ER which acts as 'witness' to the event of a perceiving $\mathbf{d}$. It thereby testifies that the entity $\mathbf{d}$ perceived on that occasion *is* the represented entity.

But ERs can also have anchors of other types. Central to what follows are *vicarious anchors*.

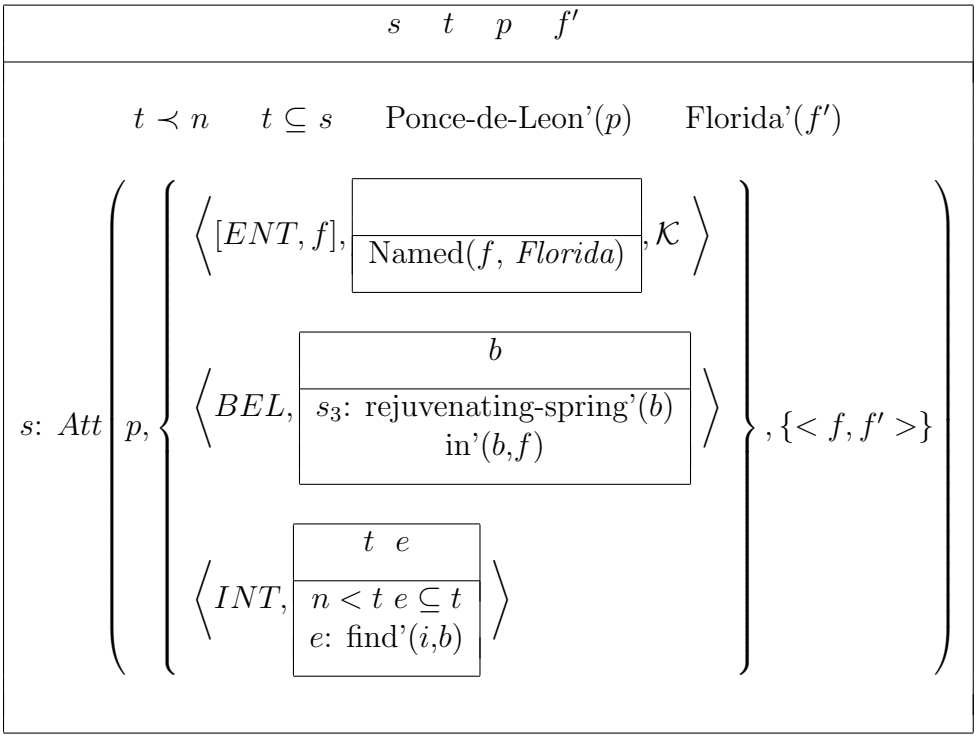
• Note: An ER can have more than one anchor: $\mathcal{K}$ is an *anchor set*.

Often anchor sets can be quite large, growing each time the ER is reused after it has first been formed.

• MSDRT analyzes attitude reports as attributions of mental states, specified in the form of MSDs. MSDRT's Logical Forms for such reports make use of a predicate Att, in which MSDs occur as arguments.

The DRS in (7) is a Logical Form for the attitude report (5).

(7)



Comments to (7):

• The state s is to the effect that Ponce de Leon (represented by the dref p) was at some time t in the past of the utterance time n of (5) in a mental state of the kind described by the MSD in the third argument position of *Att*.
(The first argument of *Att* is s.)

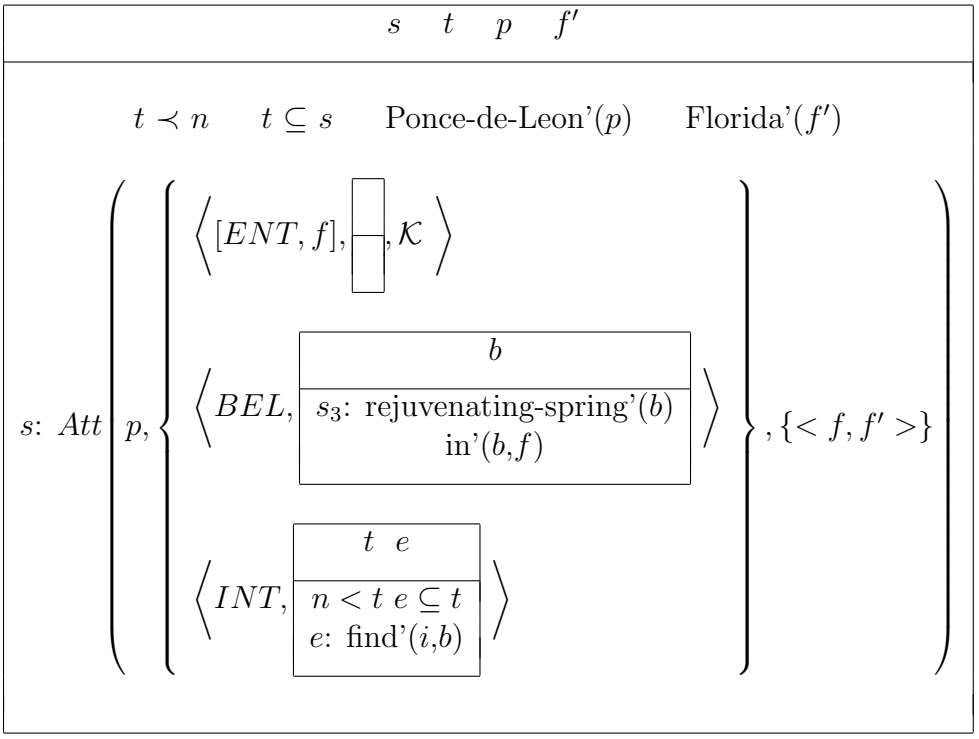
It is assumed in (6) and (7) that Ponce de Leon knew Florida by its name *Florida*.

(This is expressed by the Condition 'Named(f, *Florida*)' in the second, 'descriptive' component of the ER.)

But this may be unrealistic, and it is arguably not part of what (5) says.

The speaker of (5) only says that Ponce de Leon had some entity representation for Florida and that the belief attributed to him was in part about the entity represented by that ER. So a better Logical Form for (5) is one that does not include this Condition:

(8)



Suppose that Ponce de Leon did know Florida as Florida.

Then (6) would have been a correct representation of his belief about a place called *Florida* that there was a rejuvenating spring there.

But note the difference between this way of capturing the contribution made by the name *Florida* and the Condition 'Florida'(f')' in the top part of the Condition Sets of the DRSs in (7) and (8).

Conditions like 'Florida'(f')' have been used in versions of DRT to express that the dref f' represents the referent of the name *Florida*. But that was a stop gap solution.

No better analysis of proper names was available within thr DRT framework.

• MSDRT offers a way of doing better and getting rid of the difference between the treatment of *Florida* in (6) and its treatment in (8).

This brings us to the second major use of MSDRT.

4 Using MSDRT as a Communication-Theoretic Framework for doing Semantics

To this end we now use MSDs to describe *the mental states of the discourse participants*.

More specifically, we focus on the mental state of the recipient/interpreter H of utterances just before and just after interpretation of a given utterance u.

For simplicity we assume that H accepts what the speaker S says as true, and forms a corresponding belief.

Furthermore, MSDRT makes the following assumption about the normal use and interpretation of proper names (the *standard use* of proper names):

(9) 1. A speaker S can make a standard use of a proper name N only if she has an N-labeled ER. (An ER is *N-labeled* iff its descriptive component contains the Condition 'Named(α,N)', where α is the ER's distinguished discourse referent.

When S uses N as label of an N-labeled ER she has, then her use of N refers to the entity represented by this ER.

2. The recipient H of an utterance u that contains an occurrence of the name N should interpret this occurrence by using an N-labeled ER he has and that should represent the same entity as the ER used by S.

In case H doesn't have such an ER (or takes himself not to have such an ER) H is forced to *accommodate* such an N-labeled ER, with a *vicarious anchor* that witnesses his getting the given use of N from the utterance by S he is interpreting.

This vicarious anchor fixes the entity represented by his accommodated ER to be that that S referred to by her use of N.

(9) can be seen as part of a reconstruction of how names can spread through a speech community, in the sense of the causal Theory of Names (Kripke 1980), (Chastain 1975, **?**).

Names can occur outside or inside the content specifications of propositional attitudes.

As stated, (9) fully describes only the use and interpretation of names outside such content specifications.

Here is a simple example of how this works.

Suppose speaker S says (10) to listener H.

(10) S: I read a short story by Gogol.

We consider two scenarios in which S utters and H interprets (10). In the first H doesn't have an ER for Gogol, in the second he does.

(11) gives the MSD for the relevant part of the mental state of S, assuming that S herself believes the information that is expressed in (10).

(11)
$$\left\{ \begin{array}{l} \left\langle [ENT, g_S] \ , \ \begin{array}{|c|}\hline \\ \hline \text{person}(g_S) \\ \text{Named}(g_S, Gogol) \\ \hline \end{array} \ , \ \mathcal{K}_{Gogol} \right\rangle \\ \\ \left\langle BEL, \begin{array}{|c|}\hline e \quad y \\ \hline e \prec n \quad \text{short-story'}(y) \quad \text{by'}(y, g_S) \\ e\text{: read'}(i, y) \\ \hline \end{array} \right\rangle \end{array} \right\}$$

(12) describes H's mental state before interpretation of (10). The absence of a *Gogol*-labeled ER for Gogol in this MSD is to be understood as an indication that the mental state (12) describes does not have such an ER.

(12)
$$\left\{ \left\langle [ENT, s_H] \ , \ \begin{array}{|c|}\hline \\ \hline \text{person}(s_H) \\ \hline \end{array} \ , \ \mathcal{K}_S \right\rangle \right\}$$

In this case H's interpretation of (10) requires the accommodation of a *Gogol*-labeled ER for Gogol. The result of this accommodation and the construction of H's representation of the content of (10) lead to the mental state described in (13) with the belief to which H's interpretation has led.

(13)
$$\left\{\begin{array}{l}\left\langle [ENT, s_H]\ ,\ \begin{array}{|c|}\hline \\ \hline \text{person'}(s_H) \\ \hline\end{array}\ ,\ \mathcal{K}_S\ \right\rangle \\ \\ \left\langle [ENT, g_H]\ ,\ \begin{array}{|c|}\hline \\ \hline \text{person'}(g_H) \\ \text{Named}(g_N, \textit{Gogol}) \\ \hline\end{array}\ ,\ \left\{\begin{array}{|c|}\hline e_1 \\ \hline e_1 \prec n \\ e_1\text{: ref}(s_H, \textit{Gogol}, g_H) \\ \hline\end{array}\right\}\ \right\rangle \\ \\ \left\langle BEL, \begin{array}{|c|}\hline e_2 \quad y \\ \hline e_2 \prec n \quad \text{short-story'}(y) \quad \text{by'}(y, g_H) \\ e_2\text{: read'}(s_H, y) \\ \hline\end{array}\ \right\rangle \end{array}\right\}$$

Note the *vicarious anchor* of H's accommodated ER for Gogol.
The general form we adopt for vicarious anchors is schematically presented in (14).

(14)
$$\begin{array}{|c|}\hline e \\ \hline e \prec n \\ e\text{: ref}(s, \gamma, \alpha) \\ \hline\end{array}$$

• We now consider the case where H does have a *Gogol*-labeled ER for Gogol before S says (10) to him and that he takes to represent the entity thatcher S used *Gogol* to refer to.

(15) gives the relevant part of H's mental state before interpretation.

(15)
$$\left\{\begin{array}{l}\left\langle [ENT, s_H]\ ,\ \begin{array}{|c|}\hline \\ \hline \text{person}(s_H) \\ \hline\end{array}\ ,\ \mathcal{K}_S\ \right\rangle \\ \\ \left\langle [ENT, g_H]\ ,\ \begin{array}{|c|}\hline \\ \hline \text{person}(g_H) \\ \text{Named}(g_H, \textit{Gogol}) \\ \hline\end{array}\ ,\ \mathcal{K}_{\textit{Gogol}}\ \right\rangle \end{array}\right\}$$

The result of processing (10) is now as shown in (16).

(16)
$$\left\{ \begin{array}{l} \left\langle [ENT, s_H] \ , \ \begin{array}{|c|}\hline \\ \hline \text{person}(s_H) \\ \hline \end{array} \ , \ \mathcal{K}_S \right\rangle \\ \\ \left\langle [ENT, g_H] \ , \ \begin{array}{|c|}\hline \\ \hline \text{p'n}(g_H) \\ \text{N'd}(g_H, Gogol) \\ \hline \end{array} \ , \ \mathcal{K}_{Gogol} \cup \left\{ \begin{array}{|c|}\hline e \\ \hline e \prec n \\ e\text{: ref}(s_H, Gogol, g_H) \\ \hline \end{array} \right\} \right\rangle \\ \\ \left\langle BEL, \begin{array}{|c|}\hline e \ \ y \\ \hline e \prec n \quad \text{short-story'}(y) \quad \text{by'}(y, g_H) \\ e\text{: read'}(s_H, y) \\ \hline \end{array} \right\rangle \end{array} \right\}$$

Compare the anchor set of the Gogol ER in (16) with that the Gogol ER in (13).

The vicarious anchor that is explicitly displayed is a member of both sets.

But in the *Gogol*-labeled ER of (13) it is the only anchor, whereas in the anchor set of (16) it will be one of more.

• According to MSDRT's treatment of the use and interpretation of standardly used proper names H adds a vicarious anchor to the anchor set of the ER he uses in his interpretation of a name N, even though the ER is already properly anchored to its referent by the anchor set as it was.

The reason for this is that vicarious anchors do two related but distinct jobs:

1. They fix or confirm what entity is represented by their ER.

2. They establish a *link* between S's use of N and H's use of N, both when it is one he has just acquired and when it is one he already had.

Vicarious anchors can play this second role even when a name fails to properly refer, as for instance names for fictional entities or names that are intended as names for existing things but that fail to refer because of some mishap, such as the planet *Vulcan*, which for some brief time was erroneously thought to exist (Kripke 1980).

Even in such cases vicarious anchors are witnesses to intersubjective connections between N-labeled ERs belonging to different agents.

It is in this way that networks of ERs belonging to different members of a speech community are formed over time.

Causal chains that link users of a name N for entity **d** to those present at 'baptism events' which conferred N as a name on **d** are linear substructures of such networks..

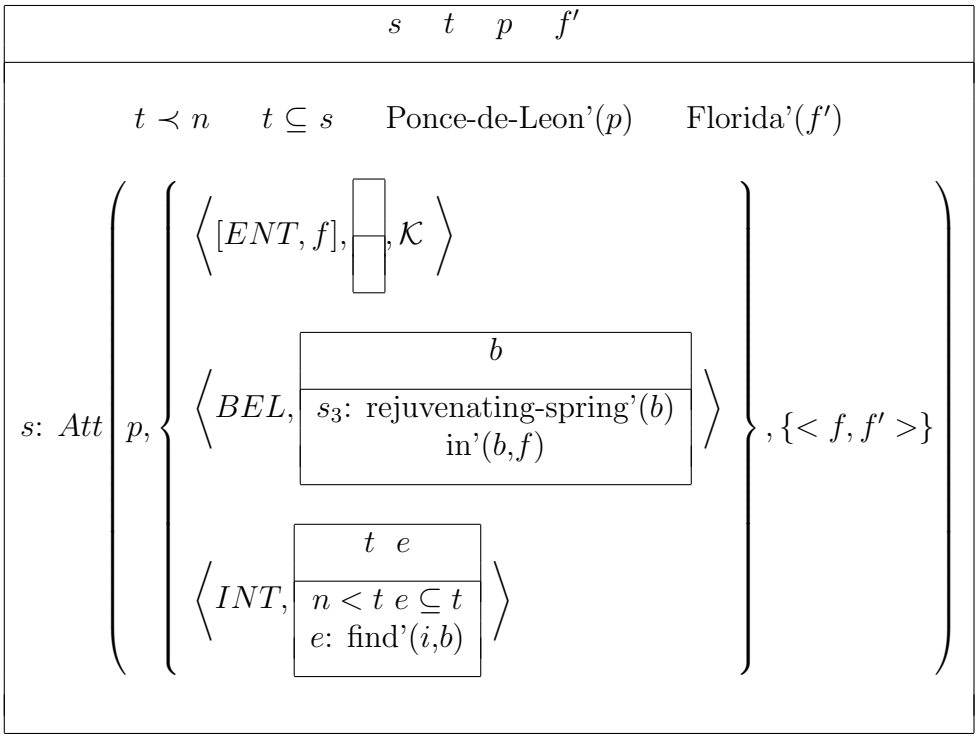
• This much about the use of names that do not occur as part of content specifications in attitude attributions.

When a name occurs within such a content specification, the conditions in (9) for standard name uses obtain too. But now some further constraints must obtain as well.

In fact we already saw this constraint in operation in the Logical Form in (8) for the attribution made in (5), both repeated here:

(5) Ponce de Leon believed that there was a rejuvenating spring in Florida; and he wanted to find it.

(8)



According to the communication-theoretic treatment of this example S must

herself have *Ponce-de Leon-* and *Florida*-labeled ERs for Ponce de Leon and Florida, and if her attribution is sincere also a belief that Ponce de Leon was at the time in question in a mental state as described by the *Att*-predication in (8).

That is, S's mental state must be as described in (17).

(17)
$$\left\{ \begin{array}{l} \left\langle [ENT, p_S], \boxed{\begin{array}{|c|}\hline \text{Named}(p_S,\ \textit{Ponce de Leon}) \\ \hline \end{array}}, \mathcal{K}_{p_S} \right\rangle \\ \\ \left\langle [ENT, f_S], \boxed{\begin{array}{|c|}\hline \text{Named}(f_S,\ \textit{Florida}) \\ \hline \end{array}}, \mathcal{K} \right\rangle \\ \\ \left\langle BEL, \boxed{\begin{array}{|c|}\hline s \quad t \\ \hline t \prec n \qquad t \subseteq s \\ s\text{: } \textit{Att}\left(p_S, \left\{ \begin{array}{l} \left\langle [ENT, f_{PdL}], \boxed{\ }, \mathcal{K}_{f_{PdL}} \right\rangle \\ \\ \left\langle BEL, \boxed{\begin{array}{|c|}\hline b \\ \hline s_3\text{: rej'g-spring'}(b) \\ \text{in'}(b, f_{PdL}) \\ \hline \end{array}} \right\rangle \\ \\ \left\langle INT, \boxed{\begin{array}{|c|}\hline t \quad e \\ \hline n < t \ e \subseteq t \\ e\text{: find'}(i,b) \\ \hline \end{array}} \right\rangle \end{array} \right\}, \{< f, f' >\} \right) \\ \hline \end{array}} \right\rangle \end{array} \right\}$$

In an optimal communication situation H should also have *Ponce de Leon-* and *Florida*-labeled entity representations for Ponce de Leon and Florida.

And his updated mental state should also have a belief with the same content representation as S's belief in (17).

Note that there is a potential for miscommunication here:

S attributes to Ponce de Leon a belief whose content is a singular proposition about the referent of her ER for Florida;

H attributes to Ponce de Leon a belief whose content is a singular proposition about the referent of his ER for Florida.

Only when their ERs are coreferential will these two propositions be the same.

(And the same of course also applies to their respective ERs for Ponce de Leon.)

5 Non-standard uses of names in content specifications

I believe that what I have described as the standard use of names in content specifications of attitude attributions is how such occurrences of names are understood in the vast majority of their uses.

But that is not so for many of the prominent puzzles about names in attitude attribution contexts that have populated the playground of contemporary philosophy of mind and language.

We will briefly look at two types of those puzzles:

1. *Vulcan*
2. *Hesperus-Phosphorus*

5.1 *Vulcan*

This puzzle arose in the wake of what Kripke has to say in *Naming snd Necessity* about the name *Vulcan*:

The French astronomer Leverrier postulated an inner planet, which he named *Vulcan*, to explain certain perturbations in the movements of the planet Mercury.

It became clear fairly soon that there couldn't be a planet with the required properties. But for a while, according to the story, Leverrier believed that there was such a planet and thus that *Vulcan* was its name.

And some others, presumably, did so as well.

Consider the following belief report.

(18) Leverrier assumed that Vulcan was closer to the sun than Mercury.

In the light of the story it is reasonable to assume that Leverrier's mental state at the time referred to by (18) can be correctly described by the MSD in (19).

(19)

$$\left\{ \begin{array}{l} \left\langle [ENT, v_L], \begin{array}{|c|}\hline \\ \hline \text{planet}(v_L) \\ \text{Named}(v_L,\ \textit{(Vulcan)} \\ \hline \end{array}, \{DEFIN(Vulcan)\}, +real \right\rangle \\ \\ \left\langle [ENT, m_L], \begin{array}{|c|}\hline \\ \hline \text{planet}(m_L) \\ \text{Named}(m_L,\textit{Mercury}) \\ \hline \end{array}, \mathcal{K}_{m,L}, +real \right\rangle \\ \\ \left\langle [ENT, s_L], \begin{array}{|c|}\hline \\ \hline \text{city}(p) \\ \text{Named}(s_L,\textit{the Sun}) \\ \hline \end{array}, \mathcal{K}_{s,L}, +real \right\rangle \\ \\ \left\langle BEL, \begin{array}{|c|}\hline s_1 \\ \hline n \subseteq s_1 \\ s_1\text{: Closer-to'}(v_L,s_L,m_L) \\ \hline \end{array} \right\rangle \end{array} \right\}$$

First suppose that (18) is uttered by a speaker S from the time when Leverrier introduced *Vulcan* who also believes in Vulcan's existence and that this is also true of the interpreter H.

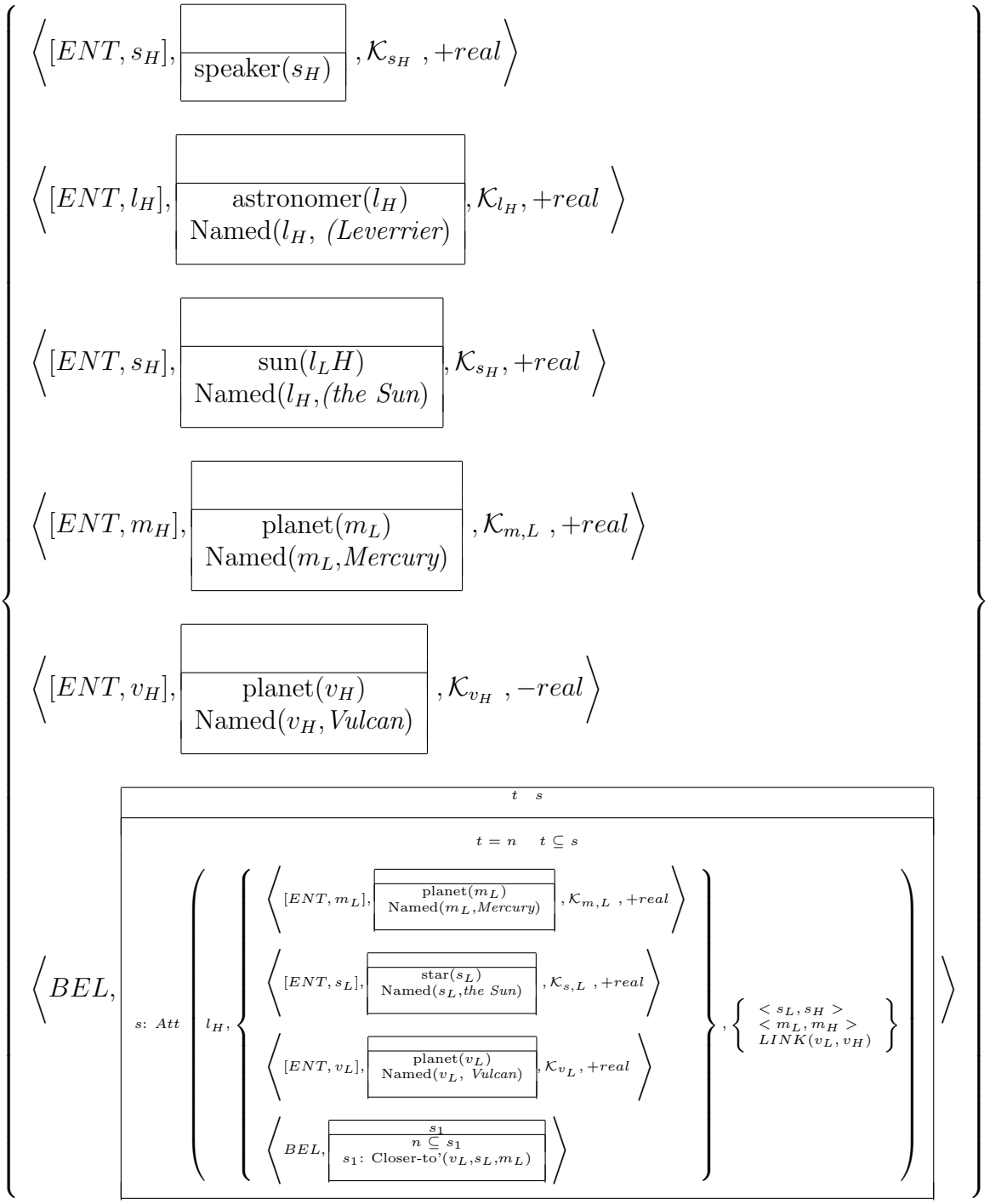
We may assume that before interpretation starts H is in a mental state described by the MSD (20.a) and that after interpretation H's state has been updated as shown in (20.a).

(20)

a.

$$\left\{ \begin{array}{l} \left\langle [ENT, s_H], \begin{array}{|c|}\hline \\ \hline \text{speaker}(s_H) \\ \hline \end{array}, \mathcal{K}_{s_H}\ , +real \right\rangle \\ \\ \left\langle [ENT, l_H], \begin{array}{|c|}\hline \\ \hline \text{astronomer}(l_H) \\ \text{Named}(l_H,\ \textit{(Leverrier)} \\ \hline \end{array}, \mathcal{K}_{l_H}, +real \right\rangle \\ \\ \left\langle [ENT, s_H], \begin{array}{|c|}\hline \\ \hline \text{sun}(l_L H) \\ \text{Named}(l_H, \textit{(the Sun)} \\ \hline \end{array}, \mathcal{K}_{s_H}, +real \right\rangle \\ \\ \left\langle [ENT, m_H], \begin{array}{|c|}\hline \\ \hline \text{planet}(m_L) \\ \text{Named}(m_L, \textit{Mercury}) \\ \hline \end{array}, \mathcal{K}_{m,L}\ , +real \right\rangle \\ \\ \left\langle [ENT, v_H], \begin{array}{|c|}\hline \\ \hline \text{planet}(v_H) \\ \text{Named}(v_H, \textit{Vulcan}) \\ \hline \end{array}, \mathcal{K}_{v_H}\ , -real \right\rangle \end{array} \right\}$$

(21)


$\langle [ENT, s_H], \boxed{\text{speaker}(s_H)}, \mathcal{K}_{s_H}, +real \rangle$
$\langle [ENT, l_H], \boxed{\text{astronomer}(l_H) \\ \text{Named}(l_H, \textit{(Leverrier)})}, \mathcal{K}_{l_H}, +real \rangle$
$\langle [ENT, s_H], \boxed{\text{sun}(l_L H) \\ \text{Named}(l_H, \textit{(the Sun)})}, \mathcal{K}_{s_H}, +real \rangle$
$\langle [ENT, m_H], \boxed{\text{planet}(m_L) \\ \text{Named}(m_L, \textit{Mercury})}, \mathcal{K}_{m,L}, +real \rangle$
$\langle [ENT, v_H], \boxed{\text{planet}(v_H) \\ \text{Named}(v_H, \textit{Vulcan})}, \mathcal{K}_{v_H}, -real \rangle$
$\langle BEL, \boxed{t \quad s \\ t = n \quad t \subseteq s \\ s\text{: } Att \left(l_H, \left\{ \begin{array}{l} \langle [ENT, m_L], \boxed{\text{planet}(m_L) \\ \text{Named}(m_L, \textit{Mercury})}, \mathcal{K}_{m,L}, +real \rangle \\ \langle [ENT, s_L], \boxed{\text{star}(s_L) \\ \text{Named}(s_L, \textit{the Sun})}, \mathcal{K}_{s,L}, +real \rangle \\ \langle [ENT, v_L], \boxed{\text{planet}(v_L) \\ \text{Named}(v_L, \textit{Vulcan})}, \mathcal{K}_{v_L}, +real \rangle \\ \langle BEL, \boxed{s_1 \\ n \subseteq s_1 \\ s_1\text{: Closer-to'}(v_L, s_L, m_L)} \rangle \end{array} \right\}, \left\{ \begin{array}{l} < s_L, s_H > \\ < m_L, m_H > \\ LINK(v_L, v_H) \end{array} \right\} \right)}, \mathcal{K}_{l_H}, +real \rangle$

The use of the names *Vulcan*, *the Sun* and *Mercury* by S in (18) and their interpretation by H seem much like that of *Florida* in our sentence about Ponce de Leon.

But with regard to *Vulcan* there is an important difference:

The use of *Vulcan* by S cannot be justified by S's assumption that Leverrier has an entity representation for the entity represented by her own *Vulcan*-labeled entity representation. For no entity is represented by either ER.

What justifies S's use of *Vulcan* in (18) is that the entity representation she assumes Leverrier to have is *vicariously linked* to her own entity representation.

Likewise for H's interpretation.

Conclusion: The justification of the use or interpretation of a proper name N in an attitude attribution is sometimes that the entity representation on which one's use or interpretation of N relies is connected with the presupposed entity representation in the mental state of the attributee via vicarious linking.

This justification also applies when S and/or H know that the name doesn't have a proper referent, as when a speaker S today says (18) to an addressee H who also knows about the history of Vulcan.

5.2 *Hesperus/Phosphorus*

The *Hesperus-Phosphorus* problem is one of a number of similar cases that are often discussed.

(*London* vs. *Londres*; *Clark Kent* vs. *Superman*; *Tully* vs. *Cicero*; ... .)

In each of these the agent to whom attitude attributions are made has two entity representations anchored to the same entity, but thinks that they represent two different entities.

Consider the following three attribution sentences

(22) a. Thales believed that Phosphorus is visible some time before dawn, but at no other time.

b. Thales believed that Hesperus is visible some time before dawn, but at no other time.

c. Thales believed that Venus is visible some time before dawn, but at no other time.

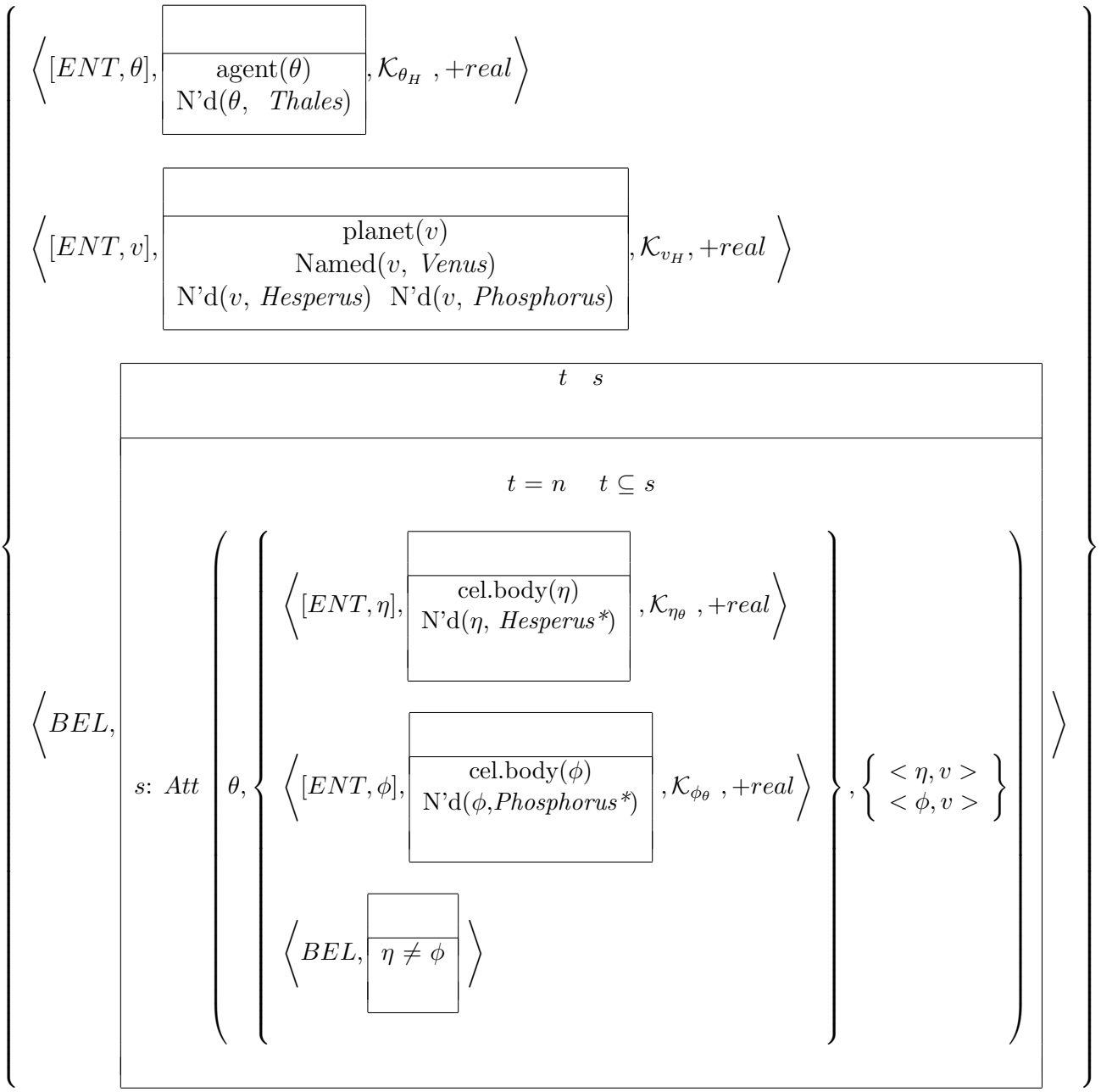
Suppose that S and H both know that in the days of Thales agents had distinct entity representations for the celestial body they could sometimes see before dawn and the celestial body that they could sometimes see after dusk.

Suppose that S says the first of the sentences in (22) to H.

It is reasonable to assume that before interpretation starts, H is in a mental state described by the following MSD.

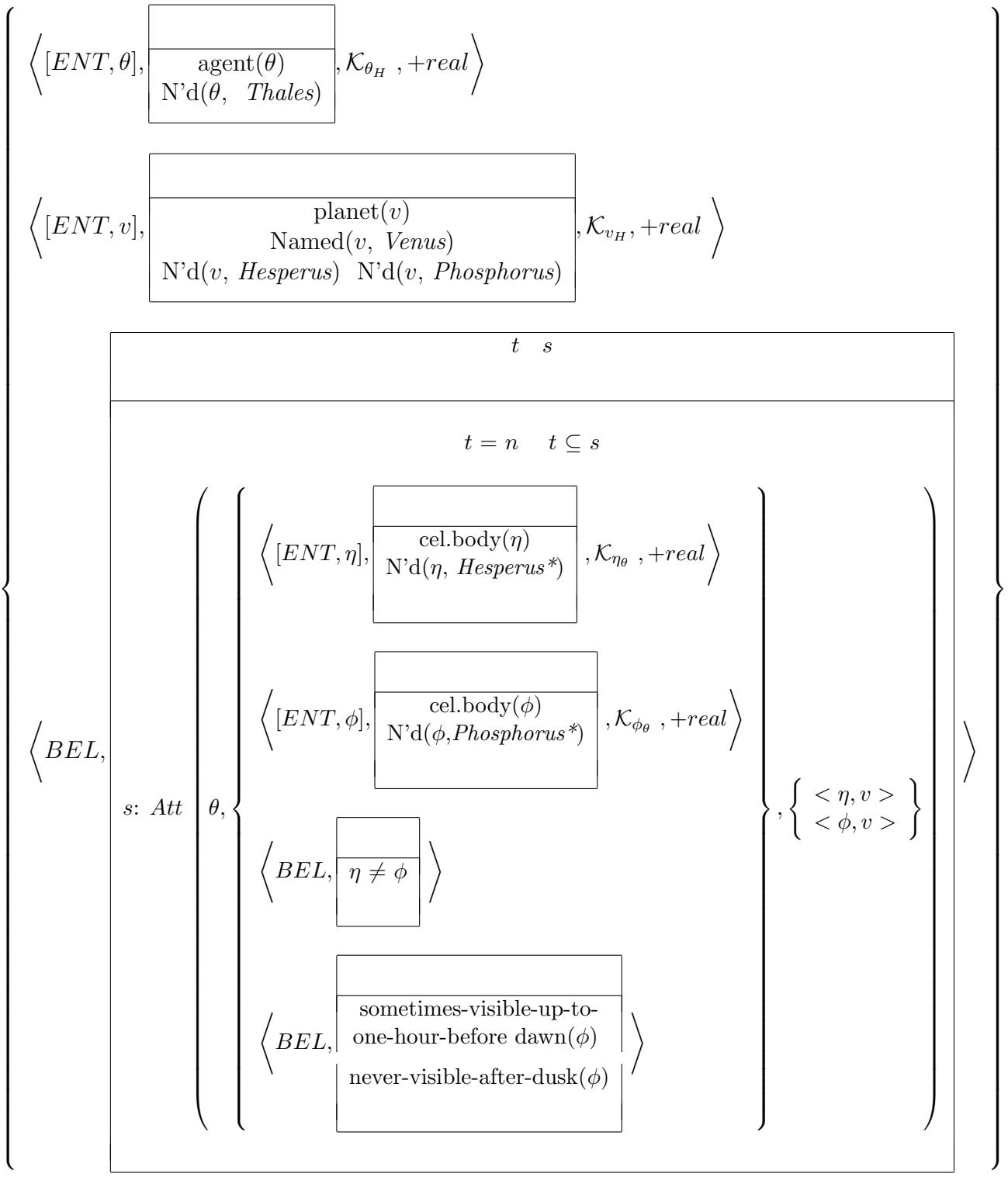
This MSD includes his representation of the relevant part of the mental state attributed by S to Thales.

(23)



After interpretation of S's utterance this MSD is updated with a new belief.

(24)


⟨[ENT, θ], agent(θ) N'd(θ, Thales), K_θH , +real⟩
⟨[ENT, v], planet(v) Named(v, Venus) N'd(v, Hesperus) N'd(v, Phosphorus), K_vH, +real⟩
t s
t = n t ⊆ s
⟨BEL, s: Att (θ, {⟨[ENT, η], cel.body(η) N'd(η, Hesperus*), K_ηθ , +real⟩
⟨[ENT, φ], cel.body(φ) N'd(φ,Phosphorus*), K_φθ , +real⟩
⟨BEL, η ≠ φ⟩
⟨BEL, sometimes-visible-up-to-one-hour-before dawn(φ) never-visible-after-dusk(φ)⟩}, {< η, v > < φ, v >})⟩

We haven't shown how the representation of the belief attributed to Thales by S's utterance is constructed in detail.

If we had, that's would have shown the problem of interpreting the occurrence of *Vulcan* in relation to H's MSD for Thales.

And that would also have revealed how the conventionalized use of *Hesperus* and *Phosphorus* in attitude attributions like those in our Thales sentences is so important for effective communication involving such sentences.

In other words, that would reveal more clearly that the reason why these reports can work as well as they do is that:

(i) S and H are in sync about the relevant part of the mental state of Thales.

(ii) S and H share a convention as to which of their names for Venus is to be used in order to point to which of the entity representations for Venus that they both know someone like Thales will have:

Phosphorus to the entity representation with Morning star content and *Hesperus* to the entity representation with Evening star content.

Conclusion:

The correct interpretation of attitude attributions of the kind considered in this section depends on getting two things right:

(i) The correct MSD for the relevant part of the attributee's mental state.

The correct identification within that MSD of the entity representations targeted by names used by the speaker.

6 Morals

• We started with DRT, a Logical Form approach to natural language semantics motivated by various discourse phenomena. (Temporal and nominal anaphora; presupposition.)

• We then moved to MSDRT, an extension of DRT originally designed to provide a semantics for complex attitude attributions.

Attitude attributions are analyzed in MSDRT as descriptions of mental states. Their Logical Forms are built around the Mental State Descriptions (MSDs) that MSDRT makes available to this end.
• The MSDs of MSDRT can also be used to describe the mental states of discourse participants.

In this way MSDRT provides the foundation for a *communication-theoretic framework* for doing natural language semantics.

• This communication-theoretic framework has proved helpful in particular with problems of reference, among them the roles and uses of proper names.

• Of special interest is what the framework enables us to say about the use of names in the content specifications of attitude attributions.

• Here the two uses of MSDRT – as a semantics for attitude reports and as a communication-theoretic framework for doing natural semantics generally – happily converge.

THANK YOU

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