

# Propositional attitudes, stereotyping and the mental lexicon

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## 1 Introduction

In this contribution, it seems fair to discuss a problem and to propose a solution in a domain in which all three laureates clearly have won their spurs. The problem to be discussed is raised by (1) and (2).

- (1) a. John believes that all dogs are animals.
  - b. John believes that the square root of 40000 is 200.
- (2) a. John believes that all bachelors are married.
  - b. John believes that the square root of 4000 is 200.

According to [10]:162, they demonstrate the collapse of Montague's programme of extensionalizing intensions: "... the neopositivist philosophy of science, when applied to the human sciences, ultimately runs aground on the cliffs of the human mind and thus of natural language".

I have been working in the Montagovian framework since the seventies and I am not a neopositivist. On the contrary, I side with those who choose the cognitive perspective on doing semantics on a formal basis as well as on the basis of an outspoken admiration for those who belong to the semantic tradition so nicely described in [4]. In the present paper, I will argue with the help of the sentences in (1) and (2) that one can have a cognitive perspective while using the Montagovian tools. The squib nature of my contribution gives me the opportunity to finally say something about what I have always considered a problem for philosophical logicians rather than for linguists. *Believe*-sentences are crucial for a better understanding of intensional meaning, including the full machinery of possible worlds, but as a linguist I see the problem with necessarily false or necessarily true propositions in (1) and (2) as a non-issue, or perhaps better: as a problem outside the scope of where we like to have possible worlds as underlying intensions.

## 2 Propositional attitudes

The problem raised by (1) and (2) is often called the problem of propositional attitudes. It boils down to saying that there is a believe-relation between John and a proposition. In cases like (3), Seuren can still follow Montague.

- (3) a. John believes that the morning star is inhabited.
  - b. John believes that the evening star is inhabited.

The fact that John may confirm (3a) but deny (3b) can be explained in terms of the set of possible worlds, which in (3a) is different from the one in (3b), as shown in (4). Hence it is not allowed to replace *the morning star* in (3a) by *the evening star* in (3b) *salva veritate*.

- (4) a.  $\exists x(\forall y(\text{MS}(y) \leftrightarrow x = y) \wedge \text{BELIEVE}(j, \hat{[\text{INHABITED}(x)]}))$   
 b.  $\exists x(\forall y(\text{ES}(y) \leftrightarrow x = y) \wedge \text{BELIEVE}(j, \hat{[\text{INHABITED}(x)]}))$

In (4a), the definite description *the morning star* stands outside the scope of the intensional operator  $\hat{\cdot}$ , which is defined as a function  $h$  from indices (possible worlds) to truth values (type  $\langle s, t \rangle$ ). The fact that *the evening star* is also outside the scope of  $\hat{\cdot}$  explains why John can have different beliefs with respect to the sentences in (3).

However, things change as soon as the formal machinery in (4) is applied to so-called opaque or oblique contexts such as (1) and (2). Technically, it means that (1a) would be represented as in (5) and this is generally taken as problematic..

- (5)  $\text{BEL}(j, \hat{[\forall x(\text{DOG}(x) \rightarrow \text{ANIMAL}(x)]])}$

Seuren (p.162) observes: “If propositions, like propositional meanings, are taken to be sets of possible worlds, then a necessarily false proposition is by definition the null set of possible worlds, and a necessarily true proposition is by definition the full set of possible worlds”, after which he gives the sentences in (1) and (2) in order to dispute Montague’s position. For him the decisive argument is that if John believes a proposition which is necessarily true as in (1a), he is bound to believe that (1b) is also true, the same applying *mutatus mutandis* to the sentences in (2).

Seuren shares his worries with [5]:170, which says: “If two sentences  $\phi$  and  $\psi$  are logically equivalent (i.e. have the same intension, and thus are true at exactly the same indices), then it will always be a logically valid inference from  $\mathbf{Bel}(\alpha, \hat{\phi})$  to  $\mathbf{Bel}(\alpha, \hat{\psi})$ , for any believer denoted by  $\alpha$ .”; cf. also the Most Certain Principle in [2]:492. But sentences like (1) and (2) constitute a clear counterexample: (1a) may be false and (1b) true and (2a) may be true and (2b) false. [5] considers the solution of this problem as crucial for the success of the possible world semantics and is not very optimistic about it. For Seuren all attempts so far to solve the problem along the line of Montagovian semantics have failed, which means a rejection of the possible world semantics, however reluctant he is to do so because of the nice formal machinery that is made available by Montague.

The quotation from [5] just given reveals a crucial feature of the referential theory of meaning, namely that intensional verbs are generally (cf. [1], [2], [5], [6], etc.) taken as expressing a relation between an individual and a proposition, as in (3) and in cases like (6) and (7).

- (6) a. Harry said that John kissed Mary.  
 b. Harry said that the smartest boy in the class kissed Mary.  
 (7) a. The detective knows that the thief entered through the skylight.  
 b. The detective knows that Biggles entered through the skylight.

In spite of the fact that the problem of interchangeability concerns the underlined noun phrases in (3) - (7), they are not directly involved in the believe-relation itself, because the external argument of an intensional verb relates to the proposition as a whole and not to a specific part of it. The point I would like to make is that this does not seem to hold in (1) and (2).

### 3 Intensionality and lexical meaning

Let me first say that sentences like (1) and (2) are really unfit for a linguistic analysis. If John is an adult person, then saying (2a) becomes quite ridiculous or implausible. One of

the few situations in which (2a) could be said is when John happens to be three years old or in a situation in which the speaker makes fun of John. And if John simply knows that  $\sqrt[3]{40000} = 200$ , (1b) is a very clumsy way of reporting about this knowledge. One would never use the four sentences in normal situations, so they appear in philosophical texts where they block the view on situations in which natural language speakers use this sort of sentence. Of course, one can improve on this by dropping the quantifier *all* and by using verbs like *know* in (1b) or *dispute* in (2b), etc. but that does not change the point.

From now on I will concentrate on (1) and in particular on (1a), which (clumsily) says that according to John dogs belong to the species *Animal*, which in Montagovian terms amounts to saying that for John the Carnapian meaning postulate  $\Box\forall x[\text{Dog}(x) \rightarrow \text{Animal}(x)]$  holds (cf. [3]). Let me add some examples that should be taken into account on top of (1a).

- (8) a. Hans believes that unwillingness is a form of recalcitrance.  
 b. I believe that a nuclear function of musea is to conserve memory.  
 c. I read somewhere that someone who is bored is pitiful. That amazes me because ...  
 d. Derrida is of the opinion that a fraternity is an excluding community.  
 e. When the banks were still small, it was simple: a banker was someone who loaned and invested money.

These are sentences from my collection of scanned clippings of articles in newspapers, magazines or internet. In [13], I used some material from this collection in order to illustrate my skepticism about the usefulness of linguistic corpora, when it comes to semantic analysis. Corpora are contaminated by the absence of ways to separate the metalinguistic use of language from the use of object language. Arguably a considerable part of discourses stored in corpora consists of sentences like (8), where expressions like *Hans believes that* are often replaced by phrases like *According to Hans* and where phrases such as *I believe that*, *I think that*, *according to me*, etc. are often simply dropped because the context is clear enough to permit that. What appears as a propositional attitude in  $\mathbf{Bel}(\alpha, \phi)$  can appear by dropping  $\alpha$  and  $\mathbf{Bel}$  in (2) and (8), as can be seen easily by checking the result. What remains is a description of what a certain person, mentioned or implied, thinks about whether a certain meaning element does or does not belong to the meaning of a certain word as used by that person. The speaker of a sentence in (8) participates in a debate about what the word in question means. This debate is a permanent feature of our discourse.

There is a lot of debate going on about what people mean if they use the underlined words, in the public as well in the private domain. For example, in the Netherlands the debate about the word *onwil* ('unwillingness') was quite fierce at the end of the nineties. This had to do with the fact that at that time the word was publicly used in connection with the Srebrenica affair: a ministerial commission used the word to characterize the attitude of the top of the Dutch army which had sent troops to Bosnia in order to protect its native population but failed to do so by what is nowadays considered coward behaviour. Sentence (8a) can only be understood as expressing that according to Hans the word *unwillingness* contains the semantic feature [+recalcitrant], (8b) says that the meaning of the word *museum* should contain the element 'conserving memory' as a defining feature, (8c) says that contrary to my feeling about it, the meaning of *boredom* should contain a semantic element 'pitiful', and (8d) expresses Derrida's belief that the word *fraternity* contains a negative element that has to do with keeping off those who do not belong to it. Finally, by assuming a covert *I believe* in front of (8e), the sentence

expresses that the speaker exposes a meaning element of the word *banker* which has disappeared in these neo-liberal days of greed and bonuses.

The three sentences in (8) clearly express that people in talking about the things that are or that happen in the domain of interpretation interact about the meaning of the words they use in their communication. In numerous situations people find it necessary to talk about the meaning (intensions, we say) rather than about the things themselves (extensions, we say). And all the sentences in (8) turn out to belong to the same set of sentences to which (1) and (2) belong and which form a problem for those who want to analyze them in terms of propositional attitudes, and in the case of (1a) in terms of analyticity. And this is because those who do that (Quine included, cf. [8],[9]) consider the meaning of *unwillingness*, *museum*, *boredom*, *bachelor*, *raven*, etc. as god-given, where the (logical) god in question provides necessity.

## 4 Stereotyping and meaning

What is the difference between the sentences in (9)?

- (9) a. John sees a politician as a professional in politics in particular as a holder of an elected office.  
 b. John sees a politician as an manipulative and unreliable person.

Why is a sentence like (9a) taken as expressing a (problematic) believe-sentence and why is (9b) taken as a stereotypical sentence banned from the discussion about propositional attitudes? In the present section, I will argue that it is necessary to include both sentences in (9) in the discussion because they are essential for a proper perspective on how to deal with sentences having a metalinguistic content.

[12] is an attempt to deal with stereotyping in terms of generalized quantification. Recently I discovered the existence of the Google h-index and I noticed then that this paper, published in a collection of papers in a different domain from the formal semantic one, contributed nill to this index, so the squib nature of the present contribution (hopefully) allows me to plunder a section of [12]. I just pick the relevant elements from it. It should be added that the two sentences in (9) are constructed on the basis of the two definitions of *politician* provided by the OED on my computer screen.

The basic format of GQT for the analysis of sentences like (10) is given in Figure 1. Determiners like *some*, *three*, *all*, *no*, *many*, *few*, *at least 30 but not more than 50*, etc. provide

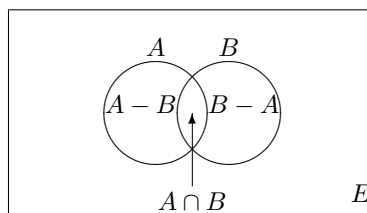


Figure 1: *Intersection model of generalized quantification*

information about the intersection  $A \cap B$ , as in cases like (10) in which  $A$  is the set of men,  $B$  the set of those who are ill and  $E$  the set of individuals constituting the domain of interpretation.

- (10) a. All men are ill :  $A \cap B = A$   
 b. Some men are ill :  $A \cap B \neq \emptyset$   
 c. Three men were ill:  $|A \cap B| = 3$

Stereotypes, as widely held and oversimplified ideas about persons or things, have much in common with beliefs. If John stereotypes women as weak creatures, (11) is a true sentence about John's mental lexicon.

- (11) John believes women are weak.

The only difference with (1a) is that John's belief about dogs in (1a) is shared by a community which overwhelmingly accepts the scientific consensus about dogs, whereas considerably less people share his belief about women in (11). This difference is not reflected, however, in the structural properties that constitute John's belief: in his mental lexicon there must be a meaning postulate  $\Box\forall[\text{Woman}(x) \rightarrow \text{Weak}(x)]$ , if (11) is true.

Our lexical knowledge of the relation between two words, say *man* and *ill*, is based on our experience with many domains of discourse  $E$  either directly or by consulting a dictionary in which this experience is presented in a sort of canonized way. If sentence (10b) *Some men are ill* is said to be true with respect to a model  $M$ , it applies to just one domain in which the relation between  $A$  and  $B$  can be verified in  $E$ . That is, one has to look for the set of men  $A$  in the domain of discourse  $E$ , for the set  $B$  of all ill individuals and (5b) is true if and only if we find some men in  $A \cap B$ . The same applies to (10a) *All men are ill*: all of the men in the domain  $E$  should be located in the set  $B$  of ill individuals if they happen to be ill.

But (10a) can also be used to characterize men as entities having the persistent property of illness. This persistency involves a series of models each having a domain  $E$ . In this case, (10a) should be said to be true with respect to a set  $\mathcal{M} = \{M_1, \dots, M_n\}$  in which for every  $M_i$  in  $\mathcal{M}$ , there is an interpretation function  $I_i$  making (10a) true. In certain militant feminist circles of the seventies, (10a) *All men are ill* and its near synonymous *Men are ill* were used as expressing a deep-rooted biological truth.

Stereotyping comes in at the very moment at which  $A - B$  is declared or considered or taken to be empty with the explicit or implicit claim that this holds for all members of  $\mathcal{M}$ . The result is clearly set inclusion:  $A$  is now considered a subset in every  $E$  and the speakers are directed by the structure of their lexical knowledge. In terms of  $\mathcal{M}$ , stereotyping can be seen as a refusal or an impossibility to inspect all  $M$ s in  $\{M_1, \dots, M_n\}$  individually or as a reduction to just those domains in which inclusion has been the case contingently (cf. [6]:54f.). This amounts to saying that stereotyping is basically a form of universal quantification at two different levels: (i) a particular model is not sufficiently or fully verified in  $M$  in order to find counterexamples to the statement that  $A$  is included in  $B$ ; (ii) the inclusion relation is assumed to generalize to (all) other models  $M$  in  $\mathcal{M}$ .

A determiner  $D_E$  in the relation  $D_E(A, B)$  is right-monotone increasing when (12a) holds and a determiner in the relation  $D_E(A, B)$  is left-monotone decreasing or anti-persistent if (12b) holds.

- (12) a. MON  $\uparrow$ : if  $D_E(A, B)$  and  $B \subseteq B'$ , then  $D_E(A, B')$   
 b.  $\Downarrow$  MON : if  $D_E(A, B)$  and  $A' \subseteq A$ , then  $D_E(A', B)$

The determiner *all* satisfies the definitions in (12) and is  $\Downarrow$  MON  $\uparrow$ .

- (13) a. All politicians are unreliable.  $\Rightarrow$  All MPs are unreliable.  $\Downarrow$  MON

b. All politicians break promises.  $\Rightarrow$  All politicians are unreliable. MON  $\uparrow$

Stereotypes show the same type of behavior as sentences with universal quantification, as can be seen in the following examples, assuming that parliamentarians (MPs) are a subset of politicians and people breaking promises are a subset of the set of unreliable people.

(14) a. Politicians are unreliable.  $\Rightarrow_{\text{ST}}$  MPs are unreliable.  $\Downarrow$  MON

b. Politicians break promises.  $\Rightarrow_{\text{ST}}$  Politicians are unreliable. MON  $\uparrow$

Note that for those who believe in the truth of the sentences on the left and right side of the arrow in (14), the meaning postulate  $\Box\forall x[\text{Politician}(x) \rightarrow \text{Unreliable}(x)]$  holds as firmly as the meaning postulate  $\Box\forall x[\text{Dog}(x) \rightarrow \text{Animal}(x)]$  holds for those who reject the truth of the sentences in (14). Note that those who are prepared to defend (14) generally will not recoil when confronted with the universal quantifier in (13): it allows them to skip the models in which they might find counterevidence.

## 5 Individual and public meaning

The only way of dealing correctly with the difference between the sentences in (14) and (1a) on the one side and with sentences like (3) and the believers of the falsity of the sentences in (13) at the other side is to adopt a cognitive perspective on lexical semantics. Each speaker in a language community is bound to compare his or her individual assignment of meaning to a word with the meaning assignments by others. It is therefore plausible to assume that speakers of a language generally agree on what they experience as the public meaning of words, like *dog*, *animal*, *politician*, etc. (if they doubt they consult a dictionary (in spite of its evident shortcomings mostly not seen by laypersons)) and it is this public meaning that philosophical logicians have in mind when they discuss about propositional attitudes. But individual meanings often differ from the public meanings, certainly when it comes to dealing with words as used in the sentences of (8). The use of verbs like *believe*, *assert*, *think*, *see as*, and of *according to* or *in her view* should warn the hearer that a metalinguistic stand is at issue, which means that the sentence in question is about a confrontation between  $\Box_{\text{public}}$  and  $\Box_{\text{individual}}$  in the meaning postulate involved.

One of the suggestions made by logicians like Carnap and Quine is that a postulate like  $\Box\forall x[\text{Dog}(x) \rightarrow \text{Animal}(x)]$  should be the only one connected with the word *dog*. Let me clarify the misleading nature of such a view with the help of a more popular example like (15) as discussed in detail in [8]:23ff. in the context of analyzing the notion of synonymy as the basis for relating the meanings of words.

(15) Bachelors are unmarried.

It is considered a big logical problem that (15) leads to *Unmarried men are unmarried* on the basis of a synonymy relation between definiendum and definiens. Some dictionaries define *bachelor* simply as ‘(an) unmarried man’ and this might explain why logicians (and linguists in their footsteps) use this example so frequently because Carnap must have had a look at a dictionary before he ventured to give a convincing example of an analytic statement dressed in natural language.

Apart from the lexicographic (bad) habit of defining a noun in terms of a noun phrase, OED does better. It gives: ‘a man who is not and has never been married’. The latter clause excludes widowers from being called bachelors. This clause is not sufficient, however, in view

of countries where registered partnerships are allowed. In that case, many speakers would not use *bachelor*, when talking about a man who lives together with a woman, the more so if there are children around. This is exactly a meaning element about which certainly a debate will take place in a language community: some agree and some disagree with excluding this man from the set of bachelors. Suppose that two homosexuals share a household in a country in which it is impossible for homosexuals to marry or to have a registered partnership. Would one call each of them a bachelor? There are other complications such as: do persons who do not marry because they have an IQ of below 30 fall under the extension of *bachelor*? Is the Pope a bachelor? Etcetera. The logical approach to believe-sentences has ignored this aspect in favour of focussing on interchangeability.

It should be underlined here also that lexical definitions concern word classes (nouns, verbs, etc.), whereas the philosophical-logical discussion tends to abstract from the difference between nouns and noun phrases. For example, in (6) and (7) the focus is on the question of whether the proper noun phrases *John* and *Biggles* are interchangeable with *the smartest boy in the class* and *the thief*, respectively. And in (3) the proper names of *Hesperus* and *Phosphorus* are also available in the background to make the point about Leibniz' law. In other words, the assignment of a lexical  $\langle e, t \rangle$ -feature to a noun with the help of universal quantification over models is linguistically quite different from the question of whether noun phrases are substitutable *salva veritate*.

All these comments point into one direction: the Quinean notion of synonymy as used in [8], [9] is misdirected: if *synonymy* is the right term for characterizing the relation between a definiendum and a definiens, then it is not the right term to use for noun phrases that are interchangeable in sentences that do not aim at checking what belongs and what does not belong to the meaning of a word. Or reversely. To compute the meaning of  $\mathbf{Bel}(\phi)$  in sentences like (3a) or (6b) is not the same as raising doubts about the canonized meaning of a noun or adjective in a language community. Speaking in metalanguage in order to agree on whether certain meaning elements are to be included or not provides a different perspective. Different rules for playing the game of agreeing on meaning will be necessary. This is what I meant with a confrontation between  $\Box_{\text{public}}$  and  $\Box_{\text{individual}}$ . I am not sure whether the dynamic alternative to Leibniz' law as proposed in [7]:207 amounts to the same opinion.

It is tempting to see this confrontation in terms of the same Montagovian machinery as discussed in the first two sections of the present paper, so that individual propositional attitudes run parallel to public ones, but I think that (16) is promising as the format that should be given its own place so as to take away the problem of propositional attitudes which worried [5], [11]:64 and [10]. This means that (1a) could be analyzed along the line of (16).

- (16) John believes of the noun *dog* that  $\Box\forall x[\text{Dog}(x) \rightarrow \text{Animal}(x)]$  is a correct candidate for a public meaning postulate.

This implies indeed that the use of *believe* in sentences that inspect a certain word on the way it is used in a language community is quite different from the use of *believe* in straightforwardly object-language cases like each of the sentences in (6) and (7). I have always been skeptical about the way in which Quine in [8] ignored the difference between talking about the world and talking about the words needed to talk about the world and I think that the discussion about (15) in terms of the distinction between an individual and a public domain helps to enhance that skepticism.

The sentences in (1b) and (2b) did not get attention so far, but here the same story can be told. John's belief concerns his competence to apply the meaning of *square root*. In other words, even if John in (1b) knows that the square root of 40000 is 200, his belief is not about

necessary truth but about the result of the extraction of the root. Bringing the issue in a more natural setting, one should pay attention to sentences like (17).

- (17) Hans Wiegel stupidly believes that  $1+1 = 2$ . He used this masterly sum to convince the Dutch people that his (political) opinions are as well-founded as this mathematical truth, but apparently he doesn't know about Boolean algebra.

Here Wiegel's belief can be seen as applying to his sense of mastering the addition operation signified by the "word" + (cf. for addition in propositional attitudes [1]:358 and [2]:492). Sentences like (18) could make this point perhaps more clear.

- (18) John believes that  $\sin\frac{1}{4}\pi = \frac{1}{2}\sqrt{3}$ .

This is a wrong belief because the proper answer is  $\frac{1}{2}\sqrt{2}$ . So, John mistook the sinus of an angle of  $45^\circ$  for the sinus of an angle of  $60^\circ$ , which is  $\sin\frac{1}{3}\pi$ . Again, the sentence is about John's belief concerning the proper application of a rule, namely the computation of the sinus of  $\frac{1}{4}\pi$  in  $\sin\frac{1}{4}\pi$ , and not about John's attitude towards the complement sentence itself, taken as a whole.

## 6 Conclusion

My intention was to raise some doubts as to the objections made in [10] and [5] to the Montagovian treatment of believe-sentences. My position is that sentences like (1) and (2) do not need to form a problem for the treatment of "regular" believe-sentences. The only thing one has to do is to take them away from the set of sentences falling under the heading of propositional attitudes by giving them a special position because they express belief about the meaning of a part of the complement sentence, not about the sentence itself. The use of *believe* in this type of sentence is to signal that in the mental lexicon of the believer there is evidently a private meaning postulate that does not match with a(n alleged or not) publicly accepted meaning postulate.

Crucial for the analysis is the assumption that individual meaning assignment always falls under the heading of stereotyping. This term has a negative flavour due to the fact that it mostly is used in order to demonstrate the shortsightedness of the human species, in particular of other people than oneself. But the machinery for dealing with stereotypes is exactly the same as the one assigning meaning postulates to words. So it is better to speak of individual meaning assignments that are matched with public meanings in which scientific opinions about denotations play a considerable role. Discourse is characterized by the constant need for matching each others meaning postulates in order to test whether or not one agrees about the meaning elements. Believe-sentences as in (1) and in a more natural way (8) can be seen as reporting about matching individual meanings with public meanings. My conclusion is that the Montagovian framework is quite appropriate for formal semantics with a cognitive perspective.

Let me finish with applying a believe-sentence to just one unique domain, dear to me, the ILLC-domain:

- (19) Henk believes that the emeritus status accorded to Frank, Jeroen and Martin is just the beginning of a new creative period and in this case *believes* is interchangeable *salva veritate* with *hopes* and *knows*.



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