

Intentional Identity and Information Exchange

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“We have intentional identity when a number of people, or one person on different occasions, have attitudes with a common focus, whether or not there actually is something at that focus” (Geach 1967, p. 627). In this paper we compare and relate Robert van Rooy’s recent analysis of intentional identity descriptions by means of ‘Hob-Nob sentences’, with Paul Dekker’s equally recent analysis of cross-speaker anaphora, ‘Hob-Nob situations’ as we will also call them here. Hob-Nob sentences and Hob-Nob situations have been allocated to different (sub-)areas of the theory of interpretation, to the semantics of attitude ascriptions, and to the pragmatics of pronominal anaphora, respectively. However, the two are closely related. Hob-Nob situations are most naturally described using Hob-Nob sentences, and Hob-Nob sentences generally describe Hob-Nob situations. A combined account may serve to shed light on the semantics / pragmatics interface, and also on the relation between believing and meaning. This paper thus makes up a concrete case for studying two long-standing philosophical issues which to our opinion are most actual in the area of language and information.

Hob-Nob Sentences

A pronoun occurring in the embedded clause of an attitude attribution may have as its syntactic antecedent an indefinite in the embedded clause of an earlier attitude attribution. It is not difficult to represent this in standard logical languages if the indefinite is interpreted *de re*, but such an indefinite does not always need to be interpreted *de re*, as is illustrated by Geach’s Hob-Nob sentence (1), or, a bit less involved, example (2):

- (1) Hob thinks a witch has blighted Bob’s mare, and Nob wonders whether she (the same witch) killed Cob’s sow.
- (2) Hob thinks a witch has blighted Bob’s mare, and Nob thinks she killed Cob’s sow.

As Geach has pointed out, it is not *prima facie* obvious how to analyze the (second) attitude ascriptions to Nob. Nob’s musings are intended to be about the same witch as Hob’s thoughts, but there need not be any real individual in the focus of attention. Besides, it appears it wouldn’t be of any help to analyze the pronoun as an E-type description, because Nob doesn’t have to believe that the witch he thinks about blighted Bob’s mare, neither does he have to believe that Hob believes this. In short, no straightforward ‘*de re*’ or ‘*de dicto*’ analysis of (1) or (2) seems to be plausible.

Edelberg (1992) has analyzed this kind of examples by understanding natural language terms as (sometimes) referring to the ‘belief objects’ of epistemic agents. The Hob-Nob sentence can be interpreted in a satisfactory way if the indefinite ‘a witch’ refers to a belief object of the first agent (Hob), and the anaphoric pronoun to a belief object of the second agent (Nob) which is a counterpart of the first. We

might formulate such an account by means of the following (as yet unanalyzed) representation of the example (2):

$$(3) \exists\alpha\exists\beta(B(h, W\alpha) \wedge B(n, K\beta) \wedge \alpha \approx \beta)$$

(Here, ‘ W ’ can be taken to abbreviate an analysis of ‘is a witch who blighted Bob’s mare, and ‘ K ’ as an abbreviation of ‘killed Cob’s sow’.) In this formula α stands for Hob’s belief object, and β for Nob’s belief object, and by means of $\alpha \approx \beta$ it is explicitly asserted that the second is a counterpart of the first.

Edelberg’s analysis raises a couple of questions. An analysis along these lines must at least provide an explanation of what it means to belief things about belief objects, and what it means for someone’s belief object to be a counterpart of someone else’s belief object. As to this last question, Edelberg resorts to the notion of ‘similarity of explanatory role’ in the belief systems of the various agents. Van Rooy (1997) has argued that this account is not satisfactory.

Besides, an analysis of example (2) as (3) has to explain how we can obtain the last from the first in a compositional way. For (3) involves a wide scope (existential) quantification over belief objects, while the descriptive material associated with the noun phrase ‘a witch’ in (2) which has given rise to this existential quantification remains within the scope of the attitudinal verb. What enables such a split between the logical impact (existential quantification) and the descriptive contribution (that of being a witch) of a relatively simple indefinite noun phrase like ‘a witch’?

Van Rooy (1997) has given an analysis of Hob-Nob sentences along the lines of Edelberg which seems to answer each of the three questions in a satisfactory way. Van Rooy’s analysis makes use of the type of information states which have been developed in frameworks of dynamic semantics. These information states model information about ‘discourse referents’, the possible values of discourse markers in discourse. Crucial to van Rooy’s analysis is an externalistic understanding of this notion of a discourse referent. There is assumed to be a factual (causal / intentional) relation between discourse referents or belief objects on the one hand, and belief objects and real individuals on the other. (Van Rooy (1997) also argues that pronouns are normally *referentially* used, and refer to the speaker’s referent of its antecedent indefinite. He furthermore shows that even the universal readings of donkey sentences can be predicted on the basis of this assumption.)

Van Rooy applies these information states to model the belief states of epistemic agents containing belief objects. Indefinites in the scope of belief-verbs are taken to refer to these belief objects. Like Edelberg, van Rooy employs counterpart relations between belief objects of different agents. Unlike Edelberg, however, he explains these relations in terms of how these belief objects have come to existence. The intuition is that two belief objects are a counterpart of each other if they represent or are intended to represent the same source. Normally the source of a belief object is the object the belief is about. Sometimes, it is (the source of) someone else’s belief object, viz., someone who has communicated its existence. What is important here is that counterparthood is conceived of as a factual relation.

With regard to the third issue, notice that van Rooy’s analysis of Hob-Nob sentences automatically solves the scope problem. Dynamic semantic information states have observable structure. In such information states information is hooked up to accessible discourse markers. So, if a person is ascribed such an information state, and if it is said that that state contains a belief object figuring as a certain kind of witch *in* that belief state, then there is some aspect of the states which figures as an attachment point in the state for being a witch. Put more clearly, an analysis along the lines of van Rooy validates something like the following equivalence:

$$(4) B(h, \exists x Wx) \approx \exists\alpha B(h, W\alpha)$$

Van Rooy’s analysis, thus, allows us to use the narrow scope analysis of an indefinite in a belief context as in the left-hand side of this equivalence, because it is taken to

describe a situation like that described by the formula on the right-hand side, and it enables reference to the belief object at issue. In this sense, van Rooy's analysis of the attitudes can properly be said to be transparent, although not at all in the sense despised by Quine. (As a matter of fact, van Rooy's theory, as well as that of Dekker, properly accounts for the opacity of the attitudes which Quine, and others, have observed.)

Hob-Nob Situations

We use the term 'Hob-Nob situations' to refer to cases where two or more agents discuss and exchange information about a subject they have agreed upon, when actually there need not be a real thing which they are talking about. Notice that this description remains close to Geach's description of intentional identity which we quoted at the start of this paper. Typically these involve the use of pronouns by one agent to refer back to subjects mentioned or introduced by another agent. (Hence the term 'cross-speaker anaphora', which is also used.) Consider:

- (5) *A*: A man is sleeping on a park bench.
- (6) *B*: I can hear him snore.

These two utterance may make up a nice and understandable exchange of information, even if there is no such thing as (something looking like) a man sleeping on a park bench over there. (Of course, what *A* says would be false in that case.) It seems pretty obvious what the meaning of *A*'s statement is in that case. *A* commits himself to the (truth of the) proposition that a man is sleeping on a park bench over there. But what should we say is said by *B*? What information does he express?

As in the case of Hob-Nob sentences, it doesn't seem that an E-type analysis of (*B*'s use of) the pronoun would be of any help, because *B* may disagree with virtually all descriptions employed by *A*, without this making *B*'s statement contradictory:

- (5) *A*: A man is sleeping on a park bench.
- (7) *B*: It is not a man, it is a woman, and she is not asleep, she is just sunbathing. Besides, it is not a parkbench.

Alternatively, Groenendijk, Stokhof and Veltman (1997) argue that cross speaker anaphora requires something like speaker's reference. If, they say, *B* refers back to the individual introduced by *A*, then *A*'s utterance must apparently be understood to be referential, and be analyzed as in, e.g., (8):

- (8) *T* is a man sleeping on a park bench.

where *T* is either a demonstrative phrase or a definite description. The idea seems to be that a responder *B* then may pick up that description, or the individual referred to. We definitely agree that for *B* to refer back to an entity introduced by *A*, there must be some definite entity which *A* talked about, or at least *B* must assume there to be one. However, Groenendijk, Stokhof and Veltman's analysis leaves two big questions wide open. Why should indefinite noun phrases be reanalyzed in the case of cross speaker anaphora? And how must we (or *B*) go about to determine the specific referential phrase which is to replace the indefinite noun phrase? In many cases there just is not one unique choice to be made.

The theorist who wants to characterize what is going on in examples (5)–(6), seems to be in a position similar to someone who wants to understand or interpret sentences like (1) and (2). There seems to be a definite link between two discourse entities or belief objects, but what this link is, and how it can be accounted for in a non ad hoc way has remained unclear sofar.

Dekker (1997) has given an analysis of Hob-Nob situations which is the same in spirit as van Rooy's analysis of Hob-Nob sentences. In that paper it is argued that the use of pronouns in information exchange can be explained by more general principles governing the use of their antecedents, or natural language noun phrases

more in general. All natural language terms (definite and indefinite noun phrases alike), are assumed to relate to specific subjects in the information state of a speaker. Indefinite noun phrases which set up discourse referents in a felicitous way, must refer to specific subjects in the information state of a speaker, although they may provide no clue so as to which of his own subjects a speaker refers to. Pronouns anaphoric upon these noun phrases then may refer back to the same subject. If such a pronoun is used by another speaker, then he uses it on the assumption that he knows which subject the original speaker initially referred to, or, rather, that he thinks he is able to match the speaker's subject with one of his own.

Dekker's analysis is further motivated by the observation that *A*'s reply in the following example is strange, at least. Suppose *A* was visited by several people yesterday, who inquired after the secretary's office. One of them was Arnold, who was dressed in a purple jogging suite, and the others were properly dressed, with earrings, necklaces, etc. *A* is also fully aware of all this.

(9) *A*: Yesterday, a man ran into my office, who inquired after the secretary's office.

(10) *B*: Was he wearing a purple jogging suit?

(11) *A*: If it was Arnold he was, and if it was somebody else he was not.

We claim that *A*'s response is pretty marked, and that he is not at all entitled to defend his reply by saying that at the moment of *B*'s question, he had not yet decided whether he had started talking about Arnold, or about some of the others.

Dekker's analysis also answers a relatively new, but till now theoretically wide open, question what information a speaker may have to support his utterance of open propositions, propositions with variables or pronouns in them. E-type pronoun theories and notions of support available in current systems of dynamic semantics do not offer any plausible answer to this (Gricean) question. The (pragmatic) assumption that natural language terms refer to belief objects of the speaker does.

Parallels, Semantics and Pragmatics

Hob-Nob sentences may characterize Hob-Nob situations, and Hob-Nob situations are naturally described by Hob-Nob sentences. It need not surprise, therefore, that the analyses of the two by van Rooy and Dekker are strikingly similar. The analyses do not require the two belief reports or utterances to be referring (*de re*) to one and the same individual, nor do they require there to be some (identifying) descriptive content which is shared in the two expressed or reported beliefs.

Both analyses, furthermore, involve a factual or intentional relation between belief objects, or subjects. Both analyses make essential use of the kinds of information states which have been developed in theories of discourse representation and dynamic semantics. Both employ the notion of a belief object or a subject as a partial object, construed in terms of partial information about the value of a variable.

Finally, both analyses adopt the idea that definite and indefinite noun phrases alike may refer to belief objects or subjects. Both use a special kind of counterpart relation to link up belief objects belonging to different states. In both the counterpart relation is conceived of as an actual, relation, which need not be symmetric.

Needless to say that the two analyses are not identical. A major difference between the analysis of Hob-Nob sentences by van Rooy, and that of Hob-Nob situations by Dekker is that the relevant counterpart relation is dealt with fully semantically in the first, and that the corresponding linking or resolution relation is established at the pragmatic level according to the second. Although one may be inclined to think of this as a principled difference, we think it is not.

The crux of both analyses is that the phenomena dealt with reside in the borderland between what people used to think of as the pragmatic and semantic

areas of a theory of interpretation. Thus, an adequate analysis of the phenomena will have to allow for an interaction between semantic and pragmatic phenomena anyway, and then it may be immaterial which module deals with what aspect of a phenomenon. So, whereas the extended coverage gained by the dynamic turn in semantics can be argued to consist in the incorporation of pragmatic phenomena, this probably holds to a greater extent when we extend our scope to situations of information exchange.

We think our analyses show the (desirability of an) intimate connection between the notion of an information state required in a theory of interpretation, and one that is required for the analysis of attitude ascriptions. We also think that the information states of systems of dynamic semantics, or DRT-style belief-states, have to be extended with some notion of a counterpart (a linking- or a anchoring relation). To our opinion the dynamic or DRT-style model of interpretation must be understood as fitting in a sophisticated causal theory of reference, where causal chains are understood as being mediated by the belief objects and intentions of the epistemic agents involved (cf. also the analysis of Kamp 1990). We hold that such an integrated theory would have a wider empirical coverage and a larger explanatory value.

In order to substantiate the above claims a bit further, the next section presents some of the formal details of an account of Hob-Nob sentences and situations, in the terminology of one of the two analyses, that of Dekker. Notice that this choice for one formulation is arbitrary.

Information and Support

Dekker's analysis starts of from Heimian information states, as they have been investigated in Dekker (1996). Information states are conceived of as structured around belief objects, or 'subjects', related to each other and to individuals in the real world by 'counterpart' or 'linking' relations. The subjects of information states are labeled by variables. Information states encode information about their subjects in terms of constraints upon their possible values. Conceiving of the world as the prime subject, a distinguished variables v is assumed to label this subject in each information state.

In what follows we will use intensional predicate logical models $M = \langle W, D, I \rangle$ containing a set of worlds W , a domain of individuals D and a world-dependent interpretation function I for the individual and relational constants of a predicate logical language L . (Reference to M and L is suppressed throughout.) States of information about the possible values of a subset X of the set of variables V are characterized by subsets σ of the set ASS^X of assignments to X , where:

$$(12) \quad ASS^X = \{f \cup g \mid f \in W^{\{v\}} \ \& \ g \in D^X\} \quad (v \notin V)$$

We will refer to these entities as 'information aggregates' in what follows. They can be conceived of as the interpretations of discourse representation structures. For instance, the information aggregate corresponding to the structure:

$$(13) \quad \begin{array}{|c|} \hline x_1, \dots, x_m \\ \hline \phi_1 \\ \vdots \\ \phi_n \\ \hline \end{array}$$

can be characterized by the aggregate:

$$(14) \quad \{g \in ASS^{\{x_1, \dots, x_m\}} \mid \models_{M, g(v), g} \phi_1 \ \dots \ \models_{M, g(v), g} \phi_n\}$$

The formulas of our formal language can be assigned information aggregates in a compositional way. By a judicious implementation of "Lewis' philosophy" (that indefinites are like free variables), we can account for intersentential relationships

and donkey sentences. As has been shown elsewhere (also at this conference), this can be done by *explicitly* distinguishing between a set F of free and a set B of bound variables, and such that

$$(15) V = B \cup F; B \cap F = \emptyset$$

Pronouns then can be associated with free variables and indefinite (antecedent) noun phrases with bound variables. Information aggregates encode information about both. In the conjunction of two formulas ϕ and ψ , the anaphoric relationships can be established by resolving free variables in the aggregate associated with ψ into bind variables in the aggregate associated with ϕ . (Other methods of resolution are possible, of course.) For details, the reader is referred to Dekker (1997).

One simple example is (16), with associated translation (17) and interpretation (18):

$$(16) \text{He sees something.}$$

$$(17) \exists z S y z$$

$$(18) \{g \in ASS^{y,z} \mid \langle g(y), g(z) \rangle \in I_{g(v)}(T)\}$$

Upon Dekker's analysis, a speaker utters a sentence felicitously only if the terms he uses (names, definite and indefinite descriptions, demonstratives and anaphoric pronouns), are appropriately anchored in subjects of his own information aggregate. As a first order elaboration of Grice's maxims of quality, what a speaker says about a sequence of subjects x_1, \dots, x_n must be motivated by what information he has concerning specific subjects $l(x_1), \dots, l(x_n)$ in his or her own information aggregate. In order to formulate this requirement, we refer to a linking relation l specifying which of his subjects $l(x_i)$ are the source of the discourse referents x_i (s)he has introduced. The key notion is that of an aggregate *supporting* another one under such a linking relation l (in general we use $D(l)$, $D(\tau)$ and $D(\phi)$ to indicate the domain of a function, information aggregate, and formula, respectively; it is always a set of variables)

$$(19) \sigma \triangleleft_l \tau \text{ iff } D(l) = D(\tau) \text{ and } \forall g \in \sigma \exists h \in \tau: g \equiv_l h \\ \text{where } g \equiv_l h \text{ iff } g(v) = h(v) \ \& \ \forall y \in D(l): g(l(y)) = h(y)$$

If $\sigma \triangleleft_l \tau$, then all the information which τ has concerning the subjects in its domain, σ has concerning the corresponding subjects in its own domain. Now we can say:

$$(20) \sigma \triangleleft_l \phi, \sigma \text{ supports } \phi \text{ under } l, \text{ iff } \sigma \triangleleft_l \llbracket \phi \rrbracket$$

Thus, if $\sigma \triangleleft_l \phi$, then ϕ is seen to express information about subjects x_1, \dots, x_n which σ has about the corresponding subjects $l(x_1), \dots, l(x_n)$. One example:

$$(21) \sigma \triangleleft_l \exists z T y z \text{ iff } \forall g \in \sigma: \langle g(l(y)), g(l(z)) \rangle \in I_{g(v)}(T)$$

As an account of cross speaker anaphora, however, this is only part of the story. For someone to use anaphoric pronouns, one should use them in relation to the same subject as the one (one thinks) the antecedent related to. In order to represent this, we have to bring in two more relations in our model:

- a representation function \mathcal{R} assigning information aggregates to individuals in worlds
- a 'source' relation \mathcal{S} linking subjects to subjects and individuals in worlds

(Strictly speaking we should talk about 'instantiations' or 'materializations' of information states here, but we skip over this aspect.) Finally, we have to extend our referring devices, in order to refer to belief objects. For this reason we employ composite reference markers which are finite, non-empty sequences of variables. Our variable assignments g are taken to assign values to both simple and composite variables, in the following way:

$$(22) \text{for all } \vec{x}^n \in V^n: g(\vec{x}^n) \in (D \times V^{n-1})$$

The resulting sets of variable assignments to sets $X^* \subseteq \bigcup \{V^n \mid n \in \mathcal{N}\}$ of composite variables will be indicated as ASS^{X^*} .

The value of a simple variable x will be an individual, as usual; the value of a composite variable xy consists of an individual d and a variable w , and determines the belief object w of d (if it exists); the value of a composite variable xyz consists of an individual d and two variables u and w , and determines the belief object w of belief object u of d , etc. Now we can say, roughly, when a person e is licensed to utter a formula ϕ in a world w relative to l :

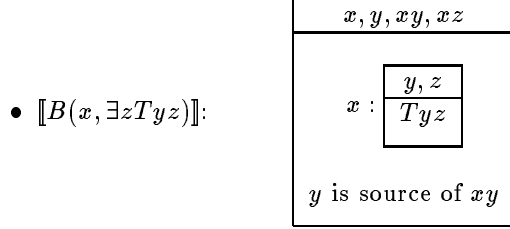
$$(23) e \trianglelefteq_{w,l} \phi \text{ iff } \mathcal{R}_w(e) \trianglelefteq_l \phi \text{ and } \forall y \in F(\phi) \exists a \forall g \in \mathcal{R}_w(e): \langle g(l(y)), g(a) \rangle \in \mathcal{S}_{g(v)}$$

That is, e 's representation must support the utterance, and for each free variable e uses e must believe there to be an antecedent individual or subject which derives from e 's source for his use of that pronoun.

With the machinery developed sofar, we can also approach simple attitude ascriptions (in this example $X = \{x\} \cup F(\phi) \cup \{xz \mid z \in D(\phi)\}$):

$$(24) \llbracket B(x, \phi) \rrbracket = \{g \in ASS^{X^*} \mid \exists l: \mathcal{R}_{g(v)}(g(x)) \trianglelefteq_l \llbracket \phi \rrbracket \ \& \\ \forall y \in F(\phi): \langle g(y), g(xy) \rangle \in \mathcal{S}_{g(v)} \ \& \\ \forall z \in D(\phi): g(xz) = \langle g(x)l(z) \rangle\}$$

If we switch to the corresponding discourse representations, we can see what a simple belief ascription amounts to:



Here xy can be used to refer to agent x 's belief object y and xz to this agent's belief object z .

Summing up we use an old-fashioned notion of meaning (that of sets of variable assignments, or information aggregates) and counterpart or linking relations to relate subjects of information aggregates to their sources. With these means, we have formulated the interpretation of statements made with formulas containing free variables (pronouns) and the interpretation of attitude reports with free variables (pronouns). We now return to the Hob-Nob sentences.

(Non-)Identity Resolution

Propositions with (free variable) holes need to be resolved in context. In many case this can be done by relating them to an antecedent term, and by interpreting such an anaphoric relationship as one of co-reference. This is the standard case, treated well in systems of dynamic semantics. In our terminology this amounts to equating two variables (a free and a bound variable). Consider this example:

(25) There is an ape.

$$\llbracket \exists xAx \rrbracket = \{g \in ASS^{\{x\}} \mid g(x) \in I_{g(v)}(A)\}$$

(26) It bites.

$$\llbracket By \rrbracket = \{h \in ASS^{\{y\}} \mid h(y) \in I_{h(v)}(A)\}$$

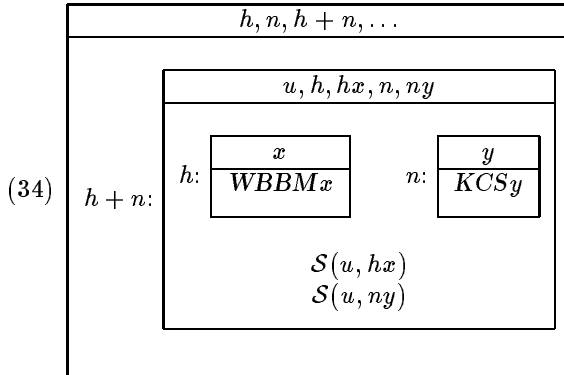
(27) (25) $\wedge_{\{x,y\}}$ (26) =

$$\{f \in D^{\{x\}} \mid f(x) \in (I_{f(v)}(A) \cap I_{f(v)}(B))\}$$

Also in attitude contexts the present system allows the resolution of intensional holes by co-reference (identity). In the following example we find co-reference between two belief objects, which invokes, what has been called a case of modal subordination:

The moral of this appears to be that in general the *speaker* is responsible for the link, and this constitutes a big difference between Hob-Nob sentences and Hob-Nob situations.

We finally note that resolution may take place against the background of shared beliefs:



In this example Hob and Nob’s belief objects have been related to an object in a common *downdate* of their own aggregates. As we will argue in more detail in the full paper, such ways of resolving pronouns give us a handle to describe what is going on in the more involved cases of Arsky and Barsky which Edelberg discusses.

Hob-Nob Presuppositions

Until now we only talked about situations where we report attitudes of a number of agents with a common focus, or where agents discuss and exchange information about one and the same thing, by means of pronouns. We argued that for such a successful attitude report or for a successful exchange of information about this common focus it is a necessary and sufficient condition that there exists a causal link between the ‘belief objects’ involved. In particular, it need not be the case that the second agent agrees with what is attributed about this element in common focus to the first agent, in case of intentional identity attribution, or that the second speaker agrees with what the first speaker said about the thing in focus, in case of information exchange. But of course, things could be otherwise. In case of information exchange the second speaker might accept what the first speaker asserted, which suggest that he might express this acceptance by the use of presupposition triggers in his reaction in a dialogue. In case of belief attributions, the speaker might know or believe that the second agent accepts what is attributed to the first agent, which leads to the expectation that he might express this knowledge by the use of an explicit presupposition trigger. We believe that both expectations are warranted.

The following example is adapted from Heim (1992)

- (35) Jon is sure that his parents are gone.
- (36) May thinks that [her]_F parents are gone, too.

In an utterance of (36), with focus accent on ‘her’, we think ‘too’ may relate to the proposition that Jon’s parents are gone, not to the proposition that Jon thinks that his parents are gone. Under such an analysis, we think, it need not be presupposed that Jon’s parents are gone but the sentence gives rise to the expectation that May believes that Jon’s parents are gone. Something similar can be said to be the case in the corresponding multi-speaker case:

- (37) *Jon*: My parents are gone.
- (38) *May*: [My]_F parents are gone, too.

With (38), May indicates that she has accepted, believes, the proposition uttered by Jon in (37). These cases exhibit some Hob-Nob effects. In both examples both

May and Jon appear to be committed to the truth of the proposition that Jon's parents are gone, although the utterer of (35) and (36) need not be committed to the truth of that proposition, and although the proposition simply need not be true. The truth (or falsity) of that proposition then can be compared with the existence (or non-existence) of a certain individual in the Hob-Nob cases.

These observations lead to the question how to account for these more general Hob-Nob effects in case agents agree. For such Hob-Nob situations the answer seems quite straightforward; In dynamic semantics it's assumed that each assertion is interpreted with respect to a context of interpretation. Such a context represents that what is presupposed by the participants of a conversation. This context is updated each time an assertion is accepted, and speakers might cohere what they say with what he or others asserted by means of presuppositional expressions. The use of a presuppositional expression in an assertion requires that this context contains already (perhaps after accommodation) this explicitly presupposed information.

For Hob-Nob sentences where the second agent also accepts what is attributed to the first agent, it seems we have to assume that the embedded sentence of the second belief attributions is modally subordinated to the embedded sentence of the first belief attribution. As, for instance, Roberts (1989) showed, some sentences are not interpreted with respect to the main context of interpretation, but with respect to subordinated contexts set up by modal expressions. For instance, with the second sentence of the discourse *A wolf might come in. He would eat you first* we seem to make the claim that the wolf will eat you, on the assumption that one comes in. Geurts (1995) has recently developed a systematic approach towards modal subordination to account for anaphoric and presuppositional dependencies across belief and desire attributions in the one-agent case. The most straightforward way to extend this account to the multi-agent case (suggested by Geurts in unpublished work) seems to lead to the prediction that the assumption under which the second embedded sentence is interpreted must not only be believed by the first agent, but also by the second one. Notice that this agrees with what we observed about the examples (35) and (36).

Still, we feel that this cannot be the whole story. Suppose that Zag does not believe that Jon and May are coming to the party, but that he believes and just told us that Liz is coming. We think that in such a situation also the following discourse is acceptable:

(39) Meg thinks that Jon and May are coming to the party.

(40) Zag thinks that [Liz]_F is coming *too*.

These examples need not give rise to the presupposition that (Zag thinks) Jon and May are actually coming to the party. It is not clear to us how to account for this intuition when we make use of Geurts' analysis of modal subordination. The example furthermore suggests that we find asymmetries between Hob-Nob situations and Hob-Nob sentences not only in case of anaphora, but also in case of presupposition. Consider the following examples:

(41) *Jon*: Ard nowadays walks to his work.

May: Ben has gone nuts, *too*.

(42) Jon thinks Ard nowadays walks to his work.

May thinks Ben has gone nuts, *too*.

May in (41), and the speaker (and not May) in (42) seems to express that walking to your work is nuts. Again we find that it is the speaker who is responsible for the link, not the anaphoric link this time, but the presuppositional link. We believe that the above asymmetry in case of presuppositions is due to the specific way we make use of presupposition triggers like 'too', 'also', 'another', 'again', etc. Karttunen and Peters (1979), among others, argued that such triggers are special in that they don't influence the content of what is said, and Zeevat (1992) argued that these triggers

are only used by speakers as bookkeeping tools in the storing of information by humans.

We finally wish to consider denial of presuppositions. One of the results of Dekker's analysis of licensing first order propositions, concerned its application to the phenomenon of pronominal contradiction, and this seems to be related to denial of presuppositions, in case of which one agent denies what is presupposed by another agent in a dialogue:

(43) Kaz: Liz regrets that he failed the test.

(44) Dov: Liz does *not* regret failing the test, because she passed it.

It appears that we can express the situation exemplified in (43)–(44) by a Hob-Nob sentence too:

(45) Kaz believes that Liz regrets failing the test, but

(46) Dov believes that Liz does *not* regret failing the test, because (he believes that) she in fact passed.

Note that although the embedded clause of the second sentence is most naturally interpreted with respect to a context in which the embedded clause of the first sentence is accepted, this obviously doesn't mean that Dov agrees with what Kaz is said to believe. The above Hob-Nob sentence can be used to express the corresponding Hob-Nob dialogue situation. However, we believe that this sentence can also be used if Kaz and Dov did not discuss things with each other; Dov need not have any beliefs about what Kaz believes of Liz' test results. Just as in earlier examples, not Dov, but the the speaker is responsible for the link needed to make the second attribution appropriate.

Conclusion

Hob-Nob sentences and Hob-Nob situations are similar but not the same. Common feature shared by the two is intentional identity. The main (pragmatic) difference lies in the different responsibilities for the asserted link. Our findings are furthermore related to the required pragmatic input to semantics. The interpretation of Hob-Nob links is not in general that of plain co-reference, but has to be supplied by pragmatic principles.

Another general conclusion that can be drawn from the present paper is that speakers, generally, are to be held responsible for both anaphoric and presupposition links. This observation seems to be in disagreement with recent implementations of the satisfaction theory of presupposition, like that of Irene Heim and David Beaver. We don't think that this shows that the central idea behind the satisfaction theory of presupposition is wrong. But it does suggest that this idea should be implemented in a rather different way than it is normally done.

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