

PRESUPPOSITIONS AND ANAPHORS IN ATTITUDE CONTEXTS*

ABSTRACT. This paper consists of two main parts and a coda. In the first part I present the 'binding theory' of presupposition projection, which is the framework that I adopt in this paper (Section 1.1). I outline the main problems that arise in the interplay between presuppositions and anaphors on the one hand and attitude reports on the other (Section 1.2), and discuss Heim's theory of presuppositions in attitude contexts (Section 1.3).

In the second part of the paper I present my own proposal. To begin with, I define an extension of DRT in which attitude reports can be represented (Sections 2.1–2.2). I then argue that the verb *believe* triggers a certain presupposition and that, given the binding theory, this presupposition determines the projection behaviour of the verb (Section 2.3). This analysis yields predictions which are incomplete in the sense that they do not fully account for speakers' intuitions about presuppositions and anaphors in belief contexts. In Section 2.4 I suggest that this is as it should be because we may assume on independent grounds that there is a class of plausibility inferences which complement the predictions of the presupposition theory. Finally, the analysis is extended to the verb *want* (Section 2.5).

The paper concludes with a brief discussion of related phenomena in other domains: modals, quantifiers, and non-declarative speech acts (Section 3).

1. SETTING THE STAGE

1.1. *The Binding Theory*

The theory of presupposition adopted in this paper was first proposed by van der Sandt (1989), and further developed by van der Sandt and Geurts (1991), van der Sandt (1992), and Geurts (1995), among others. For reasons that will soon become clear I call it the 'binding theory' of presupposition. I am aware that syntacticians have been using this term in a rather different sense, but their usage is so different from mine that my appropriation of the term is unlikely to engender confusion. In the following I will only provide a thumbnail sketch of the binding theory; see the references just cited for more details.

The binding theory's central tenet is that anaphora is a species of

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presupposition.¹ The distinctive trait of anaphora is that, by and large, anaphors *must* be bound to a suitable antecedent. Presuppositions in general, however, merely *prefer* to be bound. If on occasion a suitable antecedent is not available, a presupposition will generally be accommodated (Karttunen 1974, Stalnaker 1974, Lewis 1979). But accommodation is a repair strategy: *ceteris paribus*, if a suitable antecedent is available, the binding option is preferred.

The binding theory is a generalization of Discourse Representation Theory (Kamp 1981, Kamp and Reyle 1993); *qua* theory of anaphora it more or less coincides with DRT.² The following analysis illustrates what I mean when I say that presuppositions may be bound like anaphors:³

- (1)a. If anybody volunteered, then it was Wilma who volunteered
(did so)
- b. $[: [x: x \text{ volunteered}] \Rightarrow [z: \underline{z} \text{ volunteered}, z = W]]$
- c. $[: [x, z: z = x, x \text{ volunteered}, z \text{ volunteered}] \Rightarrow [z = W]]$
- d. $[: [x: x \text{ volunteered}] \Rightarrow [z: x = W]]$

In the second half of (1a) the it-cleft triggers the presupposition that someone volunteered, which is represented in (1b) by the underlined material (at this stage I ignore any other presuppositions that (1a) may contain). This presupposition has access to a suitable antecedent in the first part of the conditional, and hence it is bound as shown in (1c), which represents the final interpretation of the sentence; this is equivalent to (1d). Note that it does not follow from (1c, d) that someone volunteered, and thus the presupposition that this is the case is in a sense 'blocked', which is as it should be.

A presupposition that cannot be bound will normally be accommo-

¹ Actually, van der Sandt's (1992) claim is that presuppositions are anaphors, but this is just a terminological difference. I prefer to reserve the term 'anaphora' for referring to a subclass of presuppositions, and associate it with descriptive paucity and binding to discourse entities currently in focus. In van der Sandt's vocabulary, the term appears to have lost such connotations.

² The binding theory *cannot* be implemented as a generalization of most other 'dynamic' theories of interpretation, such as file change semantics (Heim 1982) or dynamic predicate logic (Groenendijk and Stokhof 1991), because it crucially involves the level of discourse representation which is absent in these dynamic theories. See Geurts (to appear) for further discussion of the differences between dynamic semantics and DRT.

³ Officially, I regard names as definite expressions; the name *Wilma* is more or less synonymous with 'the person named "Wilma"' (see Geurts 1997 for discussion). However, for convenience, I will employ constants to represent names, as in (1) (although strictly speaking individual constants are not part of the DRS language).

dated,⁴ which is to say that it is added to some DRS that is accessible to the DRS in which it was triggered (call this the presupposition's 'home DRS'). If a presupposition is triggered within an embedded DRS, there is more than one DRS in which it might be accommodated in principle. The binding theory claims that in such an event the least embedded DRS is the preferred accommodation site.

- (2)a. If it was Barney who volunteered, we're in trouble.
 b. $[\cdot: \underline{x: x \text{ volunteered}}, x = B] \Rightarrow [: \text{we're in trouble}]$
 c. $[x: x \text{ volunteered}, [: x = B]] \Rightarrow [: \text{we're in trouble}]$

In (2a) the presupposition that someone volunteered is triggered in an embedded position. Since this presupposition cannot be bound, it will have to be accommodated.⁵ There are two DRSs accessible to its home DRS: the home DRS itself and the main DRS. But as accommodation in the least embedded DRS is claimed to be the preferred option, the binding theory predicts that the default reading of this sentence is (2c), which is clearly correct.

A presupposition that cannot be bound is preferably accommodated in the main DRS. However, this default preference may be overwritten in various ways.

- (3)a. Either nobody volunteered or it was Betty who volunteered (did so).
 b. $[: [: \neg[x: x \text{ volunteered}]] \vee [z: \underline{z \text{ volunteered}}, z = B]]$
 c. $[z: z \text{ volunteered}, [: \neg[x: x \text{ volunteered}]] \vee [: z = B]]$

In (3a) the presupposition that someone volunteered is triggered in the second disjunct. Again, this presupposition cannot be bound to a suitable antecedent,⁶ and will therefore have to be accommodated. As in the previous example, it may be accommodated either in its home DRS or in the main DRS, but in this case the latter option would result in an interpretation, represented by (3c), which is obviously implausible, and therefore the former option is preferred, so that the eventual reading of

⁴ I say 'normally' because accommodation is not always possible. If the audience can neither bind nor accommodate, presupposition failure of some sort occurs. I will henceforth ignore this possibility.

⁵ In fact, this is not a very realistic example, because the presuppositions triggered by it-clefts are typically, though not invariably, required to be contextually given, which is to say that they will normally speaking be bound rather than accommodated (see below).

⁶ In standard DRT, that is. See Krahmer and Muskens (1995) for a version of DRT in which antecedents in the first disjunct may, under certain circumstances, bind anaphors in the second disjunct. See Geurts (to appear) for a critical discussion of this proposal and Geurts (1995) for a more detailed presentation of the analysis outlined here.

the sentence is (3b). Adopting Heim's (1983) terminology, the presupposition is accommodated 'locally' in this case, although in general 'global' accommodation (i.e. in the main DRS) is the preferred option.

Let me expound a bit on the concept of accommodation, which has given rise to a considerable variety of misinterpretation and abuse. First, the binding theory's notion of accommodation is a perfectly straightforward one: if a presupposition cannot be bound, then *that presupposition*, nothing else and nothing more, is added to some accessible DRS. This is what I take 'accommodation' to mean; it would appear that there is little room for misunderstanding here. However, presuppositions are seldom accommodated without further ado. As Heim (1992) emphasizes, presupposed information is supposed to be unremarkable, and whenever a hearer has to accommodate a presupposition φ that he does find remarkable, he will attempt to revise his picture of the common ground in such a way that φ is, so to speak, accounted for. A rather clear illustration of what I mean by this is afforded by the so-called 'bridging' cases first discussed in these terms by Haviland and Clark. Compare the following discourses (from Haviland and Clark 1974: 514–515):

- (4)a. Mary got some beer out of the car. The beer was warm.
- b. Mary got some picnic supplies out of the car. The beer was warm.

In (4a), *the beer* is interpreted by way of binding, but in (4b) the same definite NP cannot be linked to a suitable antecedent, and so we must conclude that it is interpreted by way of accommodation. That is to say, the information correlated with *the beer* is merged into the main DRS, and the interpretation process can proceed. Intuitively speaking, this is not wrong, but the picture is incomplete. One should like to account for the fact that someone who processes (4b) would normally infer (and would be entitled to infer) that the beer belonged with the picnic supplies mentioned in the first sentence. But the concept of accommodation as such doesn't require this inference. I believe that this is right: there is a crucial difference between accommodation and the plausibility inferences that usually come in its wake: even a speaker who lacked the world knowledge required to make a connection between picnic supplies and beer should be able to infer that, according to the speaker, there was beer. Anyway, (4b) illustrates what I take to the norm: if a presupposition is accommodated, then usually bridging inferences are called for. However, a theory of presupposition cannot be expected to clarify such processes, because bridging is a much more general phenomenon, which not

only occurs in connection with presuppositions (see Geurts and van der Sandt 1998 for related discussion).

The binding theory holds that binding is preferred to accommodation, and that global accommodation is preferred to local accommodation. The first of these principles is easy enough to explain, given that accommodation is a repair strategy, but it is less obvious what the rationale for the second principle might be. Note, first, that global accommodation will often, though not always, yield stronger readings than local accommodation. I find it doubtful, however, that hearers generally try to make their interpretations as strong as possible, and therefore I don't see that the undeniable preference for global accommodation can be explained on this basis. It seems to me that this preference should be explained in terms of relevance rather than quantity (to adopt the Gricean jargon for the nonce). Consider the following example:

- (5)a. Fred didn't bring his wife.
 b. [x: x is F's wife, \neg [: F brought x]]
 c. [: \neg [x: x is F's wife, F brought x]]

This might very well be uttered in a context where it hasn't been established yet that Fred has a wife. A hearer who isn't informed about Fred's marital status will typically infer from an utterance of (5a) that Fred is married, i.e. he will accommodate Fred's wife globally, as in (5b), rather than locally, as in (5c). Why? Presumably because on the latter interpretation (5a) would generally be a pointless thing to say. To be sure, one can imagine situations in which the message represented by (5c) would be of interest, but such situations would appear to be rather marginal.

Some presuppositions are easier to accommodate than others. The presuppositions triggered by pronouns, for example, are rather difficult to accommodate: by and large, anaphors must be bound. On the other hand, the presuppositions triggered by certain factive verbs or definite NPs are quite readily accommodated. Van der Sandt suggests that such differences correlate with the descriptive richness of presuppositions: pronouns are semantically attenuate expressions, and therefore must be bound, whereas the presuppositions triggered by factives may be quite specific, and therefore can be accommodated. This explanation is a plausible one, but it is incomplete. For instance, it seems that the presuppositions triggered by *too* may be as specific as factive presuppositions, but nonetheless the former are anaphoric in the sense that they insist more strongly that an antecedent be available. Compare:

- (6)a. Fred doesn't know that someone tried to steal his lawn mower.

- (6)b. Barney tried to steal Fred's lawn mower too.

The factive in (6a) triggers the presupposition that someone tried to steal Fred's lawn mower. In (6b) practically the same presupposition is triggered; assuming that the focus is on *Barney*, the presupposition triggered is that someone other than Barney tried to steal Fred's lawn mower. This is, if anything, slightly more specific, but nonetheless the first presupposition is easily accommodated, while the second one virtually must be bound. Or compare:

- (7)a. Did you know } that Wilma is pregnant again?
 b. Isn't it a shame }

(7a) and (7b) presuppose the same thing, viz. that Wilma is pregnant again. But obviously this presupposition is much more readily accommodated in the former case than in the latter. Apparently, it is not only the content of a presupposition that determines how easily the presupposition is accommodated, and therefore van der Sandt's conjecture doesn't provide a full explanation of why some presuppositions are harder to accommodate than others. Unfortunately, I am thus far at a loss to see how a better explanation might go.

To conclude this introductory section, I want to make two remarks about the status of DRT and DRSs. First, I should like to emphasize that DRT is a performance theory.⁷ That is to say, DRT is about how one party in a discourse interprets utterances produced by another party. It may be an abstract performance theory in that it focuses its attention on only some of the factors that affect the interpretation process, but it is a performance theory nonetheless. Hence DRT is a theory of interpretation in two ways: it is not only about the interpretations that hearers assign to utterances, but also about interpretation processes.

My second point concerns the status of DRSs. Of course, DRSs carry information; they have truth conditions. But what is the *point* of representing this information? There are several possible answers to this question (cf. Asher 1993), and although for many purposes it doesn't matter much how DRSs are understood, it matters a great deal if one's purpose is to develop a theory of attitude reports. Briefly, the view that I will take is that a DRS is a partial picture, constructed by the hearer,

⁷ This is in line with the DRT orthodoxy (cf. Asher 1987, Kamp and Reyle 1993), but unbelievers such as Groenendijk and Stokhof (1991) have sometimes interpreted the framework in different ways.

of the speaker's commitment slate, which is a set of assumptions a person has committed himself by dint of his utterances.⁸

The content of a commitment slate need not have anything to do with what the speaker actually believes or with what the hearer assumes that the speaker actually believes. If a speaker utters a sentence, he commits himself to its truth, but he need not genuinely believe that it is true. Commitment, in this sense, merely entails that the speaker should behave as if he believed the sentence to be true. For instance, he should be prepared to defend his claim and he should abstain from saying or implying the contrary. But his commitment does not imply that he is sincere.

1.2. *Presuppositional Expressions in Attitude Contexts*

There are at least two reasons why presuppositions that are triggered within the scope of an attitude verb are more problematic than others. One is that attitude contexts are a notoriously difficult area in their own right. The other is that in attitude contexts the pre-theoretical notion of presupposition, which otherwise is quite secure, starts tottering. Consider a simple example:

- (8) Louise believes that her niece lives in Leeds.

In (8) the definite description *her niece* occurs within the scope of the attitude verb *believe*, and we would normally be entitled to infer from an utterance of this sentence that (the speaker believes that) Louise has a niece, and it may be argued that this inference is of a presuppositional nature. Generalizing this observation, we arrive at

- (9) *The e-principle*

If *V* is a verb of propositional attitude and *S*{*χ*} is a simple sentence in which the presupposition is triggered that *χ*, then (a speaker who utters) '*a* *Vs* that *S*{*χ*}' presupposes that *χ*.

I call this the 'e-principle' because it says that a presupposition that arises in the attitude context associated with *V* is construed externally, i.e. as not being a proper part of the attitude report. There may be some temptation to view this as a special kind of *de re* construal, but as I shall argue below, what I call the external construal of a presupposition is sufficiently different from the notion of *de re* interpretation to deserve a name of its

⁸ The term 'commitment slate' is due to Hamblin (1971, 1987), but the notion is clearly related to Stalnaker's (1973) notion of presupposition, and Stalnaker's (1984) notion of acceptance.

own. Construed as a rough empirical generalization, not as a theoretical statement, the e-principle appears to inform Gazdar's (1979) and van der Sandt's (1988) views on the interaction between presuppositions and attitude contexts, and the principle looks plausible enough, at least as long as we are prepared to ignore the fact that (8) would usually license a *further* inference, which also seems to originate with the definite noun phrase *her niece*, namely that *Louise believes* that she has a niece. Hence the following generalization might be entertained as well:

(10) *The i-principle*

If *V* is a verb of propositional attitude and $S\{\chi\}$ is a simple sentence in which the presupposition is triggered that χ , then (a speaker who utters) '*a Vs that $S\{\chi\}$* ' presupposes that *a believes that χ* .

Terminological details aside, the i-principle ('i' for 'internal') is defended by Karttunen (1974) as well as Heim (1992). Again, the concept of internal construal is similar to, but not quite the same as, the concept of *de dicto* construal. The difference (which will be discussed in greater detail in Section 1.3) is already apparent from the wording of (10), which says that '*a Vs that $S\{\chi\}$* ' presupposes, not that *a Vs that χ* , but rather that *a believes that χ* . To see why this is so, consider:

(11) Louise {desires/hopes/suspects} that her niece lives in Leeds.

Obviously, an utterance of (11) would not normally be taken to imply that Louise desires/hopes/suspects that she has a niece (which is what we would expect if *her niece* were read *de dicto*), but rather that she believes that she has one. Among the attitudes, belief has a special status: our desires, hopes, and suspicions are grounded in what we believe, but not, or not necessarily, the other way round. It is evident that the regularity expressed by the i-principle has something to do with the fact that belief is the central attitude, although it remains to be seen what exactly is the nature of this connection.

The problem with (8), and with attitude ascriptions generally, is that it may reasonably be taken to corroborate both the i-principle and the e-principle. We would normally infer from an utterance of (8) that Louise has a niece *and* that she believes that she has one – or, to put it otherwise, presuppositions that are triggered in the scope of an attitude verb may give rise to a two-sided reading, which is internal as well as external. Such two-sided readings do not always come about, of course. In a context in which Louise doesn't know that she has a niece, but is nonetheless acquainted with her niece in some other way, a merely external reading of

(8) would be called for; whereas in a context in which Louise mistakenly believes that she has a niece, a strictly internal reading would be achieved. But often a two-sided reading will prevail.

It may be argued that both the internal and the external halves of these two-sided interpretations are of a presuppositional nature. First, it is clear that both the inference that Louise has a niece and the inference that she believes that she has a niece can be traced back to the definite noun phrase *her niece*. Secondly, both inferences appear to display the projection behaviour that is the hallmark of presuppositions.

(12) Maybe Louise doesn't believe that her niece lives in Leeds.

Here (8) is embedded within the scope of a modal and a negation operator, and as one would expect on the basis of the e-principle, it follows from (12) that Louise has a niece, while the i-principle correctly predicts that an utterance of this sentence would normally imply that Louise believes that she has a niece.

In the light of these observations, it may seem attractive to take the position that both the i-principle and the e-principle are correct. Things are not as simple as that, however. Suppose that we extend our DRS language in such a way that representations like the following are well formed:

(13) [: L believes: [x: x is L's niece, x lives in Leeds]]

This is intended as a nearly completed representation of (8), in which only one presupposition remains to be dealt with, i.e. that Louise has a niece. The precise semantics of conditions of the form '*u* believes: *ψ*' will be left open for the time being, since this is precisely one of the issues at stake; for the moment it suffices if some intuitive sense can be made of representations like (13).

Although it is the semantic interpretation of belief conditions that will determine whether or not, in a DRS φ that contains a condition of the form '*u* believes: *ψ*', φ is accessible to *ψ*, it is instructive to pretend that we may simply decide the matter by fiat, and see what happens if we choose one way or the other. So let us assume that the main DRS in (13) is accessible to the embedded one. Then the binding theory predicts that (13) will be completed as follows:

(14) [x: x is L's niece, L believes: [: x lives in Leeds]]

Here Louise's niece has been accommodated in the main DRS. Hence, if the clausal complement of *believe* has access to the context in which it is embedded, we confirm the e-principle but not the i-principle.

On the other hand, suppose that our semantics entails that the main DRS in (13) is not accessible to the embedded DRS. We then predict that Louise's niece must be accommodated in Louise's belief DRS. Hence, if the embedded DRS in (13) does not have access to the main DRS, the binding theory predicts an internal instead of an external reading, and the i-principle is confirmed, not the e-principle. So it is far from obvious how we may obtain the two-sided readings that are characteristic of presuppositional expressions in attitude contexts, *if* we start out from the premise that both the internal and the external aspect are of a presuppositional nature, and must therefore both be accounted for by a theory of presupposition.

At this point another strategy suggests itself. Suppose that we have a semantics that allows us to make sense of a DRS like (14), which is to say that the main DRS is accessible to the embedded one. As it stands, the binding theory will then predict that (8) must in fact have the interpretation encoded by (14). But now we add to our theory a further stipulation to the effect that every presupposition χ must be copied into every DRS between the DRS in which χ was triggered and the DRS to which it is projected. Implementational details aside, this is Zeevat's (1992) proposal. Zeevat's copying rule requires that (14) be transformed into

(15) [x: x is L's niece, L believes: [x: x is L's niece, x lives in Leeds]]

Thus it is predicted that (8) will receive the two-sided reading that we are after. Moreover, the resulting theory vindicates the i-principle as well as the e-principle, although it must be noted that the latter comes out as being logically prior to the former, for we first obtain the interpretation that the e-principle would predict, and then turn it into an interpretation that in addition satisfies the i-principle. However, the postulate that gives us this is quite clearly *ad hoc*, and lacks a sound conceptual foundation. Presuppositions are supposed to be given pieces of information. What could ever be the rationale for requiring that the same piece of information be given more than once? Suppose that χ is a presupposition that is triggered in DRS φ_1 and bound in a higher DRS φ_n ; $\varphi_1, \dots, \varphi_n$ are the DRSs that are accessible to φ_1 and have access to φ_n . Once χ has been bound, it is confirmed once and for all that χ was given, so why should a hearer take the trouble of placing copies of χ into all of $\varphi_1, \dots, \varphi_{n-1}$? The same question may be asked if χ is accommodated, rather than bound, in φ_n . One should expect that accommodating χ once should suffice for upholding the pretence that χ was given, so why accommodate it, additionally, in each of $\varphi_1, \dots, \varphi_{n-1}$? To the best of my knowledge, there isn't a satisfactory answer to these questions. Moreover, it seems that Zeevat's

copying rule will make false predictions for attitude contexts created by verbs other than *believe* or its synonyms.⁹ In the case of (11), for example, it would predict that Louise desires/hopes/suspects that she has a niece, and this prediction is incorrect.

Although what I have said does not quite prove the point, it begins to look as if the i-principle and the e-principle cannot be true together. If the main DRS in (13) is accessible to the embedded one, the e-principle is confirmed but not the i-principle; if it is not accessible, it is the other way round; and Zeevat's attempt to have it both ways is *ad hoc* and yields incorrect predictions. It would seem, therefore, that in a structure like (15) – which is or at least resembles what we would like to have – at most one of the two sub-structures representing Louise's niece can be accounted for in presuppositional terms. The question then becomes whether a presupposition theory should explain the internal or the external half of a two-sided reading.¹⁰ That is to say, should an account of the interaction between presuppositions and attitudes take its lead from the i-principle or should it rather take the e-principle as its point of departure?

In this paper I consider two approaches to the problems that I have outlined in the foregoing. The first approach is advocated by Heim (1992), and may be characterized, with some qualifications, as an attempt to vindicate the i-principle: according to Heim, the inference from 'a believes that S{ χ }' to 'a believes that χ ' is of a presuppositional nature, while the inference to χ is not. I will argue in the next section that Heim's theory is on the wrong track, and then proceed to lay out an alternative approach which is similar to Heim's in some respects (in particular, it incorporates essentially the same semantics for *believe* and *want*), but which takes the e-principle as its starting point. I shall claim therefore that, as a rule, 'a believes that S{ χ }' presupposes χ , and that the inference to 'a believes that χ ' is to be accounted for in another way. One of my arguments in favour of this position is that such an account is in fact easy to provide, whereas it is much harder, if not impossible, to come by an inferential schema that runs in the opposite direction, which is what Heim requires.

Prima facie, it would seem that the e-principle is corroborated by (16a) and falsified by (16b), whereas with the i-principle it is the precisely the other way round:

⁹ Zeevat (1992) confines his attention to belief contexts, and doesn't consider any other attitude verbs.

¹⁰ I take it that the fourth possibility (that neither the internal nor the external component is explainable in presuppositional terms) is a nonstarter.

- (16)a. If Louise has a niece, then she believes that her niece lives in Leeds.
 b. If Louise believes that she has a niece, then she also believes that her niece lives in Leeds.

The i-principle predicts that in the consequent of both (16a) and (16b) the presupposition will be triggered that Louise believes that she has a niece. This presupposition will be bound in (16b), which is intuitively correct. However in (16a) this presupposition will not be bound, so we predict that this sentence presupposes that Louise believes that she has a niece, which is false. In short, the i-principle gives the right prediction for (16b) but fails with (16a). Exactly the converse holds for the e-principle: it delivers the desired result for (16a), but also predicts that (16b) presupposes that Louise has a niece, which is just as false.

Speaking in terms of the binding theory, (16a, b) suggest that a presupposition triggered in a belief context may be bound within as well as outside of that belief context. However, the data are more complex than this pair of examples suggests, as witness:

- (17)a. Barney {believes/hopes} that Fred will agree, and he hopes that Wilma will agree too.
 b. ?Barney hopes that Fred will agree, and he believes that Wilma will agree, too.

(17a) shows that a presupposition triggered within a context created by the verb *hope* may be bound within a preceding *hope* or *believe* context, or within a *believe* context, and (17b) corroborates the asymmetry between *believe* and non-*believe* contexts that we observed earlier on, for apparently a presupposition triggered in a *believe* context cannot without further ado pick up an antecedent from a *hope* context.

These examples are obviously related to the phenomenon of 'intentional identity', which has been an unfailing source of controversy ever since Geach published his famous Hob-Nob sentence:

- (18) Hob thinks a witch has blighted Bob's mare, and Nob wonders whether she (the same witch) killed Cob's sow. (Geach 1967: 628)

The problem of intentional identity as presented by Geach is the following. It seems possible to read (18) in such a way that, according to the speaker, Hob and Nob have the same witch in mind although the speaker does not commit himself to the claim that witches exist. This is something of a poser, to be sure, and the binding theory leads us to expect that the

problem of intentional identity goes even deeper than Geach realized: it should not be restricted to pronouns but extend to all presupposition-inducing expressions. This expectation turns out to be correct, as the following examples illustrate:

- (19)a. Hob thinks that his cow can whistle, and Nob wonder whether his sow can whistle, too.
 b. Hob thinks that his chickens don't lay eggs anymore, and Nob wonders when they'll start laying eggs again.

In the second conjunct of (19a), the presupposition is triggered that some individual other than Nob's sow can whistle, and apparently this presupposition can be bound within Hob's belief context in the first conjunct; for a speaker can utter this sentence without accepting this presupposition (indeed, as far as the speaker is concerned, Nob may not even have a sow). The same holds, *mutatis mutandis*, for (19b), where the adverbial *again* triggers the presupposition that Hob's chickens have stopped laying eggs.

The 'intentional identity' cases are more dramatic than the other data considered in this section, because they suggest that presuppositional binding may cut across attitude contexts associated with different individuals. It is for this reason that the theory that I propose in the second part of this paper does not account for Hob-Nob sentences. I admit this unblushingly, because I don't know of any halfway convincing account of these cases. But it is nonetheless a cause for concern, since from an observational point of view it does not seem to me that the Hob-Nob cases are something out of the ordinary; for in their own way, they conform to the usual patterns of presuppositional and anaphoric binding that we observe in less problematic attitude contexts. Unfortunately, I will have to leave this matter open.

1.3. *No Satisfaction*

It is not entirely unfair to say that the extant literature on presuppositions yields just a single extensive analysis of the behaviour of presuppositions in attitude contexts, namely Heim's 1992 article.¹¹ However, the reason why I have chosen to review Heim's proposal here is not that it happens to lack competition. Rather, it is because in certain respects the theory is

¹¹ Though Zeevat (1992) should be mentioned, too. Zeevat confines his attention to belief contexts, however, and it is not clear how his analysis could be extended so as to deal with other attitude contexts, as well.

very similar to the approach that I want to advocate, while on the other hand there are non-trivial differences as well, and therefore bringing out what is common to the two theories and what is not will give us a sharper view on both.

Heim's proposal is a version of what I have called the 'satisfaction theory' of presupposition, and to begin with I want to briefly explain what that is (see Geurts 1995, 1996a, for more extensive discussion). According to the satisfaction theory, an utterance of a sentence changes the context in which it is made, and the way in which a sentence affects its context determines its presuppositional characteristics. The satisfaction theory presupposes a dynamic semantics, which is to say that a sentence φ is regarded as a function that changes the context in which φ is uttered; this function is what Heim (1983) calls the 'context change potential' of φ . The context change potential of a complex sentence is defined compositionally in terms of the context change potentials of its parts, as illustrated in (20), which gives a dynamic semantics for a propositional language extended with a simple device for representing presuppositions: if φ and χ are sentences, then $\varphi\{\chi\}$ is a sentence, with the intuitive meaning that χ is a presupposition triggered in φ .

I adopt Heim's own notation and let ' $c + \varphi$ ' stand for the result of incrementing c with φ . A context c 'satisfies' φ iff $c + \varphi = c$.

- (20)a. $c + \varphi = \{w \in c \mid \varphi \text{ is true in } w\}$, if φ is a simple sentence
 b. $c + [\neg\varphi] = c - (c + \varphi)$
 c. $c + [\varphi \wedge \psi] = c + \varphi + \psi$
 d. $c + [\varphi\{\chi\}] = c + \varphi$, if c satisfies χ ; undefined otherwise

For any sentence φ , $+ \varphi$ is a partial function from $\text{pow}(\mathbb{W})$ into $\text{pow}(\mathbb{W})$. If φ is a simple sentence, then this function reduces its input context c to the set of worlds $w \in c$ in which φ is true. Negation is in effect set complementation, and conjunction is interpreted as functional composition. Other connectives may be defined as usual; for instance, $\varphi \rightarrow \psi = \neg[\varphi \wedge \neg\psi]$.

The semantics in (20) extends the notion of context change to embedded sentences: in order to interpret a complex sentence φ in c , each sentence embedded in φ must be interpreted in its own local context, which may but need not coincide with c . In order to compute $c + [\neg\varphi]$, for example, we must compute $c + \varphi$ first, and therefore the local context of φ in $\neg\varphi$ is the same as that of its matrix. Conjunctions are processed from left to right, and therefore, if c is updated with $\varphi \wedge \psi$, then c is the local context of φ , while the local context of ψ is $c + \varphi$; the same holds for conditionals.

The notion of local context is crucial to the satisfaction theory's understanding of presupposition.

This dynamic semantics for propositional logic is a partial one, the definedness conditions for negation and conjunction being as follows:

- (21)a. $c + [\neg\varphi]$ is defined iff $c + \varphi$ is defined
 b. $c + [\varphi \wedge \psi]$ is defined iff $c + \varphi$ is defined and $c + \varphi + \psi$ is defined

These conditions in (21) follow from the semantics in (20), and the predictions that the satisfaction theory makes about presupposition projection follow from these definedness conditions. Presuppositions are contextual requirements: if φ presupposes χ , then $c + \varphi$ isn't defined unless c satisfies χ . Thus, negation is predicted to be a hole (to use Karttunen's 1973a term): $c + [\neg\varphi]$ is defined iff $c + \varphi$ is defined, and therefore the presuppositions of $\neg\varphi$ are the same as those of φ . The theory's predictions about conjunctions and conditionals are somewhat unsettling at first (though many people have managed to persuade themselves that they are correct): $\varphi\{\chi\} \wedge \psi$ and $\varphi\{\chi\} \rightarrow \psi$ presuppose that χ , as one would expect, but $\varphi \wedge \psi\{\chi\}$ and $\varphi \rightarrow \psi\{\chi\}$ presuppose that $\varphi \rightarrow \chi$. Thus presuppositions triggered in the second half of a conjunction or conditional are weakened; this is what I have called the 'proviso problem' (Geurts 1995, 1996a).

As in the binding theory, it is assumed in the satisfaction theory, too, that a hearer will be prepared to accommodate presuppositions that are not satisfied by the current context, and that global accommodation is *ceteris paribus* preferred to local accommodation. In fact, as noted in Section 1.1, the distinction between local and global accommodation and the principle that the latter has priority over the former are due to Heim (1982, 1983).

On earlier occasions, I have argued at length and *ad nauseam* that the satisfaction theory is a nonstarter. Very briefly, it is grounded in a semantic theory whose key principles are highly problematic (Geurts, to appear), and *qua* presupposition theory it gives rise to the proviso problem, gets into trouble over modals, fails to provide an adequate account of accommodation, and so forth (Geurts 1995, 1996a). There is ample reason, therefore, to reject the theory. Nonetheless, I will try and judge Heim's account of attitude reports on its own merits.

Given that Heim is working within the framework of the satisfaction theory, it is clear how she must proceed: she will have to devise definitions that capture the truth-conditional meaning of the attitude verbs as well as their projection characteristics. In her article Heim does this for the verbs

believe, *want*, *wish*, and *be glad*, but here we confine our attention to the first two.

Heim's analysis of *believe* is a transposition of the classical possible-worlds semantics of belief sentences (Hintikka 1962, 1969). According to this theory, a sentence of the form '*a* believes that φ ' is true in a world w iff φ is true in all worlds that are compatible with *a*'s beliefs in w . This translates to the context-change framework in a straightforward way, as follows (Heim 1992: 189): Let *dox* be a function that, in each world w , assigns to an individual *a* the set of worlds that are consistent with what *a* believes in w , i.e. $\text{dox}_a(w)$ is the set of doxastic alternatives that are open to *a* in w .

$$(22) \quad c + [a \text{ believes } \varphi] = \{w \in c \mid \text{dox}_a(w) \text{ satisfies } \varphi\}$$

As before, a context c satisfies φ iff $c + \varphi = c$. Since contexts and sets of doxastic alternatives are of the same type (i.e., they both are sets of worlds), it makes sense to regard the latter as contexts, too, on which context-change functions operate in the usual way. Accordingly, we shall refer to sets of doxastic alternatives as 'doxastic contexts'.

What (22) does is eliminate from the current context set all those worlds in which *a* does not believe that φ . With respect to the projection properties of *believe*, (22) predicts that '*a* believes that $\varphi\{\chi\}$ ', presupposes that *a* believes χ : $c + [a \text{ believes } \varphi\{\chi\}]$ is guaranteed to be defined only if in all worlds $w \in c$, $\text{dox}_a(w)$ satisfies χ , which means that c must already satisfy that *a* believes χ . For example, the it-cleft in (23a) triggers the presupposition that (23b) is true, and when the it-cleft is embedded in a belief sentence, as in (24a), Heim's theory predicts that the resulting presupposition is (24b):

(23)a. It was Fred who tripped Barney.

b. Barney was tripped.

(24)a. Barney believes that it was Fred who tripped him.

b. Barney believes that he was tripped.

Heim's theory correctly predicts that, while (25a) will not give rise to the inference that (24b) is true, (25b) will:

(25)a. Barney believes that he was tripped and he believes that it was Fred who tripped him.

b. Perhaps Barney believes that it was Fred who tripped him.

In (25a) the presupposition that (24b) is true is satisfied by the first conjunct, and therefore the sentence as a whole entails but does not

presuppose that Barney believes that he was tripped. On the other hand, if (25b) is uttered in a context in which it is not already given that (24b) is true, the definition in (22) requires that this information be accommodated (I assume here that Heim can somehow account for the fact that modals are holes). Both predictions are correct, at least in the sense that the inferences that the theory predicts accord with speakers' intuitions.

On the negative side, although Heim's definition correctly predicts that the presupposition that (24b) is true is suspended in (25a), it also predicts that (26a) presupposes (26b):

- (26)a. It is possible that Barney was tripped and that he believes that it was Fred who tripped him.
 b. Barney was tripped \rightarrow Barney believes that he was tripped.

This prediction is clearly false, for (26a) does not imply (26b) in any way. (Incidentally, this counterexample does not hinge upon Heim's analysis of conjunctions. If that were the case, we should expect her predictions to be too weak, not incorrect.) This example indicates that presuppositions that originate in belief contexts may sometimes be bound, or satisfied, in a non-belief context, and the problem with Heim's theory is that it doesn't allow for this.

The second problem is related to the first one. It is that Heim's proposal only accounts for one half of the two-sided interpretations that presuppositions in attitude contexts often give rise to. (22) does not allow us to infer from (25b) that, according to the *speaker*, Barney was tripped, although intuitively an utterance of (25a) would normally license this inference. But as Heim agrees with Karttunen that (24b) is more basic in that it, not (23b), should be accounted for in presuppositional terms (i.e. she accepts the i-principle rather than the e-principle), she still has to explain how the inference to (23b) comes about. Later on in this section we shall see how she proposes to do this, but before we turn to that issue, let us first have a look at Heim's semantics of *want*.

For the verb *want*, Heim suggests two possible analyses. One of these mirrors her treatment of *believe*. Besides a function that assigns individuals doxastic contexts, we assume as given a function whose range consists of sets of buletic alternatives: in each world w , $\text{bul}_a(w)$ is the set of worlds that are compatible with a 's wishes and desires in w . The context-change semantics of *want* is then obtained by substituting ' $\text{bul}_a(w)$ ' for ' $\text{dox}_a(w)$ ' (Heim 1992: 192):

$$(27) \quad c + [a \text{ wants } \varphi] = \{w \in c \mid \text{bul}_a(w) \text{ satisfies } \varphi\}$$

Not surprisingly, the predictions that this yields parallel those of (22) to a T.

- (28)a. Harry wants to have a son and he wants his son to be the first pianist who can play the Moonlight Sonata in less than six minutes.
- b. Harry wants his son to be the first pianist who can play the Moonlight Sonata in less than six minutes.
- c. Harry wants to have a son.
- d. Harry has a son.

The definition in (27) predicts that the second conjunct of (28a) presupposes (28c), but that this presupposition is absorbed by the first conjunct. In (28b), in contrast, the same presupposition is not neutralized, and therefore it is predicted that this sentence presupposes that Harry wants to have a son. Both predictions are obviously false: we would not normally infer from (28b) that (28c) is true, nor would we want to say, intuitively speaking, that this inference is neutralized in the process of interpreting (28a). In a word: '*a* wants $\varphi\{\chi\}$ ' does not normally imply, let alone presuppose, that *a* wants χ .

As far as its predictions about the presuppositional properties of *want* are concerned, the proposal in (27) has nothing whatsoever to recommend it, and this would be the end of the story if it were the case that (27) adequately represented the meaning of *want*. However, Heim argues that this rule is already unsatisfactory for truth-conditional reasons alone. In particular, it follows from (27) that if *a* wants φ then *a* must want all logical consequences of φ . But, for example, the desire to start a relief fund for orphaned sheep does not entail the desire that there be orphaned sheep. Therefore, Heim proposes an alternative semantics for *want*, which is inspired by Stalnaker's characterization of wanting:

[...] wanting something is preferring it to certain relevant alternatives, the relevant alternatives being those possibilities that the agent believes will be realized if he does not get what he wants. Some propositions which are entailed by propositions that one wants to be true in this sense are also entailed by the relevant alternatives. It is not that I want these propositions to be true – it is just that I accept that they will be true whether I get what I want or not. (Stalnaker 1984: 89)

Stalnaker suggests that '*a* wants φ ' must be evaluated against the background of a set of 'relevant alternatives'. What alternatives (i.e. possible worlds) are these? Stalnaker is not overly explicit on this point, but it seems plausible, and in conformity with what he says elsewhere, to assume that the set of relevant alternatives at any world *w* is the set of

doxastic alternatives open to a in w , i.e. $\text{dox}_a(w)$. Stalnaker's suggestion may then be explicated as follows:

- (29)a. ' a wants φ ' is true in a world w iff a prefers all φ -worlds in $\text{dox}_a(w)$ to any non- φ -worlds in $\text{dox}_a(w)$.

This smoothly translates into the context-change function for *want* as given in (30). Let ' $<_{a,w}$ ' denote an ordering which ranks sets of worlds according to their desirability for a in w . So if p and p' are sets of worlds, ' $p <_{a,w} p'$ ' is intended to mean that, in w , a prefers all worlds in p to any world in p' . Now the context-change function associated with ' a wants φ ' may be defined as follows:

$$(30) \quad c + [a \text{ wants } \varphi] = \{w \in c \mid \text{dox}_a(w) + \varphi <_{a,w} \text{dox}_a(w) + [\neg \varphi]\}$$

This is not quite the same as the rule proposed by Heim, which is more involved, but since the complications that Heim argues for are not relevant to our purposes, we will make do with the simpler version in (30). Needless to say, none of the critical remarks that I shall be making below is contingent up upon this simplification.

The meaning rule given in (30) attributes the following presuppositional profile to *want*: (30) entails that ' a wants $\varphi\{\chi\}$ ' is defined in a context c iff $\varphi\{\chi\}$ is defined in $\text{dox}_a(w)$, for all $w \in c$, which means that ' a wants $\varphi\{\chi\}$ ' presupposes that a believes χ . Thus it is predicted, correctly, that we would normally infer from (28b), but not from (31), that Harry believes that he has a son.

- (31) Harry believes that he has a son and he wants his son to be the first pianist who can play the Moonlight Sonata in less than six minutes.

So the revised semantics of *want* validates the i-principle, which is one of Heim's avowed aims. It therefore does slightly better than its predecessor, but it is not exactly a great leap forward. One problem with (30), which Heim acknowledges (1992: 200), is that it doesn't explain presupposition filtering in *want-want* sequences: (28a) is predicted to imply that Harry believes that he has a son, which is clearly false. Also, (32a) now comes to presuppose (32b), which is wrong, too:

- (32)a. If Harry wants to have a son, he wants his son to be the first pianist who can play the Moonlight Sonata in less than six minutes.
 b. Harry wants to have a son \rightarrow Harry believes that he has a son.

One of the targets of Heim's article is to derive the i-principle, and in

this particular respect, at least, Heim's proposals are successful. It remains to be seen, however, how the resulting theory can be reconciled with an observation we made earlier on, namely that in attitude contexts, presuppositional expressions will often receive a two-sided reading. Supposing for argument's sake that Heim's theory of presupposition is correct, her problem is to account for the fact that, in general, a presuppositional expression χ which occurs in an attitude context not only gives rise to the inference that the subject of the attitude believes that χ , but also licenses the inference that the speaker holds χ to be true. Heim considers two possible solutions to this problem.

The first possible solution that Heim suggests is that, in those cases in which a presupposition appears to escape from an attitude context, the expression that has triggered it is being given a *de re* interpretation. To illustrate, the suggestion is that, possibly, we infer from (33a) that (33b) is true because Müller's *Requiem* is construed as having scope over the attitude verb:

- (33)a. The Osnabrück Philharmonic wants to put on Müller's Requiem.
 b. Müller has composed a Requiem.

Heim reasons as follows. The satisfaction theory does not license the prediction that (33a) presupposes (33b). But it is well known that it is often possible to construe noun phrases, and presumably other types of expressions as well, as taking scope over the attitude contexts in which they occur. So *instead of explaining the inference from (33a) to (33b) in presuppositional terms*, it might be viewed as the result of a *de re* construal, which is effected by a mechanism that is motivated on independent grounds.

This argument runs into several difficulties, some of which Heim addresses. First, it is not at all obvious that other presuppositional constructions besides definite noun phrases can be read *de re*. Heim tries to show that this is possible for aspectual verbs and focus particles like *also*. (She doesn't consider any further presupposition inducers, so even if her analysis of these two is correct, which I doubt, a wide range of expressions remain to be considered.) An example she discusses is (34a), which she claims may be read, *à la* Kaplan (1969), as in (34b):

- (34)a. John thought I had stopped proof-reading.
 b. There is an acquaintance relation D such that (i) John bore D to my proof-reading, and (ii) John thought that the activity he bore D to had stopped. (Heim 1992: 208)

In other words, Heim claims that, conceivably, (34a) may mean that '[. . .] John thought of the activity of mine that was in fact a proof-reading, but that he may not have recognized as such, that it had stopped' (Heim 1992: 208). Let us grant that a scenario can be constructed that enforces such a reading. According to Heim, this reading can be obtained by construing *proof-reading*, in effect, as a wide-scope definite. But this cannot be right. Consider the following minimal variant of (34a), for instance:

(35) John thought I had started proof-reading.

If Heim's analysis of (34a) were correct, then it should be possible to read (35) as meaning that John thought of the activity of mine that was in fact a proof-reading, but that he may not have recognized as such, that it had started. If this makes sense at all, it is not the reading that we want to account for. What needs to be explained, rather, is how (35) can, and typically will, give rise to the inference that the speaker *wasn't* proof-reading before the reference time, and it is by no means clear that this can be done by means of *de re* construal.

Analogous observations apply for many other presupposition-inducing expressions, but I will confine myself to one further case. It is commonly held that quantifier expressions are presupposition triggers:

(36) Fred believes that all guests at the party are drunk.

This is most likely to be read as implying that there are guests at the party, but (36) may also be uttered if the party and its guests are mere figments of poor Fred's delirious mind. So, speaking loosely, the presupposition that there are guests may have either wide or narrow scope. Now *in addition to* these two ways of construing the presupposition triggered by *all guests*, this NP itself may be read *de re* or *de dicto*. Adopting for the occasion a restricted-quantifier notation with set variables, the following interpretations can thus be distinguished:

- (37)a. [the X: guests at the party X]([all x: x ∈ X](Fred believes that x is drunk))
 b. [the X: guests at the party X](Fred believes that [all x: x ∈ X](x is drunk))
 c. Fred believes that [the X: guests at the party X]([all x: x ∈ X](x is drunk))

(Readings on which the quantifier that binds little *x* outscopes the one that binds big *X* are of course ill formed.) Each of (37a) through (37c) represents a possible interpretation of (36), and moreover, these readings are logically independent of one another. This example shows that there

is a non-trivial difference between the ordinary mechanism of *de re* construal, which has applied to the NP *all guests at the party* to yield (37a, b), and the use Heim proposes to make of this mechanism. For, if the mechanism of *de re* construal is to produce something along the lines of (37a) or (37b), then it will have to apply to the head of the quantified NP, i.e. to *guests at the party*. As in the case of (34a), this looks like a plausible analysis at first, which, apparently, receives support from the observation that *all guests at the party* is equivalent to *all THE guests at the party*. However, this analysis runs into trouble over an example like the following:

- (38) Fred believes that everybody at the party is drunk.

This is more or less the same as (36): the quantified NP may be construed *de re* or *de dicto*, and triggers a presupposition that may or may not 'escape from' the attitude context. However, if we want to account in terms of *de re* construal for readings on which the presupposition has escaped from the attitude context, as suggested by Heim, a quite radical variety of lexical decomposition appears to be called for, since it must then be assumed that the mechanism of *de re* construal applies to a semantic unit corresponding with *-body at the party*. As far as I know, there is no independent evidence whatsoever to support this type of analysis.

In the foregoing, I took it for granted that the distinction between *de re* and *de dicto* readings of belief reports is to be explicated, at least partly, in terms of scope. I happen to believe that this assumption is warranted in its own right, but apart from that it is evident that this assumption is required if we want to account for certain facts concerning presupposition projection in terms of the *de re/de dicto* opposition. It seems to me, however, that the notions of scope and presupposition, similar though they may be, should be strictly distinguished. To begin with, it is clear that the facts of presupposition projection cannot be reduced to scope differences (which is what Heim attempts to do for a certain range of projection phenomena). I have shown this with a number of examples already, but the most straightforward demonstration is provided by extensional cases like the following:

- (39)a. Many girls flirted with some teachers.
 b. [many x: girl x]([some y: teacher y](x flirted with y))
 c. [some y: teacher y]([many x: girl x](x flirted with y))

Here it is natural to give wide scope to *many girls*, as in (39b), and possible to give *some teachers* wide scope, as in (39c). But in either case, *many*

girls (or *some teachers*) may be read as presupposing that there are or were girls (teachers). So the question whether or not an expression gives rise to a presupposition is distinct from the question whether or not it has wide scope. Secondly, presuppositional expressions may give rise to readings that cannot even in principle be explained in terms of scope. For instance:

- (40) Many professors sold their Coca Cola shares.

This sentence, whose predicate contains the presupposition-triggering *their Coca Cola shares*, may be read as saying that many of the professors *who owned* Coca Cola shares sold them, in which case the presupposition serves to restrict the domain of the quantifier. It is evident that this reading cannot be accounted for in terms of scope: on this reading, *many professors* cannot be in the scope of *their Coca Cola shares*, so the latter must have narrow scope; but then the only reading which we will obtain, if we analyse this sentence purely in terms of scope, is something like the following:

- (41) [many x: professor x]([the Y: Y are all Coca Cola shares owned by x](x sold Y)).

This may or may not be a possible reading of (40), but it certainly does not represent the interpretation at stake (for further discussion, see Geurts and van der Sandt 1998).

It appears that as a matter of fact presupposition projection cannot be accounted for solely in terms of scope, and underlying this practical impossibility there is a principled difference between presupposition projection and scope, because the former is a pragmatic phenomenon, which can only be explained with reference to a level of discourse representation, whereas the latter is much more of a surface phenomenon. If we speak about an expression α in terms of scope, we are referring to some α -sized unit, i.e. α itself or some semantic entity corresponding with α . But if we speak about a presupposition triggered by α , neither α itself nor its semantic value is at issue: presuppositions are *triggered by* certain lexical expressions or syntactic constructions. At the end of the day it is this difference which rules out a treatment of presuppositions in terms of scope.^{12,13}

¹² It will have become clear in the meantime what prompted me to introduce the distinction between internal and external construals of presuppositional expressions in addition to the *de re/de dicto* distinction.

¹³ The distinction between scope taking and presupposition projection is somewhat obscured by the circumstance that definite NPs, which have always been the presuppositional expressions *par excellence*, have the special property that their descriptive contents coincide with the presuppositions that they induce. Consequently, if the presupposition triggered by a

Heim assumes that there are two mechanisms, so to speak, which can make it seem as if a presuppositional expression has escaped from a local context. On the one hand there is a presupposition-projection mechanism, which she claims is derivable from a semantics in terms of context change, and on the other hand there is the mechanism for generating *de re* construals. But although it can hardly be denied that two such mechanisms exist, it is not at all obvious that they both apply to presuppositional expressions. If presuppositions already have a natural tendency to float up from embedded positions anyway, why should they need help from a mechanism for *de re* construal? I take it that we should prefer a theory that is in a position to say that *de re* interpretations of presuppositional expressions are the outcome of the standard mechanisms of presupposition projection, and that a special mechanism for *de re* construal is only required in exceptional cases, as with marked indefinite noun phrases. Given the theory that I present below, all typical *de re* construals fall out automatically as instances of presupposition projection, and I take it that, *ceteris paribus*, this type of account is to be preferred to Heim's.

One final remark about Heim's invoking a mechanism for *de re* construal: it seems to me that in so doing she is pulling the rug from under her own theory. If it is indeed the case that presuppositional expressions in general can be construed as taking scope over the immediate contexts in which they occur, it is unclear why an appeal to wide-scope readings should be restricted to attitude contexts. Why not describe *all* presuppositional phenomena in terms of scope? For reasons discussed in the foregoing this is not a realistic option. It should be clear however that the manoeuvre which Heim is contemplating is liable to backfire on her own theory.

To recapitulate: in the first half of this section I have argued that the semantics which Heim provides for the verbs *believe* and *want* fails to correctly predict the presuppositional properties of these verbs. This is not to say that this semantics is wrong, for in fact I intend to adopt it myself, too. But it is to say that, as in the case of the connectives, the projection profile of an attitude verb does not follow from its meaning alone. In the second half of this section I partly reviewed Heim's attempts to explain the fact that presuppositions in attitude contexts may receive a

definite NP α is bound or accommodated globally, as it usually will be, it may seem as if α itself had taken wide scope, which is not the case. A further complication is that the notion of scope may be applied at different levels of analysis. Although *logically* speaking the binding theory implements presupposition projection in terms of scope, it is not a theory of scope in the *linguistic* sense of the word. It is of course the latter sense that I have been referring to.

two-sided interpretation. Since Heim's theory only accounts for the internal component, she has to explain the two-sided reading on the basis of an internal construal. I have argued against one of the two lines of argument that Heim suggests for this job. Another line that she tentatively pursues will be discussed in Section 2.4.

2. ANALYSIS

2.1. *Belief in DRT*

My account of presuppositions in attitude contexts is similar to Heim's in a number of ways, but crucially different in others, the most significant difference being, of course, that I adopt the binding theory as outlined in Section 1.1. Another important difference is that, contrary to Heim, I take the e-principle as my starting point. This is not to say that I repudiate the i-principle altogether. What I take to be correct about this principle is the notion that belief is the central case in the sense that a presupposition χ that is triggered within an attitude report on person a can be satisfied, or bound, by what is being assumed about a 's beliefs. But unlike Heim or Karttunen, I don't take this to imply that the essential datum to be explained is how such a presupposition can end up as a presupposition of the form ' a believes that χ '. The question is rather why attitude verbs are generally transparent to presuppositions, and in this respect at least my perspective is exactly the opposite from Heim's.

The theory of beliefs and wants presented below is the same as Heim's semantically speaking: like Heim, I adopt a possible-worlds semantics for belief reports, and concerning the semantics of *want* I will take Stalnaker's analysis as my point of departure, following Heim in this respect, too. But since I am not committed to the satisfaction theory, I do not have to claim that the projection characteristics of *believe* and *want* follow from their meanings alone. In fact, what I shall be claiming is that the projection profile of attitude verbs generally is determined by their meanings *and* by the presuppositions that they induce.

In this section and the next one we will be concerned with the representation in a DRT framework of beliefs and belief reports; presuppositions will not re-enter the stage until Section 2.3. Prior DRT accounts of belief and belief reports have been presented by Zeevat (1984, 1989), Asher (1986, 1987, 1993), and Kamp (1987, 1990), who propose a structural theory of belief (the term is Kamp's), which is to say that belief is construed as a relation between an individual and a syntactic object, i.e. a DRS. However, the theory that I want to advocate is not a structural one.

Although DRT is a natural framework for articulating a structural theory of belief, the two are not tied together. One can adopt DRT as a framework for analysing belief *reports* and at the same time construe belief as a relation between individuals and sets of worlds, which is what I propose to do.¹⁴

The classical possible-worlds analysis of belief (and the other attitudes) is plagued by a family of well-known puzzles having to do with logical omniscience and (non-) substitutivity of synonymous expressions, and one of the main arguments in favour of the structural account is that it manages to avoid these problems, because its central tenet is that the objects of belief are entities with a rich internal structure. If I hold onto the possible-worlds analysis nonetheless it is because I feel that it is more consonant with the common sense notion of belief than any other account that I know of, and I have not given up hope yet that its problems can be solved, for instance along the lines set out by Stalnaker (1984).

So let us assume that belief is a relation between an individual and a set of worlds. More accurately, if someone asserts that '*a* believes φ ', he claims that φ is satisfied by *a*'s doxastic context, i.e. the set of worlds that are compatible with *a*'s beliefs. If we want to embed this analysis into the DRT framework, we will need some device for representing doxastic contexts. To this purpose, I introduce what I will call 'propositional terms', which denote relations between worlds and embedding functions. Or, what amounts to the same thing, propositional terms denote sets of pairs consisting of a world and an embedding function. Such pairs may be viewed as partialized worlds, the embedding function singling out for attention a limited number of objects at a given world. I will use the term 'indexed worlds' to refer to pairs of worlds and embedding functions; sets of indexed worlds will be called 'indexed propositions'.

I propose to extend the original DRT language in an essentially conservative way. The main difference between the following version of DRT and the standard one is that the latter has a poorer inventory of terms.

- (42) *DRS-terms*
- a. $T = RM_i \sqcup RM_p \sqcup T_p$ (terms)
 - b. $RM_i = \{u, v, w, \dots, u', u'', \dots\}$ (individual reference markers)
 - c. $RM_p = \{p, q, r, \dots, p', p'', \dots\}$ (propositional reference markers)

¹⁴ Asher (1986) develops such a theory, too, but does not actually endorse it, *inter alia* for reasons discussed in the next paragraph.

- d. $T_p = \{p + \varphi \mid p \in \text{RM}_p \text{ and } \varphi \text{ is a DRS}\}$ (complex propositional terms)

Whereas in the original version of DRT all terms are individual reference markers, the present version also features propositional terms (i.e. members of $\text{RM}_p \cup T_p$). The denotations of propositional terms will be indexed propositions, and the denotation of a complex propositional term $p + \varphi$ will be the indexed proposition denoted by p incremented with the information in φ .

(43) *DRSs and DRS-conditions*

- a. A DRS φ is a pair $\langle \text{U}(\varphi), \text{Con}(\varphi) \rangle$, where $\text{U}(\varphi) \subseteq \text{RM}_i \cup \text{RM}_p$, and $\text{Con}(\varphi)$ is a set of DRS-conditions.
- b. If P is an n -place predicate, and $\alpha_1, \dots, \alpha_n \in T$, then $P\alpha_1 \dots \alpha_n$ is a DRS-condition.
- c. If $\alpha \in \text{RM}_i \cup \text{RM}_p$ and $\beta \in T$, then $\alpha = \beta$ is a DRS-condition.
- d. If φ and ψ are DRSs, then $\neg\varphi$, $\varphi \Rightarrow \psi$, and $\varphi \vee \psi$ are DRS-conditions.

Note that (43c) only caters for identity conditions in which a reference marker occurs on the left-hand side. Expressions of the form ' $q = p + \varphi$ ' (where p and q are propositional reference markers) are therefore admissible conditions; expressions of the form ' $p + \varphi = q + \psi$ ' or ' $p + \varphi = q$ ' are not. The reason for this is purely technical. On the one hand, we won't be needing any other identity conditions than those admitted by (43c). On the other hand, if we allowed the left-hand slot of an identity condition to be occupied by any term, the definition of DRS-accessibility would become more complex.

The following example illustrates how belief reports may be represented in the language defined in (42)–(43) (in this section we are concerned with representations like these and what they mean; later it will be shown how they are constructed):

- (44)a. There is an A who believes that there is a B .
 b. $[\text{x}, \text{p}, \text{q}: \text{Ax}, \text{x believes p}, \text{x believes q}, \text{q} = \text{p} + [\text{y}: \text{By}]]$

Where, as one might expect, *believes* is a two-place predicate linking individual and propositional terms. That, on the intended interpretation sketched above, (44b) is an adequate representation of the content of (44a) may be seen as follows. The propositional reference markers p and q are partial representations of x 's beliefs, where q increments p with the information that there is a y such that By . Suppose that x stands in the *believes* relation to p , i.e. p is a correct but possibly incomplete picture

of x 's doxastic context. Then, if (44a) is true, x should stand in the *believes* relation to q , too. (There are other ways of representing belief reports with the help of the language defined by (42)–(43). In Section 2.3 it will become clear why I have chosen this particular format.)

A minor inconvenience caused by representations like (44b) is that they tend to be cluttered by sequences of conditions of the form ' u believes p_1, \dots, u believes p_n '. In an attempt to alleviate this problem, I will abbreviate such sequences as ' u believes $p_1 \& \dots \& p_n$ '. So the following is a shorthand for (44b):

(44)b'. $[x, p, q: Ax, x$ believes $p \& q, q = p + [y: By]]$

If a speaker issues several belief reports on the same subject a , he may be construed as presenting a sequence of increasingly informative pictures of a 's beliefs.

(45)a. There is an A_x who believes that there is a B_y , and he $_x$ also believes that she $_y$ is a C .

b. $[x, p, q, r: Ax, x$ believes $p \& q \& r,$
 $q = p + [y: By], r = q + [: Cy]]$

The coindexing in (45a) serves to indicate coreference, as usual, but furthermore the index on a noun phrase is a homograph of the reference marker which represents that noun phrase in (45b); this convention (which is *not* part of the theory) is meant to clarify the links between NPs and their semantic representations. In (45b), q is an extension of p , and q is extended by r : q adds to p the information that there is a y such that By , and r adds to q the information that Cy . And since x stands in the *believes* relation to p , q , and r , he must believe that there is a y such that By and Cy .

(46)a. If an A_x believes that there is a B_y , he $_x$ also believes that she $_y$ is a C .

b. $[: [x, p, q: Ax, x$ believes $p \& q, q = p + [y: By]]$
 $\Rightarrow [r: x$ believes $r, r = q + [: Cy]]]$

The DRS in (46b) represents the content of (46a), and its intuitive interpretation is the following. Let x be an arbitrary object such that Ax , and suppose that x 's doxastic context is correctly characterized by some p and q , where q extends p with the information that there is a y such that By : then it must be the case that there is an r which extends q with the information that Cy such that x 's doxastic context is correctly characterized by r .

Examples like (45) and (46) show that in the present version of DRT, a DRS may contain identity conditions that affect the extension of the accessibility relation. In (45b), the sub-DRS $[y: By]$ is accessible to $[: Cy]$ only because the former extends a propositional term, p , yielding a term q which in its turn is extended by the latter; the same holds in (46b). However, in neither case do we want to say that the main DRS is accessible to its sub-DRSs, for the following reason. Saying that a DRS φ is accessible to another DRS ψ is tantamount to saying that the context represented by ψ is an extension of the context represented by φ , at least in the sense that the denizens of φ inhabit ψ , too. In its entirety, (46b) represents the commitment slate of given speaker (cf. Section 1.1), while its embedded DRSs represent the doxastic context of somebody else, viz. A. So we shouldn't even require that the information in these DRSs be consistent with the information contained in the main DRS. Hence, the main DRS in (46b) is not accessible to the DRSs it embeds.

These observations prompt the following definitions. I define DRS-accessibility in tandem with an 'extension' relation between propositional terms, which is given in (47). The relation defined in (48) is called 'strict accessibility' because a second, less restrictive, notion of accessibility will be introduced later on.¹⁵

(47) *Extension*

For any φ , \cong_φ is the smallest preorder on propositional terms for which the following hold, for all $\psi \leq \varphi$, and p ,

$q \in \text{RM}_p \cup \text{TP}$:

a. If $p = q + \chi \in \text{Con}(\psi)$, then $q \leq_\varphi p$

b. If $p = q \in \text{Con}(\psi)$, then $p \leq_\varphi q$ and $q \leq_\varphi p$

(48) *Strict accessibility*

\leq is the smallest preorder for which the following hold:

a. If $\neg \psi \in \text{Con}(\varphi)$, then $\varphi \leq \psi$

b. If $\psi \vee \chi \in \text{Con}(\varphi)$, then $\varphi \leq \psi$ and $\varphi \leq \chi$

c. If $\psi \Rightarrow \chi \in \text{Con}(\varphi)$, then $\varphi \leq \psi \leq \chi$

d. If $p + \psi \cong_\varphi q + \chi$, then $\psi \leq \chi$

¹⁵ Wanting to avoid an orgy of subscripts and superscripts, I decided to leave these definitions incomplete in at least two respects. First, it is understood that (47) and (48) are about expression tokens, not types. Secondly, \leq and \leq_φ actually are three- and four-place relations, respectively. Both are only defined within the context of larger DRS.

(49) *Accessible domains*

The accessible domain of a DRS φ is the set of reference markers that are 'visible' from φ :

$$\text{Acc}(\varphi) = \bigcup_{\psi \triangleright \varphi} U(\psi)$$

Up to a point, \leq_{φ} and \leq may be seen as information orderings. If $\varphi \leq \psi$, then ψ contains at least as much information as φ does. Likewise, if $p \leq_{\varphi} q$, then q contains at least as much information as p .

To illustrate the interdependence between \leq_{φ} and \leq , let P be the main DRS in (46b), Q the antecedent of the conditional, and R the consequent. Now it follows from (48c) that $P \leq Q \leq R$, and then it follows from (47a) that $q \leq_R r$, and since $q = p + [y: By]$ and $r = q + [: Cy]$, (48d) gives us that $[y: By] \leq [: Cy]$.

The notion of strict accessibility is defined in such a way that in (46b), for example, the main DRS is accessible neither to $[y: By]$ nor to $[: Cy]$, and so these sub-DRSs don't have access to the reference markers introduced in the main DRS: x , p , q , and r . Consequently, (50a) is not a proper DRS:¹⁶

- (50)a. $[x, y, p, q: Ax, x \text{ believes } p \ \& \ q, q = p + [: By]]$
 b. $[x, y, p, q: Ax, x \text{ believes } p \ \& \ q, q = p + [y: By]]$

In (50a), the DRS $[: By]$ employs a reference marker, y , which is not in its accessible domain (although it occurs in the universe of the main DRS), and therefore the denotation of (50a) will always be empty. By the same token, in (50b), which is a proper DRS, the reference marker y is re-introduced in the embedded DRS, or to put it otherwise, the occurrence of y in the embedded DRS is not 'bound' in the main DRS. Hence, the fact that the same reference marker occurs in the main DRS and a belief DRS is meaningless in the system as it stands. Later on, we will exploit this circumstance and endow such pairs of reference markers with a useful interpretation.

Let us now turn to the model-theoretic interpretation of the language defined above. The semantic values of DRSs and propositional terms will be of the same type, as they both denote what I have called 'indexed propositions': sets of indexed worlds $\langle w, f \rangle$, where w is a world and f is an embedding function. Given that an embedding function is to assign propositional reference markers values that contain embedding functions,

¹⁶ As usual, a proper DRS is one in which all reference markers are 'bound', i.e. φ is a proper DRS iff none of its sub-DRSs ψ contain a condition involving a reference marker u such that $u \notin \text{Acc}(\psi)$.

it will be clear that defining the notion of embedding function is a somewhat delicate undertaking, because the most straightforward definition would lead to paradox.

(51) *Embedding functions*

Let M be a model with a set of worlds W and a domain of individuals D_w for each $w \in W$. Then:

- a. $F_M^0 = \{f \mid \exists X \subseteq RM_i, f: X \rightarrow \bigcup_{w \in W} D_w\}$
- b. $F_M^n = \{f \cup g \mid f \in F_M^0 \ \& \ \exists X \subseteq RM_p, \\ g: X \rightarrow \text{Pow}(W \times F_M^{n-1})\}$, for all $n > 0$

A 0-order embedding function simply is a partial function from individual reference markers to individuals. For all $n > 0$, each n -order embedding function consists of two components, both of which may be empty: (i) a 0-order embedding function and (ii) a partial function from propositional reference markers to sets of indexed worlds $\langle w, f \rangle$, where w is a world and f is an $n - 1$ -order embedding function. Note that the resulting hierarchy of embedding functions is an inclusive one in the sense that, for all $n \geq 0$, $F_M^n \subseteq F_M^{n+1}$.

Here is a picture of an embedding function (a comparatively simple one):

$$(52) \quad f: \left[\begin{array}{l} x \rightarrow a \\ y \rightarrow b \\ p \rightarrow \left\{ \langle w, g: [x \rightarrow c] \rangle, \right. \\ \left. \langle v, h: [y \rightarrow d] \rangle \right\} \end{array} \right]$$

f is an embedding function that maps the individual reference markers x and y onto a and b , respectively; the propositional reference marker p is mapped onto an indexed proposition consisting of two indexed worlds, which contain two further embedding functions, g and h .

The models for our DRS language come with a function called 'dox', which assigns belief contexts to individuals in worlds, as in Heim's theory. For any individual a and world w , $\text{dox}_a(w)$, if defined, is a set of worlds. The interpretation of the two relational constants *believes* and *considers* is defined in terms of this function, as follows:

- (53)a. $I_w(\text{believes}) = \{\langle a, \sigma \mid \text{dox}_a(w) \subseteq \text{dom}(\sigma) \}$
- b. $I_w(\text{considers}) = \{\langle a, \sigma \mid \text{dox}_a(w) \cap \text{dom}(\sigma) \neq \emptyset \}$

The semantic correlates of DRSs and propositional terms are indexed

propositions, and each indexed proposition σ uniquely determines a classical proposition $\text{dom}(\sigma)$. Thus (53a) says that a bears the *believes* relation to σ in a world w iff a 's doxastic context entails the classical proposition determined by σ . (53b) says that a bears the *considers* relation to σ in a world w iff a 's doxastic context is compatible with $\text{dom}(\sigma)$. So, *considers* stands to *believes* as ' \exists ' stands to ' \forall '.¹⁷

(54) *DRS semantics*

Let $M = \langle W, D, \text{dox}, I \rangle$ be a model, where W is a set of worlds, D is a function that assigns a domain of individuals D_w to each $w \in W$, dox a partial function from $W \times D$ to $\text{Pow}(W)$ and I an interpretation function. Let $s = \langle w, f \rangle$ be an indexed world, where $w \in W$ and $f \in F_M^n$, for some $n \geq 0$. Then:

- a. $\|\alpha\|_s = f(\alpha)$, if $\alpha \in \text{RM}_i \cup \text{RM}_p$; undefined otherwise
- b. $\|p + \varphi\|_s = \{s' \mid \exists s' \in \|p\|_s : s' \in \|\varphi\|_s\}$
- c. $\|\varphi\|_s = \{\langle w, g \rangle \mid f \subseteq g \ \& \ \text{dom}(g) = \text{Acc}(\varphi) \ \& \ \forall \psi \in \text{Con}(\varphi), \|\psi\|_{\langle w, g \rangle} = 1\}$
- d. $\|\mathbf{P}\alpha_1 \dots \alpha_n\|_s = 1$ iff $\langle \|\alpha_1\|_s, \dots, \|\alpha_n\|_s \rangle \in I_w(P)$
- e. $\|\alpha = \beta\|_s = 1$ iff $\|\alpha\|_s = \|\beta\|_s$
- f. $\|\neg \varphi\|_s = 1$ iff $\|\varphi\|_s = \emptyset$
- g. $\|\varphi \vee \psi\|_s = 1$ iff $\|\varphi\|_s \cup \|\psi\|_s \neq \emptyset$
- h. $\|\varphi \Rightarrow \psi\|_s = 1$ iff $\forall s' \in \|\varphi\|_s : \|\psi\|_{s'} \neq \emptyset$

In order to illustrate how this semantics works, I give the interpretation of (50b):

$$(55) \quad \|(50b)\|_{\langle w, f \rangle} = \\ \{\langle w, g \rangle \mid f \subseteq g \ \& \ \text{dom}(g) = \{x, p, q\} \ \& \ g(x) \in I_w(A) \ \& \\ \text{dox}_{g(x)}(w) \subseteq \text{dom}(g(p)) \cap \text{dom}(g(q)) \ \& \ g(q) = \\ \{\langle v, j \rangle \mid \langle v, h \rangle \in g(p) \ \& \ h \subseteq j \ \& \ \text{dom}(j) = \{y\} \ \& \ j(y) \in I_v(B)\}\}$$

This says, first, that for each indexed world $\langle w, g \rangle$ in the denotation of (50b), g must have $\{x, p, q\}$ as its domain and $g(x)$ must be an A . Secondly, the classical propositions determined by $g(p)$ and $g(q)$ have to be entailed by $\text{dox}_{g(x)}(w)$, which is to say that $g(p)$ and $g(q)$ must provide correct descriptions of $g(x)$'s beliefs. Thirdly, in every indexed world in $g(q)$ there must be a y with property B , so by transitivity $\text{dox}_{g(x)}(w)$ must entail that

¹⁷ Perhaps I should note explicitly that *believes* and *considers* are defined here as technical terms, and that it is not my intention to claim that these terms, taken on their own, capture the intuitive meaning of the verbs of which they happen to be homographs. This holds in particular for the second predicate, whose English gloss will not always be 'considers' but rather something like: 'does not believe that not'.

there is a y with property B . This captures the intended interpretation of (50b).

2.2. Counterparts

As it stands, our DRT analysis is restricted to belief reports that are construed strictly *de dicto*; *de re* interpretations cannot be adequately represented.

- (56)a. Somebody _{x} believes of something _{y} that it _{y} is a sheep.
 b. $[x, y, p, q: x \text{ believes } p \ \& \ q, q = p + [y: \text{sheep } y]]$

(56b) is the closest we can get to the most obvious interpretation of (56a), but this is not close enough, because there is no connection between the occurrences of y in the main DRS and in the embedded DRS. That is to say, there is no connection *yet*, because I propose to refine the analysis in such a way that, whenever a constellation like (56b) arises, the admissible values of the two occurrences of y must be counterparts. Hence, the meaning of (56b) will be roughly the following: ‘There is an a and a b ; a believes that there is a c such that c is a sheep; and b and c are counterparts’.

As Lewis (1968: 114) says, ‘The counterpart relation is our substitute for identity between things in different worlds’. But it is a powerful substitute. It allows us to say, for instance, that a thing in one world has several counterparts in another world; or that two things in one world share the same counterpart in another world. These are precisely the kind of things that we feel like saying when describing certain intersubjective liaisons between doxastic contexts. As far as Fred is concerned, the prime minister and the president of France are one and the same person. Barney knows better: two jobs, two individuals. Barney has two people in mind who correspond with a single person in Fred’s picture of the world: they are counterparts.

According to Lewis, the counterpart relation is a relation of similarity, and if we assume that it may be any kind of similarity relation, this implies that in general the counterpart relation is neither symmetric nor transitive (see Lewis 1968: 115–117). However, it is fairly clear that, certainly in the case of the attitudes but presumably in other cases as well, the counterpart relation cannot be any kind of similarity relation. Barney will say that his notion of Helmut Kohl and the one entertained by Fred are counterparts because he assumes that Kohl *à la* Fred goes back to the same source as his own Kohl *à la* Barney (cf. Edelberg 1992). It is this type of relation

that we typically have in mind when we consider correspondences between belief states, and *this* type of relation is presumably symmetric.

The convention for encoding counterpart relations that I propose is roughly as follows: if two attitude descriptions (i.e. DRSs) φ and ψ share a common reference marker u , then the semantic values of u in φ and in ψ must be counterparts. In order to make this idea a bit more precise, let us consider the following example:

- (57)a. Somebody_x believes of someone_y that she_y believes of something_z that it_z is a sheep.
 b. [x, y, p, p': x believes p & p',
 p' = p + [y, z, q, q': y believes q & q',
 q' = q + [z: sheep z]]]

(57b) involves two belief contexts, represented by p p' and q q', one of which is embedded in the other. The two embedded DRSs in (57b) share a reference marker, z, and therefore the values of z in these two DRSs have to be counterparts. More accurately, the correlate of z in somebody_x's mind, which is represented by p', will have to be a counterpart to the correlate of z in someone_y's mind, which is represented by q'. Furthermore, since the main DRS in (57b) and the largest embedded DRS share a reference marker, too, viz. y, the correlate of y in somebody_x's mind will have to be a counterpart to the correlate of y in a's mind, where a is the speaker whose commitment slate is represented by (57b).

If we want to give a more precise characterization of the proposed treatment of counterparts, it is helpful to first define a relation which is less restrictive than the strict accessibility relation given in (48). This relation, which I dub 'weak accessibility', holds whenever strict accessibility holds, but in addition it holds across attitude contexts as well:

- (58) *Employment*
 Let $\alpha^\circ = \{\alpha\}$, if $\alpha \in \text{RM}_i \cup \text{RM}_\nu$, and $(p + \varphi)^\circ = \{p, p + \varphi\}$.
 Then $\text{Emp}(\varphi)$ is the smallest set of terms for which the following hold:
 a. If $\text{P}\alpha_1 \dots \alpha_n \in \text{Con}(\varphi)$, then $\cup\{\alpha_1^\circ, \dots, \alpha_n^\circ\} \subseteq \text{Emp}(\varphi)$
 b. If $\alpha = \beta \in \text{Con}(\varphi)$, then $\alpha^\circ \cup \beta^\circ \subseteq \text{Emp}(\varphi)$
- (59) *Weak accessibility*
 \cong is the smallest preorder for which the following hold:
 a. If $\varphi \preceq \psi$, then $\varphi \cong \psi$.
 b. If $p + \psi \in \text{Emp}(\varphi)$, then $\varphi \cong \psi$.

For example, in (56b), the main DRS is weakly accessible to the DRS

that is embedded in it, but not *vice versa*; and in (57b), the main DRS is weakly accessible to the two DRSs that are embedded in it, and the larger embedded DRS is weakly accessible to the smaller one, but not *vice versa*.

The proposed representation of counterparts can be characterized in terms of weak accessibility as follows: if $u \in U(\varphi) \cap U(\psi)$ and $\varphi \cong \psi$, but not $\varphi \preceq \psi$, then any pair of values that u can take in φ and ψ must be counterparts. Thus in the present system, there are two ways in which the interpretation of an embedded DRS may be affected by the interpretation of a higher DRS. For any pair of DRSs φ and ψ : (i) if φ is strictly accessible to ψ , then the values of any reference markers that ψ shares with φ are determined in φ ; and (ii) if φ is only weakly (not strictly) accessible to ψ , then the values of any reference markers that ψ shares with φ must be counterparts.

To ensure that DRSs like (56b) and (57b) get the right sort of interpretation, I impose restrictions on the class of eligible embedding functions. The following might be a possible embedding function associated with (56b):

$$\left[\begin{array}{l} x \rightarrow a \\ y \rightarrow b_0 \\ p \rightarrow \dots \\ q \rightarrow \left\{ \begin{array}{l} \langle w_1, [y \rightarrow b_1] \rangle \\ \langle w_2, [y \rightarrow b_2] \rangle \end{array} \right\} \end{array} \right]$$

This will no longer be an admissible embedding function unless b_0 and b_1 and b_0 and b_2 are counterparts. More generally, once a variable has been assigned a value, other occurrences of the same variable deeper down should only be assigned values that are counterparts of values assigned upstairs. Or, to put it somewhat less sloppily:

(60) *Dependents*

For any embedding function f , $dps(f)$ is the smallest set for which the following hold:

- a. If $p \in \text{dom}(f) \cap \text{RM}_p$ and $\langle w, g \rangle \in f(p)$, then $g \in dps(f)$
- b. If $g \in dps(f)$ then $dps(g) \subseteq dps(f)$

(61) *Admissible embedding functions*

Let \sim be the counterpart relation fixed by a given model M and $f \in F_M^n$, for some $n \geq 0$. Then an embedding function f is *admissible* iff the following hold:

- a. If $g \in \text{dps}(f)$ and $\alpha \in \text{dom}(f) \cap \text{dom}(g)$, then
 $f(\alpha) \approx g(\alpha)$
- b. If $g \in \text{dps}(f)$ then g is an admissible embedding function

Finally, I stipulate that the interpretation of a DRS in a model M may only involve embedding functions that are admissible in M .

2.3. *Presuppositions in and of Belief Reports*

Although I have shown how belief reports can be represented in DRT, I have said nothing yet about the mechanisms that produce these representations. These mechanisms are the subject of the present section and the next one. I have proposed that the semantic representation of a sentence of the form ‘ a believes that S ’ involves the following ingredients: a reference marker u corresponding to the subject of the sentence; two propositional reference markers p and q ; conditions of the form ‘ u believes p ’ and ‘ u believes q ’ which express that p and q represent a ’s doxastic context; and finally, a condition of the form ‘ $q = p + \varphi$ ’, where φ reflects the semantic content of S . I now add to this scheme one decisive qualification, namely that the content of a belief report divides into a presupposed and a non-presupposed part: ‘ a believes that S ’ triggers the presupposition ‘ u believes p ’, and asserts ‘ $q = p + \varphi$ ’ and ‘ u believes q ’. In words: whenever a speaker ascribes to an individual a the belief that S , he presupposes that a has beliefs and asserts that those beliefs entail S .

That ‘ a believes that S ’ presupposes that a has beliefs is confirmed by the standard diagnostic tests. For example, if a speaker utters a sentence of the form ‘ a does not believe that S ’, he obviously takes it for granted that a believes something, and this implication can be suspended in a way that is characteristic of presuppositions. Compare the following examples for instance:

- (62)a. My Powerbook doesn’t believe that the square root of 4 is 2.
- b. If my Powerbook has any beliefs at all, it still doesn’t believe that the square root of 4 is 2.

Normally, we would be entitled to infer from an utterance of (62a) that the speaker believes that his Powerbook has beliefs, and the same inference is blocked in (62b). Of course, this is precisely what we would expect if this inference were of a presuppositional nature. Furthermore, the assumption that ‘ a believes that S ’ presupposes that a has beliefs is made, albeit tacitly, by Heim, too. True, it doesn’t do any work in her theory, but it is encoded in her semantics of *believe*. Within the present framework, this assumption

will prove to be crucial, and this is because the presupposition induced by 'a believes φ ' consists of a propositional term representing a's doxastic context. I have shown that such terms may affect the accessibility structure of a DRS, and indeed we will see in a moment that the *projection* characteristics of the verb *believe* are determined, *inter alia*, by the presupposition it *induces*; in Section 2.5 the same will be seen to hold for *want*, too.

If a speaker employs an expression or construction that triggers a presupposition χ , he indicates that he takes χ to be given in the context in which it occurs – i.e. χ must be given in one of the DRSs that are accessible to χ 's home DRS. But meanwhile the notion of context has become an ambiguous one: there is a narrow and a wide notion of context, defined by strict and weak accessibility, respectively. However, there are *a priori* grounds to expect that it is the wider notion of context which is relevant in this connection. In an important sense, *everything* that is contained in a DRS φ represents information that the speaker is responsible for. This holds for belief contexts, too: if $\varphi \cong \psi$ but not $\varphi \leq \psi$, and ψ represents somebody's belief, then it still is a representation that the speaker is committed to. It is the speaker who selects the linguistic means for characterizing a subject's beliefs, and in particular it is the speaker who chooses between presuppositional and non-presuppositional devices.¹⁸ Therefore it would have been remarkable if presuppositions were confined to the narrow context in which they are triggered, and it is only natural to assume that it is weak, not strict, accessibility that is pertinent to presupposition projection. At any rate, I will assume it to be so, and unless explicitly indicated otherwise, I shall in the following use 'accessibility' as short for 'weak accessibility'.

Assuming that the lexical entry of *believe* is in fact structured as I claim it to be, and leaving the binding theory as it is, we get a number of interesting predictions about presuppositions in attitude contexts. To begin with, we predict that presuppositions may be bound in *believe-believe* sequences. The following is a case in point:

¹⁸ As it turns out, this point is easily misunderstood, perhaps because the term 'presupposition' is standardly used with at least two different meanings, which are sometimes run together. On the one hand, it is customary to say that a given expression triggers or induces a presupposition, while, on the other hand, the same term is used to characterize certain commitments that the speaker incurs as a consequence of his saying something. So even if a speaker is responsible for choosing an expression α that triggers the presupposition (in the first sense) that φ is true, it does not follow that he cannot use α without presupposing (in the second sense) that φ is true. (If this followed, presupposition projection would not be a problem.)

- (63)a. If Barney_{*i*} believes that he_{*i*} has a son_{*j*}, he_{*i*} also believes that he_{*j*} is a gifted ventriloquist.
- b. [p, p' : B believes p, B believes p' , $p' = p + [x: x \text{ is B's son}]$]
 $\Rightarrow [q, q'$: B believes q, B believes q' ,
 $q' = q + [z: \text{ventriloquist } z]]]$

I have said that 'a believes that S' triggers the presupposition that *a* has beliefs. Two such presuppositions are triggered in (63b): one in the antecedent of the conditional, and one in the consequent. The binding theory predicts that the first of this pair will be accommodated in the main DRS, because there is no suitable antecedent available, and there is nothing to block global accommodation. This gives us (63c):

- (63)c. [p : B believes p ,
 $[p'$: B believes p' , $p' = p + [x: x \text{ is B's son}]$]
 $\Rightarrow [q, q'$: B believes q, B believes q' ,
 $q' = q + [z: \text{ventriloquist } z]]]$

The second presupposition may be bound in the antecedent of the conditional, as a result of which we get (63d):

- (63)d. [p : B believes p ,
 $[p', q: q = p', \text{ B believes } p',$
 B believes $q, p' = p + [x: x \text{ is B's son}]$]
 $\Rightarrow [q': \text{B believes } q', q' = q + [z: \text{ventriloquist } z]]]$

Once q has been bound to p' , the first belief DRS is accessible the second, and therefore the reference marker x is now accessible to the anaphor z , and the latter may be bound to the former. This gives us (63e), which is equivalent to (63f):

- (63)e. [p : B believes p ,
 $[p', q: q = p', \text{ B believes } p',$
 B believes $q, p' = p + [x, z: z = x, x \text{ is B's son}]$]
 $\Rightarrow [q': \text{B believes } q', q' = q + [z: \text{ventriloquist } z]]]$.
- f. [p : B believes p ,
 $[p': \text{B believes } p', p' = p + [x: x \text{ is B's son}]$]
 $\Rightarrow [q': \text{B believes } q', q' = p' + [z: \text{ventriloquist } z]]]$

Which, I have argued in the preceding section, is an adequate rendering of a possible reading of (63a).

This example already reveals some of the explanatory potential of the theory. First, the theory predicts that (63a) presupposes that Barney has beliefs. Secondly, the theory explains how the two separate belief reports

in (63a) come to refer to the same belief state. Not that this is a particularly hard problem to solve, but I should like to point out that, in the present framework, its solution requires no special provisions or assumptions. Thirdly, and most importantly, the theory offers a straightforward explanation of the fact that an anaphor in one belief report can be bound to an antecedent in another. This explanation, naturally, extends to presuppositional expressions in general: if a presupposition can be bound in the belief context in which it arises, the binding theory predicts that this will in fact happen.

If a presupposition χ is triggered in a belief report on a subject a , and χ cannot be bound, we predict that χ will be accommodated in the main DRS. For example, it is predicted that, by default, (64a) will be interpreted as presupposing that, according to the speaker, there is a manager:

- (64)a. Wilbur believes that the manager is a crook.
 b. $[p, q: W \text{ believes } p \ \& \ q, q = p + [\underline{x}: \text{manager } x, \text{crook } x]]$
 c. $[x, p, q: \text{manager } x, W \text{ believes } p \ \& \ q, q = p + [x: \text{crook } x]]$

In (64b) the presupposition that there is a manager cannot be bound, and therefore the binding theory predicts that, in the absence of a suitable antecedent, the presupposition is preferably accommodated in the main DRS.

(Actually, I was cheating just now, though not much. If I had blindly applied the rules of the binding theory as described at the outset, the reference marker x in Wilbur's belief DRS would have become unbound. This problem is liable to raise its head whenever a presupposition is projected to a DRS that is not strictly accessible to its home DRS. But I didn't apply the rules blindly, and inserted a copy of x into the embedded DRS, and will continue to do so whenever the need arises. The binding theory is easily revised so as to sanction this sleight of hand, for instance by adjusting the binding mechanism or the representation of presuppositions.)

Of course, if a presupposition can be accommodated outside of the belief context in which it is triggered, it may also be bound there. The following is a case in point:

- (65) If Barney was tripped, then he believes that it was Fred who tripped him.

Intuitively, the presupposition triggered by the *it*-cleft in the belief report about Barney (that Barney was tripped) is bound in the antecedent of the conditional, and this is precisely what our theory predicts:

- (66)a. $[: [x: x \text{ tripped } B]$
 $\Rightarrow [p, q: \underline{B \text{ believes } p}, B \text{ believes } q,$
 $q = p \uparrow [z: \underline{z \text{ tripped } B}, z = F]]]$
- b. $[p: B \text{ believes } p,$
 $[x, z: z = x, x \text{ tripped } B, z \text{ tripped } B]$
 $\Rightarrow [q: B \text{ believes } q, q = p + [z: z = F]]]$
- c. $[p: B \text{ believes } p,$
 $[x: x \text{ tripped } B] \Rightarrow [q: B \text{ believes } q, q = p + [x: x = F]]]$

The first presupposition in (66a) is accommodated in the main DRS because it cannot be bound. The remaining presupposition, that someone tripped Barney, can now be bound in the antecedent of the conditional. The resulting DRS is (66b), which is equivalent to (66c), and which says that if Barney was tripped, then Barney believes of his counterpart to the hypothetical individual who tripped Barney (according to the speaker's) that he is Fred.

To sum up: the theory that I propose solves a number of problems concerning the behaviour of presuppositions in belief contexts which, taken at face value, might seem to point in opposite directions:

- First, it accounts for the fact that presuppositions can be bound in *believe-believe* sequences, as in (63a).
- Secondly, it predicts that a presupposition may be bound beyond the confines of a belief context, and thus accounts for cases like (65).
- Thirdly, it predicts that, whenever a presupposition cannot be bound, it will, *ceteris paribus*, be accommodated in the main DRS. For example, (64a) is predicted to presuppose that there is a manager.

2.4. Importation

My theory gives qualified support to the e-principle, which implies, speaking in terms of the binding theory, that a presupposition triggered in a belief context will project to the main DRS. The qualification made here is that this will not happen if a presupposition is bound or accommodated within the belief context in which it originates. We have already seen how presuppositions can be bound within belief contexts. The following example illustrates how, under special circumstances, they may be locally accommodated. Suppose that it is part of the interlocutors' common ground that the university of Osnabrück doesn't employ a hangman (which, to the best of my knowledge, is not the case, but that is as it may be). Then one of the interlocutors might nevertheless volunteer:

- (67) Professor Müller believes that the university hangman is after him.

In the given context, this would be construed as 'Professor Müller believes that the university has a hangman, who is after him', which is to say that the general preference for global accommodation is overridden by contextual information, and the presupposition is accommodated locally, within professor Müller's doxastic context.

If a presupposition is neither bound nor accommodated within the belief context in which it is triggered, it will be bound or accommodated externally. However, I have argued that presuppositions triggered in attitude contexts often, though not always, receive a two-sided reading, which has an internal as well as an external component (Section 1.2). I now want to refine this observation as follows: if a presupposition is construed externally (i.e. if it is neither bound nor accommodated within a belief context), it will often be construed internally, to boot. This extra internal construal is not of a presuppositional nature, though it is based upon a presupposition, construed externally. It will be convenient to have a name for this additional inference: I will call it 'importation', the idea being that a piece of information is imported into a belief context. In the following I will elaborate upon this proposal, and contrast it with the opposite view advocated by Karttunen and Heim.

Consider the following example, which I borrow from Heim (1992: 206):

- (68)a. John believes that it stopped raining.
 b. John believes that it was raining.
 c. It was raining.

Some theories of presupposition predict that (68a) presupposes that (68b) is true; this holds, in particular, for the theories proposed by Karttunen (1974) and Heim (1992). For these theories the problem is to explain why, in addition, (68c) would occasionally be conveyed by an utterance of (68a), as well, and here an exportation argument naturally suggests itself. This is in fact the course taken by Karttunen and by Heim. The latter, for example, reasons as follows:¹⁹

¹⁹ This is one of two strategies considered by Heim for explaining two-sided readings (the other, which is based upon the idea that external readings might in fact be *de re* construals, was discussed in Section 1.3). The argument that Heim presents in the passage cited here is reminiscent of one advanced by Karttunen and Peters (1979) in an attempt to justify the predictions of their theory, which are systematically weaker than one would wish (for further discussion, see Geurts 1995, 1996a).

[...] assumptions to be accommodated are supposed to be uncontroversial and unsurprising. [...] So when we hear [(68a)] out of the blue, we know two things: first, as a matter of the semantics of this sentence, we know that it requires the presupposition that John believes that it was raining. Second, we know that the speaker takes this to be uncontroversial and unsurprising. Now why would it be unsurprising that John has such a belief? The most natural guess is that it would be unsurprising because it was in fact raining and John was in an appropriate position to find out. Of course, these are not the only possible conditions under which someone might form a belief that it was raining; but they are the most *normal* conditions. (Heim 1992: 212)

This argument may seem plausible enough at first, but it doesn't withstand closer scrutiny. First, consider the following example:

- (69)a. Wilma is polishing her stethoscopes.
- b. Wilma has several stethoscopes.
- c. Wilma is a doctor.

Heim's argument would imply that we may reason as follows: (69a) requires the presupposition that (69b) is true, and the speaker takes this presupposition to be unsurprising. How could that be? The most natural guess is that (69c) is true, for normally speaking it is doctors who own stethoscopes. This result is plausible, too. What I find objectionable, however, is that the same argument that has taken us from (68a) to (68c) should take us from (69a) to (69c). For it would seem to follow from this that (69c) stands to (69a) as (68c) stands to (68a), and this is arguably incorrect. (69c) is clearly a bridging inference that is based upon plausibility, just as Heim's argument suggests, and it is easily defeasible: if (69a) is followed by, say,

- (70) She has been collecting them since she was 12 years old.

The inference to (69c) is simply suspended, although (69c) and (70) are not incompatible in any way. But the inference from (68a) to (68c) is not undone so easily: it clearly requires marked means to accomplish this, and therefore this is presumably not a defeasible inference to begin with, and at any rate it is not of the same nature as the inference from (69a) to (69c).

This conclusion is confirmed by the following observation. If we take (68b), which according to the Karttunen–Heim theory is presupposed by (68a), and give it as a complement to a factive verb like *know*, the inference to (68c) evaporates without a trace:

- (71) Fred knows that John believes that it was raining.

This already suffices to prove that there is something seriously amiss with Heim's argument. It is universally agreed that (71) presupposes that John

believes that it was raining (this presupposition is triggered by the factive verb), and Heim's theory predicts that (68a) has the same presupposition. But then why should a hearer be entitled to infer that it was raining in one case but not in the other? If Heim's reasoning were sound we should expect it to hold in both cases, but as it clearly doesn't hold in the case of (71), it is dubious that it should hold in the case of (68a). Furthermore, if we embed the presupposition of (69a) in the same way,

(72) Fred knows that Wilma has several stethoscopes.

The resulting sentence still suggests that Wilma is a doctor. Which confirms our suspicion that (68c) does not stand to (68a) as (69c) stands to (69a). The latter is clearly a bridging inference, whereas, contrary to what Heim's argument suggests, the former is not.

There is a further, more fundamental, objection against Heim's argument: it takes the wrong direction, in that it attempts to draw conclusions about the speaker's beliefs on the basis of the beliefs that he ascribes to a third party, instead of the other way round. Although the notion is notoriously hard to make precise, it is generally accepted that in construing the beliefs of others we operate on a principle of charity: we try to avoid the conclusion that other people's beliefs are contradictory, we credit them with knowledge that we take to be uncontroversial or commonly available, and so on. It is only natural to assume that the same principle underlies our speaking of other people's beliefs. Putting the point without any of the necessary nuances: if a person *a*'s doxastic context is the subject of a conversation, the interlocutors will tend to assume that *a* believes what they believe. This is a caricature but the basic idea is surely right. Heim's argument, however, proceeds in the opposite direction, which is not nearly as plausible: in general, if I describe someone as believing that φ , I intend to at least remain uncommitted concerning the truth of φ . What is more, if someone describes a person as believing (rather than knowing) that φ , his description may often be taken to imply that he doubts that φ is true or is even convinced that it is false. In short: if a speaker reports on the beliefs of a person *a* there may be a tendency to ascribe to *a* beliefs that the speaker is taking for granted, but it is *a priori* unlikely that the hearer will ascribe a certain belief to the speaker because the speaker ascribes it to *a*.²⁰

²⁰ I have the impression that Heim doesn't distinguish between the two directions of 'information flow' in talk about beliefs, or between exportation and importation, as I have dubbed them. That is at least what her citing the following passage from Karttunen (1973b) suggests:

[...] unless it has been indicated otherwise, [John] can be assumed to share the speaker's beliefs. In other words, there is a natural spill-over from [the global context to John's

The upshot of these observations is that the prospects of the importation view are decidedly brighter than those of the exportation view. This is a welcome result for my theory of presupposition, because it leaves a gap which seems to call for some version of importation. I now want to argue that, apart from the fact that it is to be preferred to its opposite, importation is plausible in itself and motivated by independent considerations.

That importation is a plausible strategy is conceded even by Heim, who appeals to it after having suggested that some (in my terminology) external readings of presuppositional expressions are in fact *de re* construals. I have shown that this idea fails in the general case, but it receives seeming support from some presupposition triggers, such as definite NPs. Suppose now that the definite subject NP in (73) is construed *de re*:

(73) Ralph thinks that the man he saw at the beach is a spy.

Let us say that this sentence is to be read as claiming that there is some acquaintance relation *R* such that Ralph bears *R* to the man he saw at the beach, i.e. Bernard J. Ortcutt, and thinks that whoever he bears *R* to is a spy. If we adopt some account along these lines, it is plausible to surmise that the mere fact that a speaker who utters (73) is referring to Ortcutt with the help of this particular definite description 'will bias the hearer towards the assumption that the intended acquaintance relation between Ralph and Ortcutt is the one established in the beach-encounter' (Heim 1992: 210). Thus even if (73) is construed *de re*, it is likely to be understood as implying that Ralph believes that he has seen a man at the beach who is a spy. According to this scenario, then, (73) will in a sense be read *de re* as well as *de dicto*.

Even if we must reject the theory in which it is embedded (as I have argued we must), the main thrust of this importation story is in the right direction. Heim's analysis of (73) is a plausible one, although I prefer to view it in terms of the external/internal distinction, and its plausibility even increases when we consider other presupposition triggers than the definite article.

belief context]. Consequently, in situations where nothing has been said about [John's] beliefs, one tends to think that, if the presuppositions of [(68a)] are satisfied, they are satisfied by virtue of the speaker's tacit assumption that [John] shares his beliefs. (Karttunen 1973b, as cited by Heim 1992: 184)

(Not having access to the Karttunen manuscript, I quote from Heim substituting Karttunen's example with the one used earlier on.) Note that this passage starts out with an unequivocal appeal to some importation principle, but that the 'spill-over' which the Karttunen-Heim theory requires goes in the opposite direction, from John's belief context to the global context, and is therefore a form of exportation.

Consider, for example, (74a):

- (74)a. Fred believes that it was Barney who tripped him.
 b. $[p, q: F \text{ believes } p \ \& \ q, q = p + [x: x \text{ tripped } F, x = B]]$
 c. $[x, p, q: x \text{ tripped } F, F \text{ believes } p \ \& \ q, q = p + [x: x = B]]$

The only presupposition that remains to be processed in (74b) is that someone tripped Fred, and the binding theory predicts that this presupposition will be accommodated in the main DRS, which yields (74c). This DRS says that an individual *a* tripped Fred, and that Fred believes that some *b*, who is *a*'s counterpart, is Barney. Obviously, if this were all the speaker wanted to communicate, his uttering (74a) would be a pointless thing to do, and it is natural to infer that, according to the speaker, Fred actually believes that *b* tripped him.

No matter what the details of this explanation will look like, we will need something along these lines for independent reasons. For example:

- (75) Fred was tripped by somebody, and he believes that it was Barney.

It is clear that, normally speaking, someone who utters (75) takes it for granted that Fred believes that he was tripped. However, the reading we (and not only we) actually predict for this sentence is (74c), and since this reading doesn't imply that Fred believes that someone tripped him, importation is required. Similarly:

- (76) It is raining but Fred believes that it will soon stop.

Fred believes that *what* will soon stop? The answer is obvious, but it requires that the information that it is raining is imported into Fred's doxastic context.

Hence, anaphoric pronouns that occur in attitude contexts provide independent support for the notion of importation. Further independent evidence is furnished by specific indefinites:

- (77) Wilma believes that a boy scout has fallen in love with her.

The indefinite noun phrase in (77) can be construed *de re*, although this is probably not the preferred option.²¹ But even if we understand an

²¹ Some people (one of the referees for this journal, for example) have played with the idea of analysing specificity in presuppositional terms, the suggestion being that, if an indefinite receives a specific interpretation, it triggers a presupposition that is not given and must therefore be accommodated. This is not a good idea however. Given that presuppositions are defined as pieces of information that are (pretended to be) given, and that accommodation is merely a repair strategy, a presupposition that *eo ipso* is not given and must be accommodated is simply a contradiction in terms. I do not see, therefore, how specific indefinites might be

utterance of this sentence as implying that there is a boy scout such that Wilma believes that he is in love with her, it is rather likely that we would infer that Wilma, too, believes that the individual in question is a boy scout. I have the impression that such two-sided readings are the rule rather than the exception – i.e., *if* an indefinite noun phrase is construed *de re*, it will in general be construed *de dicto* as well. Be that as it may, for my present purposes it is already sufficient that (77) *may* be read as implying both that there is a boy scout such that Wilma believes that he is in love with her, and that Wilma, too, believes that the individual in question is a boy scout. For if (77) *may* be read this way, it obviously isn't sufficient if we can explain how the indefinite in (77) can be construed *de re*. What we need, in addition, is an account of the fact that it can be read *de dicto* at the same time, i.e. we require some form of importation.

It is evident that importation isn't anything like a logical rule of inference: it doesn't always apply. What is more, I see no good reason to assume that it is default rule, either.

- (78)a. My mother thought that my sister was drunk.
 b. The policeman thought that my sister was drunk.

We would normally infer from (78a) that the speaker's mother believed (in fact, knew) that his sister is his sister. By contrast, (78b) wouldn't license the inference that the policeman believed the speaker's sister is the speaker's sister, except under special circumstances. If importation were a default rule, the former would be the 'normal' case, and the latter would be an exception. But this seems counterintuitive. I conclude, therefore, that importation is not a principle or inference rule to begin with: it is just a convenient label for a certain class of context-dependent plausibility inferences.

If this observation is correct, then this is additional evidence against Heim's version of the satisfaction theory. On Heim's analysis, a sentence of the form '*a* believes that $\varphi\{\chi\}$ ', will *normally* give rise to the (allegedly presuppositional) inference that '*a* believes that χ '; special mechanisms are called for if we want to explain the (allegedly non-presuppositional) inference that, according to the speaker, χ is true. But the observation

accounted for in presuppositional terms. Note that this point does not presuppose that the binding theory is correct. It assumes merely that presuppositions are (pretended to be) given information, and this is a premise that is hardly controversial. (It is accepted by satisfaction theorists, too. The main issue between the binding theory and the satisfaction theory is over the question what givenness means in this connection; see Geurts 1996a for further discussion.)

made in the previous paragraph strongly suggests that it is precisely the other way round, as indeed my analysis has it.

2.5. 'Want'

Having thus far confined my attention to the semantics and presuppositional behaviour of *believe*, I want to show in this section how the theory can be extended so as to account for *want*, too. As in the case of *believe*, the semantics of *want* that I adopt is the same as Heim's, and I shall merely complement it with an assumption concerning the presuppositions that this verb triggers. And as with *believe*, the projection properties of *want* will be argued to follow from this.

As we have seen in Section 1.3, the following is (a simplified version of) Heim's proposal for the context-change semantics of *want*, which was inspired by Stalnaker's analysis:

$$(79) \quad c + [a \text{ wants } \varphi] = \{w \in c \mid \text{dox}_a(w) + \varphi <_{a,w} \text{dox}_a(w) + [\neg\varphi]\} \\ (= (30)).$$

Where $<_{a,w}$ represents an ordering which ranks propositions according to their desirability for an individual a in a world w . What this says is that a wants φ iff he prefers all doxastic alternatives in which φ is true to any of his doxastic alternatives in which $\neg\varphi$ is true.

This analysis may be transposed into the DRT framework as follows. To begin with, we note that Heim's rule for *want* involves three sets of worlds: a set of doxastic alternatives $\text{dox}_a(w)$, the subset of $\text{dox}_a(w)$ in which φ is true, and the subset of $\text{dox}_a(w)$ in which $\neg\varphi$ is true. The third set is obviously derivable once the first two are given. Accordingly, the DRT representation that I suggest involves two propositional reference markers, one corresponding to Heim's ' $\text{dox}_a(w)$ ', and one corresponding to her ' $\text{dox}_a(w) + \varphi$ '. These two reference markers, p and q , are related via a condition of the form ' $q = p + \varphi$ '. The propositional reference marker p corresponds with Heim's ' $\text{dox}_a(w)$ '; in order to bring this out, a condition of the form ' u considers p ' is imposed on p , which is to say that the information in p is compatible with u 's beliefs (see (53b) for the precise definition of *considers*). Finally, we need to represent the information that, among the p -worlds, u prefers the ones that are in $q = p + \varphi$ to any world that is not. To this end, we introduce a three-place relational constant *prefers*, which is interpreted as follows:

$$(80) \quad I_w(\text{prefers}) = \{\langle a, \sigma, \sigma' \rangle \mid \text{dom}(\sigma') <_{a,w} (\text{dom}(\sigma) - \text{dom}(\sigma'))\}$$

This is a relation which holds between an individual a and a pair of

indexed propositions σ , σ' , iff a prefers all worlds in $\text{dom}(\sigma')$ to any world which is in $\text{dom}(\sigma)$ but not in $\text{dom}(\sigma')$. This is more general than what we actually need, but in our encoding of *want* $\text{dom}(\sigma)$ will be a set of doxastic alternatives and $\text{dom}(\sigma')$ that subset of $\text{dom}(\sigma)$ in which some proposition holds, so this gives us what we want. Instead of ‘prefers u p q ’ I will usually write ‘ u prefers _{p} q ’, which may be read as ‘among the p -worlds, u prefers the q -worlds to the $\neg q$ -worlds’.

To summarize: a sentence of the form ‘ a wants S ’ will be represented by a DRS of the form $[u, p, q: u \text{ considers } p, q = p + \varphi, u \text{ prefers}_p q]$, where u is a reference marker representing a , p and q are propositional reference markers that represent sets of alternatives that are compatible with a ’s doxastic context, and φ is a DRS that represents the content of S . (81) gives an example:

- (81)a. Professor Müller wants to play the accordion.
 b. $[x, \underline{p}, q: \text{PM } x, \underline{x \text{ considers } p}, q = p + [x: x \text{ plays the accordion}],$
 $x \text{ prefers}_p q]$

The underlining in (81b) already indicates what is the keystone of my proposal: analogously to *believe*, the content of *want* is partitioned into a presupposed and a non-presupposed part. (81a) takes some set of alternatives as given and asserts of this set, represented here by the reference marker p , that professor Müller prefers all p -worlds in which he plays the accordion to any p -world in which he does not. The arguments in favour of this analysis parallel the ones I advanced in support of my analysis of *believe*. In particular, it is easily shown that it is corroborated by the standard diagnostics for presuppositions.

Let us now see what predictions this hypothesis yields.

- (82)a. Kurt believes that he is being shadowed by a ghost. He wants to write a book about it (the ghost).
 b. $[p, p', \underline{q}, q':$
 $K \text{ believes } p \ \& \ p', p' = p + [x: \text{ghost } x, x \text{ shadows } K],$
 $\underline{K \text{ considers } q}, K \text{ prefers}_q q',$
 $q' = q + [y, z: \text{book } y, K \text{ writes } y \text{ about } z]]$

We assume that the first sentence of (82a) has been processed, and start out from the representation in (82b). This DRS contains presuppositions induced by the verb *want* (q) and the pronoun *it* (z); all other presuppositions are either ignored or assumed to have been processed already. Since ‘ K believes p ’ entails ‘ K considers q ’ if $p' = q$, q may be bound to p' . This yields (82c), which is equivalent to (82d):

- (82)c. [p, p', q, q':
 q = p',
 K believes p & p', p' = p + [x: ghost x, x shadows K],
 K considers q, K prefers_q q',
 q' = q + [y, z: book y, K writes y about z]]
- d. [p, p', q':
 K believes p & p', p' = p + [x: ghost x, x shadows K],
 K prefers_p q',
 q' = p' + [y, z: book y, K writes y about z]]

Now the remaining anaphor, i.e. z, has gained access to Kurt's belief DRS, and is bound to x. The outcome of this operation is (82e), which is equivalent to (82f):

- (82)e. [p, p', q':
 K believes p & p',
 p' = p + [x, z: z = x, ghost x, x shadows K],
 K prefers_p q', q' = p' + [y: book y, K writes y about z]]
- f. [p, p', q':
 K believes p & p', p' = p + [x: ghost x, x shadows K],
 K prefers_p q', q' = p' + [y: book y, K writes y about x]]

This analysis shows how an anaphoric pronoun in a *want* context can pick up its antecedent from a *believe* context. Similarly, in (83a) the presupposition that Fred's wife is given to drink, which is triggered by the aspectual verb *stop*, is bound in the belief context in the antecedent.

- (83)a. If Fred believes that his wife has taken to drink again, then he will want her to stop drinking.
- b. If Fred's wife has taken to drink again, then he will want her to stop drinking.

In (83b), on the other hand, the same presupposition is bound in the antecedent of the conditional, and this is predicted, too, since a *want* context is the same type of entity as a *believe* context, and we have seen already that the theory allows presuppositions to escape from such contexts. For the same reason, it is predicted that, if a presupposition triggered in a *want* context cannot be bound, it will be accommodated, which means, as a rule, that it is accommodated globally. This is correct, too, as witness examples like the following:

- (84) Fred wants his wife to stop drinking.

Under normal circumstances, this will be taken to imply that, according to the speaker, Fred's wife has been drinking, which is what we predict.

We have seen that Heim's theory cannot account for presupposition filtering in *want-want* sequences (Section 1.3). Mine can. To illustrate this, suppose that the discourse in (82a) is continued with an utterance of (85a). Our initial DRS will then be as in (85b), which consists of (82f) incremented with the information furnished by the new sentence:

- (85)a. And he (Kurt) wants to dedicate it (the book) to Professor Müller.
- b. $[p, p', q', \underline{r}, r']$:
 K believes p & p' , $p' = p + [x: \text{ghost } x, x \text{ shadows } K]$,
 K prefers $_{p'}$ q' , $q' = p' + [y: \text{book } y, K \text{ writes } y \text{ about } x]$,
K considers r , K prefers $_r$ r' ,
 $r' = r + [z: K \text{ dedicates } z \text{ to PM}]$

In (85a) the neuter pronoun in the scope of *want* is anaphoric on *a book* in (82a). (85a) presupposes that there is a set of indexed worlds which is compatible with the doxastic alternatives that are open to Kurt, and the DRS in (85b) offers three possible antecedents for this presupposition. However, there will be no suitable antecedent for *it* unless r picks up q' , which makes available y as an antecedent for z . The binding theory predicts that the latter alternative will be preferred, which yields the representation in (85c), or, equivalently but slightly more succinctly, (85d):

- (85)c. $[p, p', q', r, r']$:
 $r = q'$,
 K believes p & p' , $p' = p + [x: \text{ghost } x, x \text{ shadows } K]$,
 K prefers $_{p'}$ q' ,
 $q' = p' + [y, z: z = y, \text{book } y, K \text{ writes } y \text{ about } x]$,
 K considers r , K prefers $_r$ r' ,
 $r' = r + [: K \text{ dedicates } z \text{ to PM}]$.
- d. $[p, p', q', r']$:
 K believes p & p' , $p' = p + [x: \text{ghost } x, x \text{ shadows } K]$,
 K prefers $_{p'}$ q' , $q' = p' + [y: \text{book } y, K \text{ writes } y \text{ about } x]$,
 K prefers $_{q'}$ r' , $r' = q' + [: K \text{ dedicates } z \text{ to PM}]$

The results of our analysis of *want* may be summed up in four points:

- First, it predicts that presuppositions may be bound in *believe-want* sequences, as in (82a).

- Secondly, it accounts for the fact that presuppositions may be bound in *want-want* sequences, as when (82a) is followed by (85a).
- Thirdly, a presupposition may be bound beyond the confines of a *want* context, as in (83b).
- Fourthly, whenever a presupposition triggered in a *want* context cannot be bound it will in general be accommodated at top level, as in (84).

The binding theory doesn't account for all inferences that may be associated with presuppositional expressions in *want* contexts.

- (86)a. Ralph wants to inform against the man he saw at the beach.
 b. Ralph wants to inform against an individual whom he believes to be a man that he saw at the beach.

Typically, an utterance of (86a) would be taken to imply that the speaker holds (86b) to be true, as well. I agree with this observation, but I am bound to deny that this inference is a presupposition. According to the analysis that I have presented, (86a) presupposes (in the absence of contextual information to the contrary) that Ralph saw a man at the beach. This is intuitively correct, or at least it accounts for an inference that would normally be licensed by an utterance of this sentence. The additional inference yielding (86b) is not something a theory of *presupposition* can explain, but in the previous section we have seen how such inferences can be secured in the case of *believe*. What I said there applies here, too: there is an independently motivated plausibility inference that, on the basis of an external construal of the presupposition triggered by the definite NP in (86a), yields the conclusion that (86b) is true, as well. As in the case of *believe*, this independent evidence is furnished by anaphoric pronouns and specific indefinites occurring in attitude contexts.

- (87)a. Fred was tripped by somebody, and he wants Barney to know *it*. (cf. (75))
 b. It is raining, and Fred wants *it* to stop. (cf. (76))
- (88) Wilma wants a boy scout to make love to her. (cf. (77))

In (87a), the pronoun *it* occurs in the context created by 'Fred wants . . .', and resolving this pronoun is not in itself sufficient to secure the inference that, according to the speaker, Fred believes that someone tripped him. But clearly this is something we would normally infer from an utterance of (87a). The same holds, *mutatis mutandis*, for (87b). Similarly, even if the indefinite in (88) is construed *de re* and given wide scope, we would normally infer that, moreover, Mary believes of the individual with whom

she wants to engage in amorous transactions that he is a boy scout. In either case importation appears to be called for, and thus these observations provide independent support for the sort of inference that is needed to round out our presuppositional analysis of examples like (86a).

3. OTHER DOMAINS, SAME PRINCIPLES

Details aside, my proposal is that attitude reports give rise to DRSs of the form $[p, q: q = p + \varphi]$, where p is presupposed and φ represents the content of the reported attitude. Following the binding theory, the presupposition triggered by the attitude verb may either be bound or accommodated, and if it is bound new reference markers may become accessible in φ . This pattern is not restricted to attitude reports; it also occurs with modals, conditionals, quantifiers, plural pronouns, and non-declarative speech acts. The analysis presented in this paper can, and has been, extended to all these phenomena.

The following observations illustrate that the pattern just referred to is indeed ubiquitous. Expressions that I want to compare with attitude verbs are set in bold type; links of presuppositional binding are indicated with italics. In some cases, this encoding is somewhat imprecise, but it should at least give the right idea. Unless otherwise indicated, the following examples are taken from Karttunen's landmark paper 'Discourse referents', first circulated in 1969, and published as Karttunen (1976).

(A) *Modals:*

- (89)a. You **must** write *a letter* to your parents. *It has* to be sent by airmail. *The letter must* get there by tomorrow.
- b. It's **certain** that Sam will find *a girl* and **possible** that he will kiss *her*. (Lakoff 1972: 619)

Conditionals also fall into this class:

- (90)a. **If** Mary **had** a car, she **would** take me to work in it. I **could** drive the car too.
- b. **If** Jack has *sisters_i*, *Jack's sisters_i* have insisted his wife have children. **If** *Jack's sisters_i* have insisted his wife have children, Jack's wife has let herself have children. **If** Jack's wife has let herself have *children_j*, *Jack's wife has become neurotic*. **If** Jack's wife has become neurotic, all of *Jack's children_j* are bald. (Kuroda 1979: 185)

(B) *Quantifiers:*

- (91) Harvey courts *a girl at every convention*. *She always* comes to the banquet with him. *The girl* is **usually** very pretty.

These are cases with adverbial quantifiers. Parallel examples can be constructed with nominal quantifiers and plural definites:

- (92) Every director gave *a present* to **a child from the orphanage**. Two {of **them/of the children/children**} opened *it*. (Kamp and Reyle 1993: 381)

(C) *Non-declaratives:*

- (93)a. **Does** John have *a car* and is *it* a Mustang?
 b. **Give** me a *hotdog* please, but **don't** put any mustard on *it*.

Finally, there are mixed cases such as the following, which again are culled from the Karttunen collection:

- (94)a. Mary **wants** to marry *a rich man*. *He must* be a banker.
 b. I **wish** Mary had *a car*. She **would** take me to work in *it*. I **could** drive *the car* too.

In the following I will briefly indicate how each of these classes fits into the framework of this paper; for more extensive discussions of modals and quantifiers I refer to Geurts (1995, 1996b) and Geurts and van der Sandt (1998).

First, modals. According to a doctrine that goes back at least as far as Peirce, modals are typically restricted to a domain that is contextually specified (cf. Kratzer 1991). For example, when (95) is read deontically, it is most likely to be interpreted as: 'Assuming that the circumstances are such and such, Fred must go home'.

- (95) Fred must go home.

Although judgments are rather delicate, it seems to me that there is sufficient independent evidence that this context dependence is of a presuppositional nature: modals presuppose their domains. For example, I should say that (96a) tends to be read not (or not just) as (96b) but rather as (96c):

- (96)a. Barney believes that Fred must go home.
 b. Barney believes that the circumstances are such that Fred must go home.
 c. The circumstances are such that Barney (presumably recognizing the circumstances for what they are) believes that Fred must go home.

If modals presuppose their domains, they should exhibit projection behaviour, and these observations suggest that they do. So (89a), for example, will be interpreted as follows:

- (97)a. [p, q, p', q':
 q = p + [x: letter x, you write x to your parents], p nec q,
 q' = p' + [z: z is sent by airmail], p' nec q']
- b. [p, q, q':
 q = p + [x: letter x, you write x to your parents], p nec q,
 q' = q + [: x is sent by airmail], q nec q']

Here *nec* is a modal predicate interpreted along the following lines:

$$(98) \quad I_w(\text{nec}) = \{ \langle \sigma, \sigma' \rangle \mid \text{dom}(\sigma) = \text{dom}(\sigma') \}$$

In (97a) *nec* occurs twice. In the first case, its domain doesn't have a suitable antecedent and is therefore accommodated. The domain of the second modal, i.e. *p'*, is bound to the propositional reference marker introduced by the first modal, *q*, as a result of which the anaphoric *z* obtains access to its intended antecedent. The resulting interpretation is (97b).²² Conditionals are analysed in essentially the same way.

Secondly, quantification. It is widely accepted that quantifiers presuppose their domains, so there is no need to belabour this point. In the present framework, an unselective universal quantifier may be interpreted by restricting the domains of its arguments to the current world, roughly as follows:²³

$$(99) \quad I_w(\text{all}) = \{ \langle \sigma, \sigma' \rangle \mid \text{dom}(\sigma) = \text{dom}(\sigma') = \{w\} \}$$

With the help of this quantifier, (91) can be analysed thus:

- (100)a. [p, q, p', q':
 p = p + [x: convention x], q = p + [y: at x H courts y],
 p all q,
 q' = q + [u, v: at u v comes to the banquet with H],
 q all q']
- b. [p, q, q':
 p = p + [x: convention x], q = p + [y: at x H courts y],
 p all q,

²² Strictly speaking, (97) is too weak because the range of possible values of *p* is insufficiently restricted. I assume that, because *p* must be accommodated, further restrictions will be furnished by the context. The same holds, *mutatis mutandis*, for quantificational domains.

²³ This is a first approximation only. See Geurts (1996b) for details.

$$q' = q + [: \text{at } x \text{ y comes to the banquet with H}], \\ q \text{ all } q'].$$

At every convention and *always* are treated here as unselective universal quantifiers; the former imposes explicit restrictions on its domain, the latter does not. Now the old story repeats itself: the presupposition triggered by the first quantifier is accommodated; the second presupposition is bound, thus making accessible the intended antecedents of *u* and *v*, which are duly bound to *x* and *y*, respectively. The resulting interpretation is (100b).

Finally, non-declaratives. As I see it, a DRS represents (the hearer's picture of) the speaker's commitment slate (Section 1.1). When a speaker asserts that snow is white, and the hearer understands him correctly, then the ensuing DRS represents that the speaker is committed to the claim that snow is white. Thus, at a certain level of abstraction (i.e. when we ignore the hearer, which is something we shouldn't do, really), an assertion changes the speaker's commitment slate. Non-declarative speech acts change the speaker's commitments, too, but in a different way. A speaker who asks if snow is white, for example, commits himself to having a certain wish – specifically, the wish to learn whether or not snow is white. Similarly for other types of speech acts.

Commitments are part of a discourse contract; they do not entail genuine beliefs, desires, and so on (although we often assume that speakers are sincere and that their commitments are not just for the nonce). Someone who makes an assertion commits himself to a claim; he need not believe it to be true. Likewise, someone who asks a question commits himself to having a wish; his actual desires are a different matter altogether. Consider a teacher who asks his pupil what is the square root of 16. We would not normally take the teacher to have expressed a heartfelt wish (if we did, we should press for an early retirement), but his commitment is real: if the pupil gave the correct answer, the teacher would not be entitled to say, 'Yes, but who cares?' for example.

So in a way, the interpretation of (101a) is the same as that of (101b):

- (101)a. Is snow white?
- b. I wish to know if snow is white.

I say 'in a way' because all I want to claim is that a speaker who asks the former incurs the same type of commitment as someone who asserts the latter. In *this sense*, (101a) is an attitude report, and therefore my analysis of attitude reports applies to examples like (93a, b), too.

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