Contexts and Propositions

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This paper concerns itself with the relation between two important semantic notions: the traditional notion of proposition and a more recent notion of context as an information state. The notion of proposition has traditionally played an important role in the theory of meaning: propositions are entities that have independent truth conditions and act as the meaning of both independent and embedded sentences as well the objects of propositional attitudes such as assertion and belief.

The notion of context is important in the semantics of natural languages for obvious reasons since many expressions depend on features of the utterance situation or the relevant stage of the discourse for their evaluation. Two seemingly quite different notions of context, though, have come to play a role in semantic analysis only one of which will be of concern in this paper. One notion is that of an utterance context, a context whose features include the time of the utterance, the speaker, and the speaker's intentions as to what he is referring to with the utterance of particular expressions. The other notion of context which is the one relevant for this paper represents the content of the presuppositions made at the relevant stage of the discourse. Such a presuppositional context systematically changes with an increase of information in the discourse both during the utterance of a sequence of sentences and the utterance of certain complex sentences with conjunctions, conditionals, or quantifiers. A presuppositional context figures in recent semantic analyses of various phenomena: it has been taken to determine the acceptability of sentences with presuppositions, as providing information about the evaluation of unbound anaphoric pronouns, and as providing the basis of evaluation of epistemic modals and indicative conditionals.

Theories making use of a presuppositional context generally assign it a central role for the meaning of a sentence. There are two views regarding the relation between a presuppositional context and sentence meaning. On one view, a presuppositional context is taken to be meaning-determining, determining whether a sentence expresses a proposition and if so which proposition it expresses. On another, more recent, dynamic view, meaning is taken to be context-determining, the meaning of a sentence itself being

identified with its potential of changing one context to another. I will argue that presuppositional context is neither meaning-determining nor are there any semantic operations on meaning. Rather the content of a sentence is independent of any presuppositional context. The content, though, may in part be directed towards a presuppositional context, namely when it is presuppositional in nature. Moreover, important properties of a sentence's content, such as appropriateness and truth, may be relative to a presuppositional context. The evidence for the independence of meaning of any presuppositional context manifests itself in the behavior of sentences embedded under attitude verbs, in propositional anaphora, and in metasemantic intuitions about sameness and truth of content.

I will also argue that the problems arising for the various phenomena for which presuppositional contexts have been invoked require different solutions. Anaphora and presuppositions require context-dependent acceptability and truth conditions for propositions and a conception of context as a set of structured propositions. Indicative conditionals and epistemic modals, by contrast, involve a notion of context in a fundamentally different way: they lead to a proposition making use of attributive reference to 'the known facts'.

The paper starts with some remarks about the notion of context in general. It then explores the first view of context and meaning, on which context is meaning-determining. It particularly will deal with the question of how context change can be dealt with on such a view and how sentences embedded under attitude verbs can be accommodated. It argues that the crucial phenomena for which the view has been proposed, presuppositions, conditionals, and epistemic modals, do not lead to a sentence meaning partly determined by a context, but rather to a meaning independent of any context. The second, dynamic view of context and meaning, on which meaning is context-determining, has been motivated primarily by phenomena of unbound anaphora. There are general problems with extending the dynamic account to embedded sentences. Moreover, there are problems with dealing with propositional anaphora. Finally, it can be shown that sentences with unbound anaphora have a content that is relatively independent of the presuppositional context. The solution proposed in this case are structured propositions involving parametric objects whose truth conditions may depend on some structured propositions in the context.

1. Notions of context: the traditional and the dynamic view

1.1. Utterance context and indices

The traditional view of context is that of an utterance context or utterance situation, consisting of a speaker, the time and location of utterance and perhaps other indexical parameters, specifying, for example what the speaker is referring to with the utterance of a part of the utterance. An utterance context acts as meaning-determining, determining the extension or the intension of an expression. For example, the extension of *president of the US* depends on whatever the relevant time index is and the intension of *now* depends on the time of utterance. Also the truth value of the sentence *it is raining now*, as well as the proposition it expresses, depends on the time of utterance. For sentences embedded under an attitude verb or temporal or modal operator, the context determining its extension may consist of other worlds, times, and agents than those of the utterance situation.

In the tradition of intensional logic, a context is most commonly conceived as an n-tuple of indices consisting of elements of the utterance situation (cf. Lewis 1970). Indexical parameters relating to the utterance situation can ultimately be reduced to the utterance event itself: the speaker being the agent of the utterance, the temporal index the time of the utterance, etc.

In general, an intension-determining context provides only one way of determining the intension of a sentence. The same intension can generally be obtained, without exploiting the utterance context, by means of a (referentially used) description. Thus, the intension of *it is raining now* can alternatively be expressed by *it is raining on August 9, 1997*. This is an important feature that distinguishes an utterance context from the other notion of context, the presuppositional context. An utterance context has other characteristic features distinguishing it from a presuppositional context: an utterance context is external and independent of propositional attitudes of particular agents; moreover, it is relatively stable and does not systematically change from the utterance of one sentence to the utterance of another sentence or during the utterance of a complex sentence.

1.2. Presuppositional context as meaning determining

Stalnaker (1970, 1974, 1978) first introduced the notion of what I call a *presuppositional context*, a context which consists of the assumptions the speaker takes to be common ground, that is, to be shared by all the participants in the discourse (see also Lewis 1979). Such a context more precisely is defined as the content of the speaker's propositional attitude of pragmatic presupposition, as consisting of the assumptions the speaker makes,

takes his addressees to make and takes the addressee to recognize that he is making at the relevant stage in the discourse (Stalnaker 1974).[1]

Formally, on Stalnaker's account, a presuppositional context is construed as a set of possible worlds, a *context set*, the set of worlds compatible with the speaker's presuppositions. This goes along with Stalnaker's view according to which the objects of propositional attitudes, propositions, are sets of possible worlds.

There is another view of propositions, which has become more widely accepted in the philosophical literature, and that is the view according to which propositions are structured propositions. A structured proposition, in the simplest case, is an n-tuple consisting of a property or relation and n-1 objects. More generally, a structured proposition can be viewed as a list of semantic operations and their arguments, application of which will lead to the evaluation of the sentence as true or false. The structured propositions view avoids notorious problems with the possible worlds account of propositions such as the identification of necessary truths and falsehoods and of logical equivalents. Given that structured propositions are the objects of propositional attitudes, a context is naturally construed as a set of structured propositions, the set of all structured propositions p such that the speaker pragmatically presupposes p. Later we will see that there is independent evidence for contexts being sets of structured propositions, namely from certain kinds of presuppositions.

Stalnaker's notion of context is a rather different notion than that of an utterance context. But in a way, it can ultimately be reduced to it, being defined as the content of a propositional attitude of pragmatic presupposition on the part of the speaker.

Unlike an utterance context, a presuppositional context often influences the individuation of the proposition expressed or its truth conditions. On some view not adopted by Stalnaker himself, namely the dynamic view, a presuppositional context is in fact the primary semantic object for a sentence to relate to, sentence meanings being identified simply with potential operations on presuppositional contexts. A presuppositional context also distinguishes itself from an utterance context in that it is internal, constituting the content of a propositional attitude of the speaker. Moreover, it is flexible, changing systematically with an increase of information in the discourse and during the utterance of a complex sentence.

Stalnaker takes a presuppositional context to have the same semantic status as an utterance context, acting as determining the meaning of a sentence, the proposition it expresses. Thus, a sentence S expresses a proposition p relative to a presuppositional context c, formally $p = [S]^c$.[2] A sentence S with a presupposition p will express a proposition p' in a context c only if c entails p. Thus, *the kind of France is bald* expresses

a proposition p in a context c only if c entails that there is a king of France. In the case of epistemic modals and indicative conditionals, a presuppositional context even determines the identity of the proposition.

A presuppositional context changes systematically with the utterance of a new (declarative) sentence, leading to a more informative context, a context which includes the information given by the new sentence. This, on Stalnaker's account, is due to a pragmatic rule of context change for assertions, which, when propositions and contexts are both construed as sets of possible worlds, takes the shape in (1) (cf. Stalnaker 1975):

(1) $cc(S, W) = W \cap [S]$

On a structured propositions view of context and sentence meaning, the context change rule would consist in union of the context with the singleton set of the proposition expressed by the sentence being uttered, as in (2):

(2) $cc(S, c) = c \cup \{[S]\}$

A presuppositional context may change even during the utterance of complex sentences, leading to a socalled *local context*. Thus, in (3a), the utterance of the first conjunct leads to a context including the new information that there is a king of France, in (3b), the antecedent leads to a hypothetical context with the added information that there is a king of France, and in (3c), the restriction of the quantifier provides information that will satisfy the presupposition of the consequent:

(3) a. There is a king of France and the king of France is bald.
b. If there is a king of France, the king of France is bald.
c. Most people who have a dog feed their dog very well.

Not with all connectives, though, does a context change take place during the utterance of the sentence. Disjunctions, for example, obviously do not lead to a context change:

(4) There is no king of France or the king of France is bald.

To account for local context change with conjunction and implication, the rule of context change in (1) needs to be extended to sentences acting as the arguments of a connective. In general, the assertion of a conjunction amounts to the assertion of the two

conjuncts, but not so for the assertion of a disjunction. The rule in (5) then applies to any independent or embedded sentences that can be taken to be the object of an assertion. From this, the following condition on context selection for the conjuncts of a conjunction can be derived:

(5) $[S \,\&\, S']^c = [S]^c \cap [S']^c \cap S$

In the case of an implication, an analogous condition of context selection applies. According to it, the antecedent must be evaluated with respect to the initial context and the consequent with respect to the initial context with the addition of the information provided by the antecedent. Implication, though, involves only hypothetical acceptance of the antecedent and thus an evaluation of the consequent relative to only a hypothetical context. Finally, in the case of a quantificational sentence, a condition of local context selection must apply according to which the quantifier scope is evaluated with respect to a context obtained by adding the information given by the quantifier restriction to the initial context. I will come back to more conditions of context change for complex sentences later in a somewhat different theoretical context.

Having sketched the notion of a presuppositional context, let us turn to the main phenomena that have motivated it: presuppositions on the one hand and epistemic modals and indicative conditionals on the other hand.

2. Presuppositions

On Stalnaker's view, presuppositions are appropriateness conditions on the context: a presupposition carried by a sentence S must be implied by the context in order for S to express a proposition in that context. Let me call this the *contextual account* of presuppositions. The context is not always the context determining the proposition expressed by the entire sentence, but may be a context set up, for example, by the first conjunct of a conjunction or the antecedent of a conditional.

Stalnaker's view of presuppositions has become extremely influential for the development of presupposition theories, in particular for what has come to be known as the *satisfaction theory* of presuppositions (Karttunen 1973, 1974, Heim 1983). We will see, however, that there are fundamental problems with the view when taken as a semantic theory of what presuppositions really consist in. Moreover, there are problems specifically arising with the notion of context that Stalnaker employs.

But first let us see how the contextual account of presuppositions, which was first developed for independent sentences, can be carried over to embedded sentences. For presuppositions of sentences embedded under attitude or modal verbs, the following generalization holds (Heim 1992, Geurts 1995). In the case of *believe*, without special preceding context, as in (6a), the presupposition needs to be satisfied with respect to the speaker's presuppositional context (which in the relevant respect also counts as the described agent's belief); with a preceding attitude report, as in (6b), the presupposition may be satisfied with respect to the described agent's reported belief only:

(6) a. John believes that Mary repeated the exam.
b. John believes that Mary once took the exam. He believes that she repeated the exam.

In the case of verbs of desire, the presupposition of the complement clause may be satisfied in either of three ways: with respect to the speaker's presuppositional context, as in (7a), the described agent's reported beliefs, as in (7b), or the described agent's reported desires, as in (7c):

(7) a. John wants that Mary repeats the exam.
b. John believes that Mary once took the exam, and he wants her to repeat it.
c. John wants Mary to take the exam, and he wants her to repeat it next year.

Unlike the second sentence of (7b), (7a), uttered out of the blue, for most speakers presupposes that Mary failed the exam before, not only that John believes it.

Finally, with complements of modal verbs, the presuppositions must be satisfied with respect to the speaker's context, as in (8a), or with respect to what has been reported about the same modality, as in (8b):

(8) a. John must repeat the test.
b. John must take the test, and he must then repeat it.

(8a), unlike (8b), presupposes that John actually took the test before, not only that he must have taken it.

The requirement thus is that as long as the presupposition is not satisfied with respect to the speaker's context, it must be explicitly introduced into the discourse, rather than

only implied by the actual states of belief, of desire and belief, or of the relevant modal perfection.

For carrying over the contextual account of presuppositions to embedded contexts, another context thus needs to be distinguished from the one representing the speaker's presuppositions, namely a context related to the described agent's belief, to his belief and desire, or to the relevant modality.

It is clear that the presuppositions of embedded sentences cannot just be satisfied with respect to the described agent's actual beliefs or desires and beliefs or the relevant modal conditions, but rather must be satisfied with respect to a context representing the speaker's presuppositions about the state of the described agent's beliefs, his beliefs and desires, or the relevant modality. Let me call such a context a *presuppositional secondary context* or simply *secondary context*.

On Stalnaker's view, as on contextual theories in general, presuppositions are not part of what is asserted, and thus not part of the proposition expressed. As such, the view would imply a strict separation between asserted and presupposed parts of the meaning of a sentence — though such a separation has not in general been formally made explicit. When examining various kinds of presuppositions, in particular their behavior in embedded contexts, it turns out that such a separation is rather problematic, and in fact in all cases untenable, with the exception of referential presuppositions with *de re* uses of NPs.

Let us go through the classes of presuppositions on the basis of the way they are expressed:

[1] lexical presuppositions

(9) a. John stopped playing.(John played before)

b. John repeated the question. (John asked the question before)

[2] referential presuppositions

(10) a. The man left. (There is exactly one man)

b. Every man left. (There are men)

[2] constructional presuppositions (cleft constructions)

(11) It is the man that left. (Someone left)

[3] focus-sensitive operators

(12) a. John left too. (Someone else than John left)

b. John failed again. (John failed before)

[4] factive presuppositions

(13) That John left is interesting. (That John left is true)

In the case of lexical presuppositions, it is obvious that presuppositions cannot be separated from the content of the concept in question and thus from the proposition expressed by the sentence. Consider *stop* as in (10a). (10a) describes the transition from a states of affairs in which John smokes to one in which he does not smoke (as can be seen from temporal modification in *suddenly John stopped smoking*). Clearly, it is required by such a transition that John did play initially. Lexical presuppositions that act as preconditions for the application of a concept clearly cannot generally be conceived as contextual conditions separated from the assertion of the sentence. Rather here the propositions must carry partly presuppositional information. In the case of lexical presuppositions, conditions on a context could only be viewed as additional, nonsemantic requirements to be fulfilled in order for the content of a sentence to be appropriate in a context.

I will set aside referential presuppositions such as the existential and uniqueness condition of definites and the nonempty-domain condition of quantifiers such as *every*, because both definite and quantificational NPs have *de re* readings, where any assertive or presuppositional information carried by the NP will not be part of the content of the

The presuppositions of focus-sensitive operators such as *too* and *again* form the most interesting case. Here, it seems, the presupposition is clearly separable from the asserted content. For example in Heim (1992), the presupposition of *too* is treated as a contextual condition entirely separated form the contribution of the rest of the sentence. Disregarding what I will discuss below as the anaphoric effect of *too*, (14a) is analysed as in (14b), given a proposition-determining view of context:

(14) [*John left too*]^c =

{w | John left in w} if c entails that someone other than John left
undefined otherwise.

The entire function of *too* and *again* seems to be to express a presupposition. Here the presupposition is not a precondition on the applicability of a concept, but rather constitutes the entire content of an expression. Thus, the contribution of such an expression to the meaning of a sentence would be exhausted by a presuppositional condition on the context. However, it is obvious from examples such as (15-16) that sentences with *too* or *again* as soon as they are embedded must form part of the content of an attitude and thus part of the proposition:

(15) a. Bill's wife noticed that he had give the bracelet to his mistress too.
b. John said that he will come too.
(16) a. John noticed that Mary made the mistake again.
b. Mary complained she had to do it again.

In (15) and (16), the presupposition of *too* and *again* clearly form part of the content of the noticing, saying or complaining.

Even nonattitudinal predicates such as *interesting* or *important* may care about the presuppositional content of *too* and *again*:

(17) a. That Mary made the mistake again is interesting.
b. That John came too is important.

What is interesting according to (17a) is not that Mary made the mistake, given she made it previously, but rather that Mary repeated making the mistake. Similar, what is important according to (17b) is not that John came, given someone else did, but rather that John joined someone else in coming.

Also the presupposition of a cleft construction may play a part in the content of an attitude, for example in (18):

(18) Mary was shocked that it was Bill who had made all the anonymous phone calls.

In (18), the content of Mary's shock is not just that Bill made the calls, but that Bill is the one who satisfied the description previous propositional attitudes were about.

A separation between assertion and presuppositions as context conditions might also be suggested for factive presuppositions, as in (18):

(19) $[\textit{That}\ \text{S}\ \textit{is interesting}]^c =$ [[*interesting*]([S])] if [S] is true in c,
undefined otherwise.

But such an analysis cannot generally be right. Factive presuppositions not only need to form part of the content of the sentence when it is embedded; they must even form part of the content of the factive clause, as seen in the nonequivalence of (19) and (20), where in the b-examples the factive presupposition is explicitly abstracted from:

(20) a. It is interesting that John is here.

b. The proposition that John is here is interesting.

(21) a. That John solved the problem is important.

b. The proposition that John solved the problem is important.

The contextualist view of a separation between presupposition and assertion with the presupposition being a condition on the context thus is not tenable. Rather presuppositions (at least insofar they do not belong to *de re* used NPs) need to be made part of any content that may act as the object of a propositional attitude.

Obviously, for such presuppositional contents, the construal of propositions as sets of possible worlds is not sufficient. However, let me postpone the issue of how presuppositional contents can be represented formally until after a discussion of another problem for the satisfaction theory of presuppositions.

The problem has to do ultimately, I want to argue, with the way context is construed on Stalnaker's view, namely as a set of possible worlds. The problem has been noted first by Kripke (1990) and consists in what one may call the *anaphoric behavior* of presuppositions such as those triggered by *too* and *again*. Kripke argues that with the utterance of *too,* as in (22a), the speaker does not just take the presupposition to be satisfied by what is implied by the context, but rather refers to a specific proposition explicitly mentioned in the context.

(22) a. John came too.

Kripke gives two sorts of evidence for that. First, *too* as in (22a) does not just require the context to imply that someone other than John came, but rather triggers very specific additional presuppositions, depending on the antecedent proposition they relate to. Thus, (22b) presupposes that both John and his wife are distinct from the boss, even though for the general presupposition of *too* it would be enough for only one of them to be distinct.

(22) b. If John and his wife come to the party, then the boss will come to the party too.

This means that the presupposition of *too* cannot just be an implication of the context, but rather must be satisfied by a specific proposition satisfying certain requirement (the requirement apparently being that the relevant (group) entity in that proposition be entirely distinct from the referent of the NP modified by *too*).

Second, sentences such as (23a) and (23b) are infelicitous uttered out of the blue, even though anyone's presupposition is that John had breakfast before and that someone else than John had dinner in New York:

(23) a. John ate breakfast again.
b. John had dinner in New York too.

Too and *again* require the presence of a proposition of a particular form in the *active context,* i.e. the context representing the content of the *activated presuppositions*, not just some implication from the *passive context*, i.e. the context representing the content of the *implicit presuppositions*. What is required to account for the anaphoric effect of *again* and *too* is a different conception of context than that of a set of possible worlds. For this purpose, a context is best conceived as a set of structured propositions. Thus, *too* and *again* provide independent motivations for the construal of contexts as sets of structured propositions besides the more general philosophical motivation.

Besides the question of the semantics of an utterance of *again* or *too*, another important question is, what does it mean for someone to have a belief that Mary took the exam again. It is obviously not required that there be a presuppositional context containing a presupposition of the relevant sort. Rather, what is required in the case of a presuppositional belief with *again* is that the believer have some activated background belief of the relevant form. The 'active context' in this case, thus, consists of the activated background beliefs of the agent.

The anaphoric view of presuppositions that has been advocated by Kripke requires that *too* and *again* enter a relation to a particular proposition in the context. In that way, the content of a sentence with *too* or *again* would depend on the antecedent. However, there is evidence that the presuppositional content is independent of any particular antecedent that satisfies the presupposition. For example, the following two discourses are entirely felicitous:

(24) a. John believes that Mary took the exam ten years ago.
Bill believes that she took it two years ago. John and Bill believe that she took it again - and thus they believe the same thing.
b. John thinks that Mary came to the party. Bill thinks that Sue came to the party. They
believe that Ann came too - and thus they believe the same thing.

One might argue that *too* in such examples relates to an implication of the reported beliefs. But such an explanation of the data cannot work because the examples above have already shown that a mere implication from the active context is not enough to satisfy the presupposition of *too*.

The same observation can be made with the allegedly anaphoric expressions *second*, *next, other*, and *another* - and in fact, it appears, with all nonpronominal allegedly anaphoric expressions. When used *de dicto*, such expressions all lead to a content not individuated by the content of the antecedent NP:

(25) a. John thought that Bill Clinton would win the elections.
Bill thought Bush would win them.
Both believed that the other candidate had considerable fewer chances.
Both believed the same thing.
b. John thinks Mary failed the exam ten years ago.
Bill thinks Mary failed the exam two years ago.
Both think that she will pass the next time / the second time.
Both think the same thing.
c. John thinks that Mary saw Ann
Bill thinks she saw Sue.
John and Bill think she will see another student this afternoon.
Both believe the same thing.

Some of these data are not entirely surprising in view of the fact that *again* is intuitively equivalent to *another time* and related to *a second time* or *the next time*.

The lack of true anaphoricity can be observed even with 'anaphorically used' incomplete definite descriptions:

(26) John believes that Mary won the game; Bill believes that Sue won it.
Both believe that the winner does not yet know.
Both believes the same thing.

In this respect, the expressions differ from true, namely pronominal anaphora, where the antecedent does individuate the content of the pronominal belief content:

(27) a. John believes that Mary solved the problem. Bill believes believes that Sue solved it. # They both believe that she solved it last year.

b. John believes that a German solved the problem. Bill believes that Frenchman solved
it. # They both believe that he solved it last year.

Thus, it appears that the presuppositional content of *again* and *too* cannot in some way include the relation to a particular antecedent, but rather constitutes something like a *context-directed*, but *context-independent* content. As part of a structured proposition, the presuppositional content of *too*, can best be represented as a property of contexts, as informally given in (28b) for (28a):

(28) a. John came too.
b. <λc[there is an object d such that <COME, d> ∈ c and d ≠ John or <COME, Q> ∈ c, where Q is a positive quantifier and John is not in the domain of Q], <COME,
John>>

For independent simple sentences, the context property must hold of the presuppositional context in order for the sentence to be appropriate. For sentences containing a modal or attitude verb with presuppositional clausal complement, the context property associated with the clausal complement must hold of the relevant secondary presuppositional context, that is, the set of all propositions that according to the context stand in the belief relation to the relevant agent. Thus, we have the following appropriateness condition for structured propositions:

(29) a. For a property of contexts P and a structured proposition p,
<λc[P(c)], p> is appropriate relative to c' if λc[P(c)](c') = 1.
b. For a property of contexts P, a structured proposition p, and an agent a,
<BELIEVE, a, <λc[P(c)], p>> is appropriate relative to c' if for
c'' = {p' | <BELIEVE, a, p'> ∈ c'}, λc[P(c)](c'') = 1.

For *want* as the attitude verb, an appropriateness condition requires the context property to hold of a secondary context defined as the set of propositions that according to the primary context stand in either the belief or the want relation to the relevant agent. For modal verbs, the secondary context is the set of propositions that are arguments of the relevant modal operator, according to the primary context.

Thus, for the purpose of conversational appropriateness, presuppositions of sentences embedded under attitude or modal verbs have to be satisfied relative to the presuppositional context, in the same way as independent sentences. But besides the question of the adequacy of a presuppositional belief report, there is also the question of what it means to have a *presuppositional belief*. Clearly, one can have a presuppositional belief such as that Mary took the exam again without there being any presuppositional context at all. In this case, the *again*-part of the proposition requires that the agent have an *activated background belief* that Mary failed the exam at some prior time. Thus, for the presence of an actual presuppositional belief, the 'context' is different than for the adequacy of a belief reported within a discourse: for actual beliefs, the context is the set of activated background beliefs rather than the set of activated presuppositions about such background beliefs.

A report of a presuppositional belief such as (30) then is subject to two different conditions regarding its appropriateness and its truth:

(30) John believes that Mary took the exam again.

For (30) to be appropriate relative to a context c, there must be an appropriate proposition of the form 'John believes that Mary took the exam at t' ' (t' < t) in c. But for (30) to be true, John just needs to have a background belief of the appropriate sort.

Notice that the satisfiers for the presupposition of *again* need not be same in the presuppositional context and in John's background context. (30) is acceptable and true if the speaker presupposes that John believes that Mary took the exam two years ago, but John has only an activated belief that she took the exam a month ago.

Presuppositional contents are then in an essential way incomplete and thus differ from the traditional notion of proposition, an object that is independent of the content of any propositional attitudes or other propositions. Notice, though, that presuppositional contents are only directed towards, but not individuated by a context. Presuppositional contents deviate from the independent truth-conditional objects of the traditional sort in a somewhat similar way as the properties that Lewis posits as the objects of *de se* belief.

We now have appropriateness conditions for complex sentences with sentences embedded under attitude or modal predicates. But we still need to formulate such conditions for complex sentences with logical connectives. For the appropriateness of a conjunction and an implication, context change must be invoked:

(31) a. For structured propositions p and q and a context property P,

< CONJ, p, <λc[P(c)], q>> is appropriate in c if p is appropriate in c and <λc[P(c)], q> is appropriate in c ≈ {p}

b. For structured propositions p and q and a context property P, <IMPL, p, <λc[P(c)], q>> is appropriate in c if p is appropriate in c and <λc[P(c)], q> is appropriate in c ∪ {p}

Appropriateness conditions are pragmatic in nature, derivable ultimately from conditions on acceptance of propositions. As a consequence, presupposition satisfaction need not be subject to strictly specifiable conditions. This is required for an adequate treatment of disjunction as in (32):

(32) a. Either John stopped smoking or he never smoked.
b. Either John never smoked or he stopped smoking.

There is no specifiable semantic condition telling in general what the contexts are for the first and for the second disjunct in examples such as (32a) and (32b).[4] On a pragmatic view, such cases are unproblematic. Pragmatic context selection may take into account both the truthfunctional content of connectives and considerations involving the content of other parts of the sentence — for example, for the evaluation of the first disjunct in (32a), the assumption that the second disjunct is false.

The use of context-relative appropriateness conditions and the appeal to context change raises the question of how one can deal with the appropriateness of structured propositions as belief contents on the basis of context change. Consider (33):

(33) John believes that Mary took the exam once and that she took it again

For the structured proposition expressed by (33) to be appropriate relative to a discourse context, what matters is a change in presuppositional context. Thus, for the second conjunct of the embedded sentence in (33) to be appropriate, it is required that after the utterance of the first context, there is a presuppositional context containing a proposition of the form <BELIEVE, John, <TAKE, Mary, the exam, t>>, where t is prior to the time referred to by the embedded sentence in (33).

But, again, this is not the only issue involved in belief reports. We also need to ask the question, when is the structured proposition that is the content of the embedded sentence in (33) appropriate as a belief content. Here the contexts for the first conjunct and the second conjunct are not defined by the temporal sequence of acceptance of information,

but by a hierarchical relation between beliefs or other attitudes. The context for the first conjunct is the relevant background belief, but the content of the first conjunct will become part of an enlarged background belief acting as the context for the second conjunct. This mean that the conjunction in this case does not represents a single belief content, but rather two separate beliefs with somewhat different background beliefs.[6, 7] In this way, the use the context change for defining the appropriateness of independent sentences can be carried over to the content of propositional attitudes.

Summarizing, we have obtained two general results concerning presuppositions, one concerning the traditional linguistic theories of presuppositions and one concerning the nature of the content of propositional attitudes. First, unlike what has been maintained on all contextualist theories of presuppositions starting with Stalnaker, presuppositions do not require any semantic conditions to be satisfied relative to a context. Rather, they lead to context-independent, though context-directed propositional content. What has to be satisfied relative to a context are only additional pragmatic requirements guaranteeing the appropriatenes of a sentence in a discourse. Second, acknowledging presuppositional contents whose identity is independent of any particular context requires revising the traditional view of the contents of propositional attitudes. The content of a propositional attitude is not always an object that can be understood in isolation from other attitudes. Instead it may essentially be directed towards to the content of certain related attitudes.

3. Epistemic modals and conditionals

Epistemic modals and indicative conditionals are generally analysed as involving an epistemic context, and this context has often been identified with the presuppositional context. Similar problems, however, arise for such analyses as we have seen with presuppositions. It appears that the content of a sentence with an epistemic modal or indicative conditional is independent of any particular epistemic context, and thus such a context cannot play a proposition-individuating role. Like presuppositions, epistemic modals and indicative conditionals lead to context-directed, but context-independent sentence meanings. However, at least for one reading of epistemic modals and indicative conditionals, such context-independence must be accounted for in a fundamentally different way than in the case of presuppositions.

The most standard account of epistemic modals relates them to an epistemic state, the set of epistemically possible worlds, so that *might* and *must* retain their traditional treatment as existential and universal quantifiers ranging over possible worlds, in this case epistemically possible worlds. (34) gives the traditional way of construing a

proposition as the denotation of a sentence of the form *might* S, where R is the relation of epistemic accessibility for the relevant agent:

(34) $[\textit{might}\ \mathrm{S}] = \{w \mid \exists w_o\ (w\ R\ w_o\ \&\ [\mathrm{S}]^{w_o} = 1)\}$

Often the epistemic context that serves as the basis of evaluation for *might* has been identified with the presuppositional context. There are quite obvious differences, though, between the notion of context required for presuppositions on the one hand and the epistemic basis required for the evaluation of epistemic modals and indicative conditionals on the other hand. The basis for the evaluation of a sentence with an epistemic modal is not generally just the presupposition set. A sentence like *John might be here* does not just check the presuppositions speaker and addressee make. Otherwise it would be hard to account for the contribution an assertion of that sentence makes. Rather, what the assertion of an epistemic modal sentence does is claim that there is evidence supporting the scope of *might*, evidence not necessarily already part of the presuppositional context.

But suppose the context for the evaluation of epistemic modals is simply the presuppositional context. Then, with a meaning-determining view of context, the proposition expressed by a *might*-sentence will be as in (35), that is, it will be the context itself if the scope is compatible with it or else the empty set:

(35) $[\textit{might}\ \mathrm{S}]^c = \{w' \quad c \mid \exists w\ (w \quad c\ \&\ [\mathrm{S}]^w = 1)\}$

There are also proposals according to which the meaning of a *might*-sentence consist in a semantic operation on the context, or rather in a test to be fulfilled by the context. On such a view, suggested by Stalnaker and pursued within dynamic semantic approaches especially by Veltman, an epistemic modal sentence checks the compatibility of the scope of *might* with the context (cf. Veltman (1996) and Veltman, Groenendijk, and Stokhof (1996a, b)). If the scope is compatible with the context, the discourse can continue with the same context as before, if not, the empty context will result:

(36) c + *might* S = c if S is true in some alternative in c
= ∅ otherwise

Similarly, a sentence with *must* checks whether the scope of *must* is entailed by the context.

Indicative conditionals are epistemic in nature in basically the same way as epistemic modals. This can be seen from the interaction between modals and indicative conditionals, as in (37a), where the antecedent of a conditional influences the application of an epistemic modal in the consequent, and as in (37b), where an epistemic modal of possibility may introduce a set of alternatives that will act as the implicit antecedent of a subsequent conditional with *would*:

(37) a. If John is at the party, Mary might be at the party too.
b. Mary might be at the party. John would be happy.

Stalnaker (1975, 1984) in fact proposed a theory that makes the proposition expressed by indicative conditional sentences essentially dependent on the presuppositions made in the context. On this account, a sentence such as (38a) is true in a world w that is part of the context if another world w' selected from the context which is maximally similar to w and in which John is at the party is also a world in which Mary is at the party. An indicative conditional thus can be true only in worlds included in the context. The proposition expressed will then be a set of worlds as in (38b), where f is the world-selection function:

(38) a. If John is at the party, Mary is at the party too.
b. $[\textit{if}\ \mathrm{S}, \textit{then}\ \mathrm{S}']^{c} = \{ w \in c \mid [\mathrm{S}']^{f([\mathrm{S}], w)} = 1\}$

In what follows, let us adopt this account of indicative conditionals and focus just on the way it involves the context. For this purpose, the question first has to be answered of how the contextual account of epistemic modals and indicative conditionals can be extended to embedded contexts.

When a sentence with an epistemic modal or indicative conditional is embedded under an attitude verb, it is expected that the secondary presuppositional context is the context for the evaluation of the epistemic modal or conditional. But clearly this would be inadequate. Epistemic modals or indicative conditionals in embedded contexts do not take as the basis of their evaluation the presuppositions the speaker makes about the described agent's beliefs. In fact, a speaker need not know or make any presuppositions about the epistemic state of a described agent in order to assert a sentence such as (39a), in which the complement clause of an attitude verb contains an epistemic modal, or (39b), in which it contains an indicative conditional:

(39) a. John thinks it might be raining.

b. John thinks that if Mary is at the party, Bill is at the party too.

(39a) can be uttered without any particular presuppositions being made about any of John's beliefs. In such a context, *it might be raining* cannot be evaluated relative to the secondary context representing the information about John's belief, because the belief ascription would then be necessarily true. Similarly, in the case of (39b), uttered out of the blue, the background assumptions of John leading to his acceptance of the conditional will not be available for the attribution of the conditional proposition as the content of his thought. But still in such a case, both (39a) and (39b) may be true and may be believed to be true. Let me call this the *ignorance problem* for epistemic modals and indicative conditionals.

There is a standard way of solving the ignorance problem, and that is to take the belief content not to relate to a single context, but rather to a set or property of epistemic contexts, namely those epistemic contexts compatible with what the speaker presupposes about the described agent's belief (Heim 1992). The epistemic contexts in this set each represent a possibility of what the complete epistemic context of the described agent may be, given what the speaker presupposes. Let me call such contexts *complete secondary contexts*. We will then get the analysis in (40), where each world in the primary context c is associated with a set of worlds c', representing a possible belief state of John, and R is the relation of epistemic accessibility. (41) gives the definition of the set C of complete secondary contexts on the basis of a primary context c as is required for epistemic modals and indicative conditionals:

(40) [*John believes that it might be raining*]^c = believe(John, λc'[$\exists$w' $\in$ c c' =
{w | w'Rw} & $\exists$w $\in$ c' *it be raining* is true in w])
(41) C = {c'_w | $\exists$w (w $\in$ c & c'_w = {w' | wRw'})}

On a dynamic treatment, an attitude report would eliminate worlds according to whether the associated secondary context is compatible with the scope of *might* or not.

For epistemic modals and indicative conditionals, a different notion of secondary context (in fact a set of secondary contexts) thus must be used than in the case of presuppositions. There is, however, a systematic correlation between the two notions. The secondary context representing the speaker's presuppositions about the described agent's beliefs can be viewed as the union of the complete secondary contexts that are compatible with what the speaker presupposes about the described agent's beliefs. Thus, in (42), for a given primary context c, c' will be the secondary context representing the

speaker's presuppositions about the described agent's beliefs (represented by the accessibility relation R):

(42) $c' = \bigcup_{w \in c} \{w' \mid w' \, R \, w\}$

Given the analysis in (40), the object of belief when expressed by a *might*-sentence will be of a different type than usual, being a property of contexts rather a proposition. There is an alternative analysis of the meaning of a *might*-sentence, though, which would avoid such a discrepancy. On this analysis, a *might*-sentence expresses a single proposition where the epistemic state of the relevant agent is not itself part of the proposition, but rather is being referred to attributively and thus represented in the proposition by a quantifier rather than being itself part of it. The proposition may contain such a quantifier or description of the epistemic state without it being known what exactly the epistemic state consists in. Using structured propositions, the proposition expressed by *that it might be that* S for an agent *a* would then look as in (43):

(43) <[*might*], the epistemic state of *a*, [S]>

Such a structured proposition will be true just in case the actual epistemic state of *a* contains a world that supports S.

Notice that on this account, no presuppositions of the speaker come into play. The description is definite without making use of any assumptions the speaker makes about what the epistemic state consists in.

(43) presupposes that attributive reference is available also for implicit arguments, such as the epistemic basis of a modal. It is easy to see that this is indeed a possibility also in more familiar cases of implicit arguments. Thus, the spatial region A's question is about below is referred to attributively in B's answer:

(44) A: How do you think does the worst possible place on earth look like?
B: It is raining all the time.

Epistemic modals in attitude contexts raise another problem in that, on a possible worlds view of propositions, they seem to resist the standard modal-logic treatment. Thus, (39a), supposing John's epistemic state is known, cannot be true just because *it be*

raining is compatible with that state. What is required in addition is that John also somehow have entertained the thought that is is raining.[9]

This requirement can be fulfilled when structured propositions are exploited and a *might*-sentence is represented as in (43). On a structured propositions view, John's belief content consists of the *might*-operator as well as a structured proposition representing its scope. A content of this form naturally requires John to have actively taken into consideration the proposition representing the scope of *might*.

There are problems, though, with the description of an epistemic state being part of the content of an epistemic modal or indicative conditional sentence as well as with the analysis given in (42). They have to do with intuitions about the identity of the content of such sentences.

The general observation is that the contents of complement clauses with epistemic modals and indicative conditionals are entirely independent of any presuppositional secondary context, actual epistemic state, or description of an epistemic state. The contents of epistemic modal or indicative sentences when relating to different agents are viewed as being identical not only when the epistemic states of the agents are not known and happen to turn out to be identical, but also when they are explicitly said to be different — and they may be said or described as being different to any extent. One way of seeing this is by the use of propositional anaphora and *the same thing*:

(45) a. John thinks it might be raining. Mary thinks *the same thing* / *that* too — but for different reasons.

b. John thinks that if Bill is at the party, then Sue is there too. Mary thinks *the same thing* / *that* too — but for different reasons.

The identity problem arises also with intuitions concerning facts about a discourse involving sentences with epistemic modals and indicative conditionals. As Edgington (1991) observes for indicative conditionals, the subject matter appears to remain the same when an indicative conditional sentence is being discussed while new information is added to the context. Moreover, speakers may agree about a sentence containing an epistemic modal or indicative conditional even if they have otherwise explicit disagreements.

This shows that the content of neither independent nor embedded sentences hinges on a particular context. Thus, the contextualist semantic analyses of independent epistemic modal and indicative conditional sentences cannot be maintained, and also those proposals must be rejected for such sentences in embedded contexts that involve

secondary contexts which include any presuppositions on the part of the speaker regarding the described agent's epistemic state as in the analysis in (40).

One might propose that the proposition expressed by an indicative conditional or epistemic modal sentence should be dependent on a context that is only related, but not identical to the secondary context. Such a context would include only information that is relevant for the evaluation of the indicative conditional or epistemic modal sentence. But the problem remains that even the relevant facts in the two contexts having to do with the evaluation of the modal or conditional may be different and yet the propositions count as the same.

It would also not help to argue for *same thing* and *that* in the examples above are used in a loose sense, no strict identity, but only similarity with the antecedent entity being required. If this were so, then different degrees of acceptability for *same thing* should be observable, depending on the degree of shared epistemic content. But no such differences of degrees of acceptability can be observed. If John's and Mary's various beliefs have all been explicitly listed and John and Mary turn out to share no belief except for the one that it might be raining, *same thing* and *that* in (45a) and (45b) are as acceptable as when John's and Mary's beliefs are identical or partly identical or if their beliefs are not known at all (except for the belief that it might be raining).

Another problem with the suggestion is that other cases of context-dependency behave quite differently, for example, *here*, or the choice of relative modality (such as deontic, epistemic or physical modality). Here the contextual specification does play a proposition-individuating role, and differences in the way the contextual parameters are specified cannot be ignored. Thus, (46a) implies that the region referred to by *here* is the same for John and Bill. Similarly, (46b) is impossible if John has epistemic necessity in mind and Bill deontic necessity:

(46) a. John thinks Mary is here and Bill thinks the same thing.
b. John thinks Mary must be at school and Bill thinks the same thing.

There are even more severe problems with the proposal that *same thing* and anaphora are used in a loose sense, and that is that it could not be carried over to certain other constructions in which no anaphoric relationship is involved. In those constructions, there is only one proposition-referring expression whose referent must relate to different contexts simultaneously.

The first construction involves existential quantification over common belief contents as in (47):

(47) John thinks it might be raining.
Mary thinks it might be raining.
There is something they both think.

Clearly, the conclusion in (47) holds regardless of how different John's and Mary's epistemic states are or are believed to be. *Something* here acts as a quantifier ranging over shared belief contents, rather than just drawing a comparison between individual thoughts. Thus, the construction of the sentence enforces strict identity of contents.

The second construction is free relative clauses referring to propositions:

(48) a. John thinks what Mary thinks, namely that it might be raining.
b. John believes what Mary believes, namely that if Sue is at the party, Bill is there too.

Again, in (48a), and (48b), the syntactic construction requires strict identity of the objects of John's thought and Mary's thought.

Finally, also with complex attitude verbs, the two contexts may be different: John's belief that it might be raining may have a different epistemic basis than Mary's and still John may remind Mary of that one fact that it might be raining by simply saying so:

(49) John reminded Mary that it might be raining.

Again, there is only one *that*-clause in this construction and it must provide the propositional object for different attitudes (John's act of saying and Mary's activated belief) which may have different backgrounds.

To account for the identity problem for epistemic modals and indicative conditionals, the only promising option among the two proposals considered above is the one on which the content of epistemic modal and indicative conditional sentences is a property of contexts. Two agents may share two such context properties even if their epistemic contexts are different or assumed or reported to be different. Two agents clearly may not share two propositions involving attributive reference to their individual epistemic states. But even with the context-property account, as it has been formulated in (40), there is a problem, because different presuppositions about the two agents's epistemic states will lead to different definitions of properties of secondary contexts. (40) would have to be modified in such a way that no restrictions are imposed by the primary context on what

the context property. But then the connection between primary and secondary contexts is lost.

Apart from this, there is a fundamental problem for the context-property account as a general semantic analysis of sentences with epistemic modals or indicative conditionals. Such sentences at least have a reading on which they are not just about the agent's epistemic state, but rather have a more objective content.[10] On such a reading, sentences with epistemic modals and indicative conditionals may bear a truth value, can be used to ask questions, and can be the object of agreement or disagreement:

(50) a. It is a fact that John might already be here.
b. Is it true that John might already be here?
c. A: It might be the case that John is already here.
B: No I don't think so.
(51) a. It is true that if the light is on, Sue is at home?
b. A: If the light is on, Sue is at home.
B: This is right.

In these cases, the proposition expressed by epistemic modal sentence is not about any particular individual's epistemic state. But still it clearly has an epistemic reading (as is obvious from the fact that the same sorts of examples can be made up with sentences expressing metaphysically necessary truths). The proposition in such cases appears to be about what one might call 'the known facts', a kind of collective epistemic state which is treated as something clearly distinct from individual speakers's epistemic states.

Suppose then the proposition expressed by an epistemic modal or indicative conditional sentence involves attributive reference to 'the known facts' in the way suggested earlier for individual speakers' epistemic states. Then some important facts of the reading in question can be explained. First, two agents may have different epistemic states and also disagree about what the known facts are, but still they can share the same content or have a dispute about it if that content involves attributive reference to the known facts. Second, what the known facts are may change over time; but still the content of a sentence such as *might there be a solution to the problem?* remains the same. Here the possibility is exploited that circumstances of evaluation (that is, an extension-determining context) need not consist only in a possible world but may include a time. This is not implausible, since it is needed also in cases such as (52):[11]

(52) It has always been the case that the president of the US lives in the White House.

Formally, sentences with epistemic modals and indicative conditionals on the absolute reading will express the propositions in (53):

(53) a. [*that it might be raining*] = <MIGHT, THE KNOWN FACTS, <RAIN>>
b. [*if Bill is at the party, then Sue is there too*] = <IF-THEN, THE KNOWN FACTS,
<BE AT, Bill, the party>, <BE AT, Sue, the party>>

The corresponding truth conditions are as in (54a, b):

(54) a. For a structured proposition p,
<MIGHT, THE KNOWN FACTS, p> is true in a world w at a time t iff there is a world w' in THE KNOWN FACTS$^{w, t}$ such that p is true in w at t.
b. For structured propositions p and q,
<IF-THEN, THE KNOWN FACTS, p, q> is true in a world w iff for some world w' such that w' THE KNOWN FACTS$^{w, t}$ and w' is maximally similar to w, p is true in w.

There is also a possibility that the quantifier THE KNOWN FACTS is further contextually restricted, as an incomplete definite description. Such a description may even be explicitly given as in (55):

(55) a. Might it be raining tomorrow?
b. Given the weather report, might it be raining tomorrow?

In this case, reference is made to a particular epistemic basis, which can be viewed as restricted attributive reference to the known facts.

Attributive reference to the known facts also solves another problem that arises with making the propositions expressed by sentences with epistemic modals and indicative conditionals dependent on an epistemic context. The problem, pointed out by Stephen Schiffer (class lectures 1996), arises when an assumptions in the context are false. When an assumption in the context is false, an indicative conditional could not possibly be true, since it denotes a proposition that is a subset of the context:

(56) a. What John thinks is true, namely that it might be raining - although none

of John's other beliefs are true.

b. What John believes is true, namely that if Bill is at the party, then Sue is there too. - But none of John's other thoughts are true.

As a solution to the problem, one might suggest that the context should not contain irrelevant falsehoods so that the actual context an indicative conditional applies to may be a kind of derived context (Stalnaker, p.c.). There is a fundamental problem with this idea, though, and that is that it would undermine an independent definition of context, namely as the content of the speaker's pragmatic presuppositions. If a context depends on what is relevant for the evaluation of a sentence, it won't be a well-defined object prior to the evaluation of the sentence.

The problem of false assumptions arises for Stalnaker's account of indicative conditionals and the traditional account of epistemic modals because on these accounts, the presuppositional context individuates the proposition. But the problem could not be acommodated by any of the approaches discussed above either. To obtain a notion of truth for a proposition construed as a context property, such a property would have to hold for a particular context and moreover that context would have to be true. To obtain a notion of truth for a proposition involving attributive reference to an epistemic state, similarly, the epistemic state would have to be true and moreover support the proposition.

The reading involving reference to the known facts is not the only reading of epistemic modals. A total of three different readings, it seems, can be distinguished. First, there is a reading on which the epistemic basis is the agent's own epistemic state, a reading for which the context-property account is indeed adequate. Let us call this the *subjective reading*. On such a reading, no dispute about a single content is possible. Rather the speaker says something about his own epistemic state so that divergence in opinion would go along with acknowledgment of difference in subjective evaluation. This is the reading we have in (57a):

(57) a. A: This might be an apple.
B: Well, I think it might be a pear.

Second, we have what one may call an *absolute reading*, on which the epistemic basis is the known facts referred to by definite description. Third, we have what one might call an *objective reading,* on which the epistemic basis is some particular limited amount of evidence, for example when the sentence is about the weather report, as in (57b):

(57) b. A: Might it rain?
B: I don't know yet, I haven't heard the weather report.

The three readings of epistemic modals correspond to readings familiar from the semantics of NPs in attitude contexts, namely the *de se* reading, an attributive *de dicto* reading and a referential or attributive reading.

Readings analogous to the readings of epistemic modals can also be found with aesthetic and moral evaluative expressions. Aesthetic predicates such as *beautiful*, moral predicates such as *good* or denotic *must*, and expressions of estimation such as *many* all have uses on which their evaluation depends on the agent and his intentional state or act described by the predicate. Such uses are found, for example, in the most natural readings of (58a-c):

(58) a. John thought the picture was beautiful.
b. John thinks that leaving Mary is wrong.
c. John thought that Mary made many mistakes.

On such a reading, again, no dispute about the truth of the proposition is possible. Rather difference of opinion would go along with acknowledgment of divergence in subjective evaluation.

Besides the subjective evaluation reading, aesthetic and moral predicates also clearly exhibit an absolute reading. Here the sentence is treated as having a truth value and a dispute about one and the same proposition can arise:

(59) A: That the picture is beautiful is true.
B: I disagree.

On this reading, moreover, the agent will correct or defend himself when confronted with another person's evaluation, rather than just pointing out differences in evaluations.

Finally, there is also a use of evaluatives on which they involve a particular, let's say cultural standard:

(60) This girl is beautiful - given Egyptian standards of beauty.

We thus again, have what looks like a *de se* reading, an attributive *de dicto* reading, as well as an attributive or referential reading.

On the first and second reading, different views about the standards of evaluation do not have an individuating effect on the proposition, as was noted by Schiffer (1990b) for moral predicates. Suppose that John's standards of beauty, morality or high numbers of mistakes are quite different from Bill's. Then, just in case the sentences in (58) are true with Bill in place of John, John and Bill intuitively count as thinking the same thing.

This can be accounted for in the case of the subjective evaluation reading if the content of a sentence is construed, similarly to a *de se* content, as a property of agents, which in turn determines the subjective evaluation. In the case of the absolute reading, the standard of evaluation would be represented by a definite description attributively used, namely of the sort 'the absolute standard of beauty' or 'the absolute standard of goodness'. Different agents then may have different opinions about what the absolute standard is and thus enter an aesthetic or moral dispute while still sharing the same propositional content. The third reading would again involve an attributive or referentially used definite description referring to a particular culturally established standard.

The availability of the three readings of epistemic and evaluative expressions depends in some ways on the kind of attitude verb under which the sentence is embedded. For example, the subjective evaluation reading is available for *think*, but only sometimes for *believe*, and never for *know*:

(61) a. John believes that it might be raining.
b. John knows that it might be raining.
(62) a. John believes that the picture is beautiful.
b. John knows that the picture is beautiful.
(63) a. John believes that leaving Mary is wrong.
b. John knows that leaving Mary is wrong.

(61a), (62a), and (63a) allow for two readings: what one may call a 'subjective evaluation reading' and what one may distinguish from it as an 'objective evaluation reading', for example, a reading of (61a) on which *might* relates to the information given by the weather report and a reading of (62a) involving some more objective measure of beauty. But (61b), (62b), and (63b) only allow for an objective evaluation reading.

Thus, the readings of evaluatives in attitude contexts correlate in part with the nature of the described attitude depending, for example, on whether the attitude is directed toward the world or merely monitors mental occurrences.

It is clear that the 'context' for the evaluation of epistemic modals and indicative conditionals has a rather different status in a sentence meaning than the context for the

evaluation of sentences with presuppositions. The contexts for presuppositions in embedded contexts represent shared information (or information taken to be shared). By contrast, the contexts for epistemic modals and indicative conditionals in sentences under attitude verbs need not be known at all, and even though they play an extension- or truth value-determining role, no part of those contexts should play a content- or proposition-individuating role. In this respect, the context-dependency of epistemic modals and indicative conditionals patterns together with the context-dependency of moral and aesthetic predicates. Here the different standards for the subjective evaluation reading and different views about the absolute standard of evaluation do not play a proposition-individuating role either.

4. Unbound Anaphora

4.1. The phenomenon of unbound anaphora

Presuppositions have motivated a notion of context as an information state which, on Stalnaker's original account, acts as proposition-determining. There is another phenomenon that has motivated a contextual analysis using an information state. However, this phenomenon requires a very different semantic role for a context. It consists of what is called unbound anaphoric pronouns or *donkey*-pronouns. Unbound anaphoric pronouns are pronouns occurring in positions as in (65a)-(65c) in which they relate to a (usually) indefinite NP as antecedent, but, on any reasonable logical analysis, are not in a position to act as variables bound by the existential quantifier translating the antecedent:

(65) a. John has a donkey, and he beats it.
b. If John has a donkey, he beats it.
c. Everyone who has a donkey beats it.

In (65a) we have a conjunctive, in (65b) a conditional, and in (65c) a quantificational *donkey*-sentence.

Contextual analyses of unbound anaphora cannot use a proposition-determining context, but rather must use contexts as semantic objects for sentences to operate on, sentence meanings being conceived as context change potentials. Theories identifying the meaning of a sentence with its potential of changing the presuppositional context are

dynamic semantic theories. Let me call a presuppositional context with the function assigned to it by the dynamic view a *dynamic notion of context*.

If there were only presuppositions, but no quantifiers or pronouns, both the proposition-determining and the dynamic view could be adopted. On a proposition-determining view, the context is supposed to be responsible for the acceptability of a sentence carrying a presupposition, the sentence being acceptable if the context implies the presupposition and unacceptable if it does not. On a dynamic view, the context determines whether a sentence carrying a presupposition is defined for it, the sentence being defined if the context implies the presupposition and undefined otherwise.

For unbound anaphoric pronouns, the meaning-determining view of context can hardly be adopted and the dynamic perspective is instead required. On the dynamic account, the context set up by the preceding part of the sentence or discourse sets up a set of assignments that provides the values of the variable translating the pronoun, and applying the sentence with the unbound anaphoric pronoun to the context will yield a new context with a similar set of assignments. Thus the first conjunct in (65a) sets up a context which contains only those assignments that assign to the variable translating *a donkey* (as well as *it* in the second conjunct) an object that is a donkey and owned by John. The second conjunct will then apply to that context, eliminating all those assignments not also assigning to the variable an object that is beaten by John. On a proposition-determining view, if the context included variable assignments for the evaluation of unbound anaphora, the entire new context would have to be identified with the proposition. But then such a proposition will carry over all the information given by the previous context — and there are obvious problems with that which I will come to later.

On dynamic theories of context change, as on the pragmatic account we have discussed earlier, a context may change not only from the utterance of one sentence to the next; it may also change during the utterance a sentence, yielding a socalled *local context*, namely in case of a conjunction, a conditional, or a quantificational sentence, as in (65a-c). The first conjunct of a sentence may define a new context for the subsequent conjunct to operate on, as in (65a), the antecedent of a conditional hypothetically changes the context so that the consequent will be evaluated with respect to the new context, as in (65b), and the restriction of a quantifier will set up new contexts for each element in the quantification domain so that the quantifier scope will operate on those contexts, as in (65c). The dynamic account takes a conjunction S & S' to apply to a context c, c + S & S', by first extending c with S, and then extending the resulting context c + S by S', yielding the context (c + S) +S'. On the dynamic account, the addition of a conditional to a context

c, c + S --> S', consists in extending c by S and then checking whether S' is supported by the new context. Finally, in the case of a quantificational sentence Qx S applying to a context c, c will be extended to a new context for each variable assignment for x. It then has to be verified that the scope is supported by a sufficient number (as specified by Q) of such local contexts.

There are certain interactions between presuppositions and anaphora that require the dynamic account when applied to unbound anaphoric pronouns to be extended to presuppositions, and thus requires abandoning the proposition-determining view of context also for presuppositions. Such interactions appear, for example, when the presupposition needs to be satisfied with respect to a context set up by an indefinite, as in (66a), or the antecedent of an anaphor, as in (66b):

(66) a. Someone managed to open the door.
b. If a student failed the exam, he should take it again.

In (66a) and (66b), the presupposition of *managed* and of *again* cannot be satisfied independently of the evaluation of *someone* and *a student*, and thus cannot act as proposition-determining.

Dynamic theories of anaphora thus go along with a dynamic treatment of presuppositions. The dynamic context then must be construed so as to include both the information relevant for the evaluation of unbound anaphora (variable assignments) and for satisfying presuppositions (possible worlds).

Dynamic theories generally treat presuppositions, anaphora, and epistemic modals and indicative conditionals in the same way, as involving semantic operations on a context. We have already seen that the context for epistemic modals and indicative conditionals plays a different semantic role from the context for anaphora and presuppositions. The two kinds of context differ in their status in a sentence meaning, in their nature, as well as in their role for the identity of the content of sentences. But still there are similarities that should be pointed out and that ultimately need to be accounted for by any alternative treatment.

First, modals and conditionals interact with each other in that the antecedent of a conditional influences the application of an epistemic modal in the consequent, as in (67a). Second, an epistemic modal of possibility may introduce a set of alternatives that will act as the implicit antecedent of a subsequent conditional with *would*, as in (67b):

(67) a. If John is at the party, Mary might be at the party too.

b. Mary might be at the party. John would be happy.

Conditionals, on the other hand, interact with anaphora and presuppositions in that the context set up by the antecedent may introduce the information relevant for the anaphor and presupposition trigger, as in (68a). Similar facts can be observed with modals, as in (68b):

(68) a. If John owns a donkey, he beats it.
b. If John ever smoked, he now has stopped smoking.

The dynamic account constitutes a rather radical departure from the traditional view of meaning, giving up one of the most important notions of traditional semantics, the notion of proposition. Instead the notion of a presuppositional context becomes the only object for a sentence to semantically relate to. Therefore, let me clarify why unbound anaphoric pronouns seem to necessitate the dynamic view and provide some important arguments against the rival E-type account to unbound anaphoric pronouns, an account which leaves the traditional notion of proposition intact.

4.2. Dynamic and E-type accounts of unbound anaphoric pronouns

The idea of the dynamic account is that the binding problem between indefinite antecedent and pronoun is solved by taking sentences to yield sets of assignments as outputs which will provide the basis of evaluation for an unbound anaphoric pronoun in a subsequent sentence.

There is a rival to the dynamic account of unbound anaphora and that is the E-type account (cf. Evans 1995). On the E-type account, an unbound anaphoric pronoun is interpreted by replacing it by a full NP, generally a definite description. There are several problems with the E-type account that speak in favor of the dynamic account, as is discussed more extensively in Moltmann (1996). First, the replacing description is not generally systematically retrievable from the previous discourse, as seen from examples such as (69a) and (69b), where the description to replace *he* cannot be obtained formally from the embedded sentence containing the antecedent:

(69) a. Sue believes that someone broke into the apartment. Mary believes that he just stumbled in.
b. Sue believes that a neighbor broke into the apartment. Mary does not believe that

he is a neighbor.

Second, the choice of a definite determiner for the replacing NP is not generally adequate, since, unlike what has been claimed by Evans (1990), the pronoun does not generally refer to a unique entity. As seen from (65a) and (65b), the uniqueness condition is not generally satisfied in conditional and quantificational *donkey*-sentences. But it also holds for certain sequences of independent sentences, for example, plausibly in (69):

(69) John made a mistake. He corrected it.

More obvious is the lack of uniqueness with socalled modal subordination as in (70):

(70) Someone might come in. He might surprise you.

(70) is a case of what can be called *conjunctive modal subordination* (cf. Moltmann 1996), a type of modal subordination in which the two sentences are equivalent to (71):

(71) Someone might come in and surprise you.

What is important is that no uniqueness is implied in (70) or (71), and thus the second sentence could not be handled by replacing the pronoun by a description.

The absence of a uniqueness condition is most obvious in conditional and (universally) quantificational *donkey*-sentences. Instead of being subject to a uniqueness condition, the *donkey*-pronoun in such sentences displays two sorts of readings: a universal reading, as in (72a) and (71'a), and an existential reading, as in (72b) and (72'b):

(72) a. If John makes a mistake, he corrects it.
b. If John has a dime, he puts it in the meter.
(72') a. Everyone who made a mistake corrected it.
b. Everyone who had a dime put it in the meter.

The two readings in part depend on the kind of quantifier and the lexical content of the predicate. Thus, only an existential readings is available with existential and negative quantifiers:

(72") a. Someone who made a mistake corrected it.
b. None who made a mistake corrected it.

The lack of uniqueness in cases such as (69) and especially (70) indicates that even in independent sentences a general replacement by a description is not possible.

In order to account for the lack of uniqueness within the E-type account, the pronoun would have to be replaced by either an existential or universal quantifier. But there are problems with a replacement by a quantifier. One of them is that the predicted scope interactions with the universal or existential quantifier do not show up. Thus, (73a) cannot have a reading on which every man bought exactly one book for all the daughters he has, and (73b) cannot have a reading on which the students who bought a book did not read all the books they bought.

(73) a. Every man who has a daughter bought exactly one book for her.
b. Most student who bought a book did not read it.

Another problem is that occurrences of the pronoun in embedded contexts are not appropriately accounted for. Thus (73') does not mean that every man told everyone (or some) of this daughters that every (or some) daughter should study:

(73') Every man who has a daughter told her that she should study.

In view of this, in order to provide a general account of embedded and independent sentences, the semantics of unbound anaphora should better not itself implement a uniqueness condition. If there is a tendency toward uniqueness for independent sentences (as has been claimed by Evans 1995), then it should better be accounted for by an independent condition on assertions.

It then appears that unbound anaphoric pronouns do not behave like implicit full NPs, but rather like variables, involving a unique, some, or all values of a certain sort — depending on the antecedent context and the construction in which they occur.

There is another kind evidence for the dynamic approach to unbound anaphoric pronouns, namely from the behavior of anaphora across the utterances of different speakers or the attitudes of different agents. Cross-attitudinal and cross-utterance anaphora are subject to a general semantic condition, namely what can be called the *Common Source Condition*. This condition is a requirement imposed by cross-attitudinal and cross-utterance anaphora to the effect that the agents share the same source for their

belief or have communicated among each other (cf. Asher 1987). Thus, (74) seems to require that A and B's assertions and (75) that their beliefs are based on the same evidence or informational source:

(74) A: Someone is taking a walk in the park.
B: He carries an umbrella.
(75) A believes that a witch entered the garden. B believes that she is stealing the cucumbers.

The discourse in (74) seems inadequate if B's utterance is based solely on his belief that whoever takes a walk in the park at the time, carries an umbrella. Rather, more naturally, A and B are exposed to the same scene and thus act as a single agent (cf. Groenendijk / Stokhof / Veltman 1996b). Similarly, (75) requires that A's and B's beliefs in some way derive from the same source or that A and B have communicated among each other.[12]

For anaphora as in (74-75), the dynamic account will assume that B's utterance in (74) and B's belief content in (75) operate on a context that is somehow derived from the context set up by A's utterance in (74) or the first embedded sentence in (75). The latter represents the presuppositions A makes or the speaker makes about A's beliefs. These presuppositions also characterize B's belief. Thus, they can be taken to be presuppositions characterizing A's and B's shared beliefs, and in fact the content of a single belief state in which A and B joinedly participate. The content of this belief state can also be taken to be the content of an individual belief state of B, and the presuppositions characterizing that belief state is what B's utterance in (74) and the second embedded sentence in (75) operate on. The general condition then is that in order for the second sentences in (74) and (75) to be interpretable, A's and B's contexts must be linked by a belief state in which A and B act as a collective agent.

The Common Source Condition can naturally be viewed as a condition on the individuation of a collective belief state — not on a shared belief content, but on a single belief state in which two agents participate. Two agents can be said to participate in a single, collective belief state, rather than separate belief states, if they have arrived at their belief on the basis of the same evidence or because they have been communicating among each other.

The Common Source Condition thus provides evidence that the interpretation of unbound anaphora is based on a notion of context, the content of a speaker's presuppositions or his presuppositions about the content of some other agent's belief. With cross-utterance or cross-attitudinal anaphora, thus, a primary or secondary derived

context is at play, which is obtained from the primary or secondary underived context of a different agent on the basis of a collective belief state in which the two agents participate.

The Common Source Condition can hardly be derived within the E-type account, which deals with the interpretation of unbound anaphoric pronouns at a purely formally level, by replacing the pronoun by another expression.

In what follows, I first want to introduce a representative dynamic semantic theory formally and then discuss the ways the theory needs to be extended to account for modal sentences and attitude reports. I will then turn to some serious problems that arise on dynamic semantic theories in general.

4.3. The dynamic approach

Dynamic theories differ from Stalnaker's view in essential ways, but still Stalnaker's account of context has anticipated dynamic semantic theories in two respects: first, because the notion of context is driven by information (or better the content of propositional attitiudes) and subject to information change; and second, because Stalnaker allowed semantic operations to operate on a context. Dynamic theories of context differ in one fundamental respect from Stalnaker's account. Dynamic semantic theories identify the meaning of a sentence with its potential of changing a context, rather than locating this context change potential in a separate component of formal pragmatics. Thus, on a dynamic account, the denotation of a sentence *S* is a function from contexts to contexts, specified by a rule of the form c+ *S* = c', where *c'* is the new context obtained by applying *S* to c. A context then does not act as determining the meaning of a sentence, but rather constitutes the incomplete meaning of the previous discourse. Only the entire discourse, on the dynamic view, has a truth-conditional meaning. The dynamic view, thus, carries with it the loss of an independent proposition as the meaning of a sentence: sentences on the dynamic view do not have independent semantic values; rather their semantic contribution is reduced to inducing an effect on a context. Dynamic semantic theories in fact identify Stalnaker's pragmatic rule of context change for assertions with the meaning of sentences in general.

There are various sorts of dynamic theories. One major division is between dynamic theories using a semantic notion of context, construed, at least in part, out of nonlinguistic objects such as possible worlds and variable assignments and dynamic theories using a syntactic notion of context such as the discourse representation structures of Discourse Representation Theory (Kamp 1981, Kamp / Reyle 1993). The first sort of

theories can be called *semantic dynamic theories*, the second sort *representationalist dynamic theories*. In what follows, I will introduce one particular semantic dynamic theory in a simplified form, namely Dynamic Predicate Logic with possible worlds (Groenendijk / Stokhof 1992, Groenendijk / Veltman / Stokhof 1996a, 1996b). The points to be made in the subsequent discussion, though, hold for other dynamic theories as well which make use of a semantic notion of context, for example File Change Semantics (Heim 1982). I will set aside representationalist theories of context because they are not subject to the same problems nas dynamic semantic theories and are in certain ways similar in nature to the structured propositions view that I will propose at the end of the paper.

Given below is a simplified version of dynamic predicate logic, where a context c is a set of pairs <w, g> consisting of a possible world w and an assignment of objects to variables g:

(76) a. $c + R\ t_1 ... t_n$ = $\{<w, g> \in c \mid <[t_1]^w, g, ..., [t_n]^w, g> \in [R]^w\}$,
if the presuppositions of are satisfied by c
= undefined otherwise

b. $c + (p \ \& \ q) = (c + p) + q$

c. $c + \textit{not}\ p = c \setminus \{<w, g> \mid \{<w, g>\} + p \neq \varnothing\}$

d. $c + \exists x\ p = \{<w, g> \mid \exists k\ (<w, k> \in c \ \& \ g[x]k \ \& \ \{<w, g>\} + p \neq \varnothing)\}$

e. $c + p \dashrightarrow q = c + (\textit{not}\ (p + \textit{not}\ q))$

An atomic formula maps a context to a possibly smaller context by preserving only those world-assignments that make the formula true. A conjunction applies to a context by applying the conjuncts successively. A negated sentence applies to a context by taking away all those world-assignment pairs that make the sentence without the negation true — that is, those world-assignment pairs that when taken as a singleton set to which the sentence without the negation applies, will lead to the empty information state. An existentially quantified formula involving a variable *x* applies to a context by changing the assignment *k* of any world-assignment pair in the context to those *x*-alternatives *g* (*g*[*x*]*k*) that make the scope of the existential quantifier true. An implication changes a context by having the negation of the conjunction of the antecedent and the negation of the consequent applied to that context — which means, by taking away those world-assignment pairs, which, when verifying the antecedent, would not also verify the consequent (i.e., which would lead to the empty information state when, taken as singleton sets, the consequent is applied to them).

To see how the account works more concretely, take the conjunctive *donkey*-sentence in (77a) with the antecedent and pronoun translated by the same variable as in (77b):

(77) a.John owns a dog. He feeds it daily.
b. (∃x(dog(x) & own(j, x)) & feed daily(j, x)

After evaluating the first conjunct, the resulting information state consists only in world-assignment pairs <g, w> where *g* assigns some object *a* to the variable *x* in *w* so that *a* is a dog owned by John in *w*. When the second conjunct is evaluated, this information state will be changed so that only those world-assignment pairs remain in which the object assigned to *x* is also fed by John in the relevant world.

Now consider the conditional *donkey*-sentence (78a) as formalized in (78b):

(78) a. If John owns a dog, he feeds it.
b. (∃x (dog(x) & owns(j, x)) --> feed(j, x)

When the antecedent is applied to an information state *c*, then all those world-assignment pairs <*g*, *w*> will be eliminated from *c* which have the property that under a minimal change, *x* is assigned an object by *g* that is a donkey owned by John in *w*, but then is not beaten by John in *w*.

Similarly, the dynamic account captures the universal reading of *donkey*-sentences with universal quantifiers, as in (78'a) and the existential reading of those with existential or negative quantifiers, as in (78'b):

(78') a. Everyone who made a mistake corrected it.
a'. ∀y (∃x(mistake(x) & person(y) & make(y, x)) --> correct(y, x))
b. Someone who made a mistake corrected it.
b'. ∃y (∃x(mistake(x) & person(y) & make(y, x)) & correct(y, x))

As it stands the dynamic account only covers the universal reading of *donkey*-sentences with conditionals and universal quantifiers; but it does not mean that the existential reading could not be accommodated on a related account (cf. Kanazawa 1994, Chierchia 1995).

5. Extension of the dynamic account to embedded sentences

5.1. Secondary contexts

Dynamic theories that use a semantic notion of context have been developed with independent sentences in mind or sentences with epistemic modals, but not sentences embedded under attitude verbs or other modal verbs. There is a straightforward way, though, in which the dynamic account can be extended to embedded contexts. Consider (79):

(79) Mary believes that someone broke into the apartment. She believes that he stole the silver.

If the *that*-clause should have the same meaning as an independent sentence, it will operate on some context and yield a new context, namely a context that contains the information relevant for the evaluation of the anaphor *he* in the second sentence. In this case, it must operate on the secondary context representing the speaker's presuppositions about the described agent's belief, not his presuppositions about the world. Roughly, then, an attitude report applies to a complex context as in (80), where c_1 is the primary and c_2 the secondary context:

(80) $\langle c_1, c_2 \rangle$ + *she believes that he stole the silver* = $\langle c_1, c_2$ + *he stole the silver*$\rangle$

Unlike the secondary contexts for presuppositions, sets of possible worlds, a secondary context that includes assignments cannot be defined just on the basis of the speaker's presuppositions about what the described agent believes. Such a secondary context incorporates discourse-related information about the occurrence of variables (that is, the correlates of pronouns or formal relations between pronouns and antecedents), and this information cannot be part of the characterization of a described agent's belief. In particular, the context cannot be viewed as the union of the belief states compatible with what the speaker presupposes about the described agent.

A context must then be understood in a somewhat different way, and in this respect, a suggestion of Stalnaker is of help. According to Stalnaker (1979, 1996), a context may contain two different sorts of information: information about the world and information about the utterances that have been made in the discourse. The latter allows features of the utterance context to be included in the presuppositional context such as information about the time of utterance and the speaker, as well as information about the use of anaphoric pronouns and their antecedents. Construing a context as a set of pairs of worlds

and variable assignments would be conceiving of context as representing the information speaker and addressee share about the described agent's beliefs *and* the way the described agent's beliefs have been described. A secondary context, more precisely, can be defined as the part of the content of the speaker's pragmatic presupposition that is about the described agent's beliefs and the way this information has been presented.

Primary and secondary contexts then differ simply in that the primary context consists in the speaker's pragmatic presuppositions about the world as well as the way this information has been presented and a secondary context in the speaker's pragmatic presuppositions about the content of a described agent's propositional attitude and the way this information has been presented.

But then a secondary context cannot be derived anymore from the primary context; only the worlds in a secondary context will be determined by it, not the assignments it contains. Using a doxastic accessibility relation $R_{\langle believe, a\rangle}$ for an agent *a*:, the following condition on global contexts captures the relation between a primary context $c_{\langle speaker\rangle}$ and a secondary context $c^{\langle believe, a\rangle}$ representing the speaker's presuppositions about a's beliefs:

(81) a. For a global context c and any agent a:

$$\{w \mid \exists g \langle w, g\rangle \in c_{\langle believe, a\rangle}\} = \{w \mid \exists w' (w' \in c_{\langle speaker\rangle} \,\&\, w' R_{\langle believe, a\rangle} w)\}$$

The conditions is to be generalized to secondary contexts for any kind of propositional attitude V as follows, where $R_{\langle V, a\rangle}$ is the accessibility relation among worlds representing the same propositional attitude of the agent *a*:

(81) b. For a global context c, any propositional attitude V, and any agent a:

$$\{w \mid \exists g \langle w, g\rangle \in c_{\langle V, a\rangle}\} = \{w \mid \exists w' (w' \in c_{\langle speaker\rangle} \,\&\, w' R_{\langle V, a\rangle} w)\}$$

Let me call a context that includes both primary and secondary contexts a *global context.*[13] Formally, a global context can be represented as a sequence of primary and secondary contexts.

Clearly, there may be many secondary contexts in a given global context, at least as many as there are agents and their desires and beliefs under discussion. The question then is, How does a clause embedded under an attitude verb pick out the right secondary context? One might suggest that the relation of subcontext to embedded clause is an

anaphoric relationship, represented by coindexing of the *that*-clause with one of the secondary context in the global context:

(82) For primary or secondary contexts $c_1, .. , c_n$,
$<c_1,.., c_3, ..., c_n>$ + a V [*that* S]^3 = $<c_1, ..., c_3$ + S, ..., $c_n>$

This view is clearly inadequate, though, because the relation between embedded clause and secondary context is not governed by syntactic conditions or speaker's intentions, but is uniquely determined by purely content-related conditions: the choice of a secondary context depends only on the relevant kind of propositional attitude the relevant agent and thus need not be fixed in some arbitrary or syntactically governed way, as in the case of anaphoric relations. Besides that, (82) does not capture the connection between primary and secondary contexts, as given by (81).

A *that*-clause embedded under *believe* simply picks out the part of the content of the speaker's pragmatic presupposition that is about the relevant agent's belief. Suppose that c is the information state that corresponds to all of the speaker's pragmatic presuppositions and moreover, that c<speaker> is the part of c that constitutes the primary context and c<believe, a> the part of c that constitutes the secondary context carrying the information about a's belief. Then a belief report of the form *John believes that* S maps c onto a context c' minimally differing from c in that c'<believe, John> is the result of adding S to c<believe, John> and (81) is satisfied:

(83) For a global context c,
c + *John believes that* S = the global context c' that differs from c minimally in that c'<believe, John> = c<believe, John> + S and (81) is satisfied.

A secondary context, as we have seen earlier with presuppositions, does not necessarily represent the described agent's beliefs; it may alternatively represent the agent's desires, as in (84a), or both desires and beliefs, as in (84b):

(84) a. John want to write a book. He wants to write it soon.
b. John believes that Mary wrote a book. He wants to read it. He wants to read it soon.

Thus, the secondary contexts for bouletic attitude verbs consists in the speaker's presuppositions about the agent's beliefs and desires:

(85) For a global context c,

c + a *wants that* S = the global context c' that differs from c minimally in that $c'_{\langle desire, John\rangle} = (c_{\langle believe, a\rangle} \cup c_{\langle desire, a\rangle}) + S$ and (81) is satisfied.

Note that $c'_{\langle desire, John\rangle}$ will now include information about both John's desire and belief.

Secondary contexts need to be invoked also for sentences with conjunctive modal subordination, as in (86), where the second sentence operates on the modal context set up by the scope of the first modal:[14]

(86) John must write a paper. He must write it soon.

In (86), the secondary context represents the content of the speaker's pragmatic presuppositions about John's obligations. The second sentence of (86) then applies to a global context as in (87), where $c_{\langle oblig, John\rangle}$ represents the information about John's obligations:

(87) For a global context c,

c + *he must write it soon*= the global context c' differing minimally from c in that $c'_{\langle oblig, John\rangle} = c_{\langle oblig, John\rangle}$+ *he write it soon* and (81) is satisfied.

Again, the secondary context for the scope of *must* is determined in a purely content-related way, as the part of the speaker's presuppositions that is about the described agent's obligations.[3]

Besides secondary contexts, there is another kind of context that a dynamic account of attitude reports needs to invoke. It is required for anaphoric relations across utterances of different speakers or attitude reports involving different agents where the speakers or agents partly disagree, as in the following examples adapted from Strawson:

(88) A: Someone fell from the bridge.
B: No, he jumped.

(89) A believes that someone fell from the bridge. B believes that he just jumped.

In (88), B's utterance obviously cannot apply to the context that is the output of A's utterance, and in (89) the complement clause of the second sentence cannot apply to a

context set up by the complement clause in the first sentence. But still *he* is an unbound pronoun anaphoric to *someone*. Importantly, *he* in the second sentences need not be used referentially, referring to a specific person, but allows for an 'attributive reading', for which the dynamic account is crucial, as when A and B discuss certain evidence indicating that someone or other jumped or fell from the bridge.

The dynamic account can still apply here, namely once it is assumed that B's utterance or belief complement relates to a somewhat different context, namely not to the context representing the information about A's beliefs, but the context representing the information about the beliefs A and B share — namely let's say, that someone changed his location from above to below the bridge. Clearly, this context does not come about as a result of explicit information, but as a result of accommodation.

B's utterance in (88) itself does not apply to that context, since the utterance does not represent a belief of A. Rather, B's utterance applies to a context which is identical in content, but which counts as representing the information only about B's beliefs. Again, this is a context obtained only by accommodation.

Similarly, the clausal complement of the second sentence of (89) applies to a context whose content corresponds to the (accommodated) information about A and B's shared belief.

Derived contexts again are simply parts of the content of the speaker's presupposition. Their only difference to underived primary and secondary contexts is, on the dynamic view, that they do not come about as the output of a semantic rule, but as a result of accommodation, triggered by the requirement of interpreting a clause with an anaphor coherently.

As was mentioned earlier, the fact that the derived context is obtained via a common belief of the two agents manifests itself in the Common Source Condition. It is important to notice that the Common Source Condition does not appear with presuppositions:

(90) John believes that Mary failed the exam ten years ago. Bill believes that she failed it again this year.

The discourse in (90) is felicitous even if there was no common source for John's and Bill's beliefs and John and Bill have never communicated with each other. Bill just needs to believe that Mary failed the exam before however he might have arrived at that belief. That no common belief state is required for crossattitudinal presupposition satisfaction is expected because the presuppositional content is not dependent on a given context, but rather is directed toward any context.

5.2. Problems with the extension of the dynamic account to embedded contexts

The dynamic account was originally developed for independent sentences where the meaning of a sentence is identified with its potential of changing the presuppositional context. The account naturally extends to sentences embedded under attitude verbs such as *believe* if the embedded sentence is taken to apply to the secondary context representing the speaker's presuppositions about the described agent's beliefs and the way they have been presented. This account faces several problems, however. First, there are conceptual problems having to do with the conception of sentence meaning. Second, difficulties arise when the account is extended to attitude verbs other than *believe*. Finally, the account has problems dealing with propositional anaphora. These problems, I will argue, will require a return to a static conception of sentence meanings, namely as structured propositions which act as the content of individual sentences. Certain features, though, can still be taken over from dynamic theories, namely first using a notion of presuppositional context for truth and appropriateness conditions of structured propositions and second, in order to model the distinction between indefinite NPs and anaphoric pronouns, using 'discourse referents' or parametric objects which are subject to context-related familiarity conditions.

5.2.1. The notion of meaning as context change potential

On the dynamic account, sentence meanings are context change potentials. That is, the meaning of a sentence S consists in that when S is uttered in a presuppositional context c, c will change so as to include the information provided by S. There are a number of fundamental problems with this conception of sentences meaning.

First, there are problems of how to understand context change from the point of view of speech act theory. The dynamic account assumes that the change in presuppositions effected by the utterance of at least certain declarative sentences is systematic. But it is not quite clear what this means. If a presuppositional context is defined as on Stalnaker's view, as the content of the speaker's presuppositions, then sentence meaning as context change potential could mean that the speaker necessarily changes his presuppositions when uttering a declarative sentence with its literal meaning. But this cannot be right since after the utterance of the sentence the speaker may have reasons not to change his presuppositions - for instance when the hearer is obviously unwilling to believe what the sentence says.

A better view would be that the utterance of a declarative sentence as an assertion has as its goal a context change. If the goal of an assertion is context change, then context cannot be understood anymore as the content of the speaker's presuppositions, but must be understood as the content of the addressee's presuppositions. There are problems also with this view.

One of them is that is that many types of speech acts such as the expressive use and the declarative use cannot be accommodated on the basis of sentence meaning as context change potential. For such speech acts, a notion of content as the object of a propositional attitude (expressive illocutionary act) or as a representation of part of the world (declarative illocutionary act) is required.

Another problem is that the description of assertions in the sense above require a notion of content of propositional attitudes of presupposition and belief. The claim of the dynamic account would be that such contents would never be expressed directly. But we seem to use the semantic metalanguage in just that way, referring to contents directly. With the utterance of a declarative sentence, on the dynamic view, a speaker cannot express his own thoughts or give a representation of part of the world; rather he gives an instruction to the speaker of how to change the assumptions made. Thus, independent sentences are, if anything, are about some agents' assumptions rather than the state of the world. The dynamic view thus appears to claim a major discrepancy between speech and thinking, a discrepancy that is hard to maintain. On the dynamic view, it is never possible to express one's thought, and this seems to go against basic intuitions concerning our use of language.

A related problem appears with the dynamic account of attitude reports. The dynamic account takes attitude reports not to be primarily about the attitude of the agent itself, but about assumptions that are made about such propositional attitudes. The contribution of an attitude report consists in an instruction to change those assumptions, rather than saying directly what the attitude is.

Another fundamental problem for the dynamic account concerns the use of secondary contexts in the semantics of attitude reports. Given that attitude reports are only about the speaker's presuppositions concerning the attitudes of other agents, the dynamic account invokes a division of the content of the speaker's pragmatic presupposition into different secondary contents, but nothing in the semantics of attitude reports is constitutive of that division itself. The attitude verb only serves to identify the relevant secondary context and the kind of semantic operation operating on that context. But whatever marks a context as being the content of the speaker's presuppositions about this or that attitude, it presupposes a use of language that refers to the attitude directly. Thus, there is the same

sort of circularity here as when trying to identify the kind of speech act that goes along with the view of sentence meaning as context change potential.

5.2.2. The treatment of different types of attitude verbs

The dynamic view also faces general problems when it is extended to attitude reports with verbs other than *believe*. Other attitude verbs, for example *doubt*, *want*, and *wish* differ from *believe* in their anaphoric and presuppositional properties, and they can all take a belief context as a secondary context, as is seen in (91)-(93). The complement of *doubt* does not support an anaphor or presupposition in a subsequent complement, but the complement of *want* may do so with respect to another complement of *want*.

(91) a. Mary believes that someone left. She doubts that he will return.
b. # Mary doubts that any student failed the exam last year. She doubts that he will fail
the exam this year again.
(92) a. Mary believes that some student took the exam last year. She want him to take it this
year again.
b. John want to write a book. He wants to finish writing it soon.

The clausal complements of those attitude verbs operate on a belief context in a very different way than the complement of *believe*. To explain the presuppositional and anaphoric behavior of those verbs and their relatedness to the context of belief, a dynamic account has to identify the semantic content of those verbs with particular operations on a context representing the agent's beliefs, thus, in effect adopting a lexical analysis of those verbs in sentence meaning - a move indeed made in the dynamic literature that concerns itself with attitude reports (cf. Asher 1987, Heim 1992). In the case of *doubt*, the operation most obviously would be that of eliminating all the alternatives that do not support the complement (making *doubt that S* basically equivalent to *believe that not S*). In the case of *want*, a suggestion by Stalnaker (1984) has been adopted by Heim and Asher, namely that a complement S of *want* imposes a preference relation among the belief alternatives with belief alternatives w supporting S being preferred over alternatives w' that differ minimally from w by not supporting S. Dynamically, this would mean eliminating those belief alternatives that do not conform to the preference order.

Together with this account of anaphora and presuppositions for different attitude verbs goes a commitment to the effect that belief contexts are closed under logical consequences. There are general and familiar problems both with this commitment as well the commitment to a lexical analysis of attitude verbs (cf. Fodor 1997).

Another problem for the account is that there are other attitude verbs which relate to belief, but whose complement can hardly be conceived as an operation on an information state about belief, however complex. Examples are the verbs *ask, promise*, and *demand*:

(93) John believed there was a mistake in the paper. He asked Mary to correct it. / He promised that he would correct it. / He demanded that it be corrected.

The difficulties of extending the dynamic account to such attitude verbs are mirrored in the difficulties of making sense of the account for speech acts other than assertions, for example commands. Commands can hardly be construed as operations on a context; they relate to the world, not to shared information.

Such difficulties can be traced to the fact that the dynamic account ultimately identifies the pragmatic effect of assertions with the meaning of sentences in general.

5.2.3. Other clausal constructions

There are related problems with other clausal constructions that on a dynamic account would require an extremely implausible and artificial reanalysis. Many constructions with *that*-clauses can hardly be regarded as involving any kind of primary or secondary context change. These are examples:

(94) a. That S is true / possible.
b. That S may be true, but I would never claim or believe.
(95) a. The thought that it might rain bothered John.
b. The fact that it will rain ruined Mary's weekend plans.

On a dynamic account, nonattitudinal predicates such as those in (94a) would have to be construed as complex conditions on how the *that*-clause applies to some context: *true* would simply require the *that*-clause to apply to the presuppositional context, *possible* that the addition of the *that*-clause to a context does not lead to the empty set - or else (in the case of nonepistemic possibility) applying the *that*-clause to a context by eliminating those worlds from which there is no relevantly accessible world in which the *that*-clause

holds. But the account of *true* runs into trouble in the case of (94b), which requires a distinction between assertability or possible belief and possible truth.

The dynamic account has problems also with (95a), where the *that*-clause intuitively serves to characterize the content of a thought, and with (95b), where it serves to characterize the nature of a fact. The predicate in both cases clearly is understood as characterizing the thought or the fact, rather than imposing a condition on applying the *that*-clause to some context.

We have sofar seen two sorts of problems with the dynamic account, both of which arise because the dynamic account identifies the pragmatic affect of an assertion with the meaning of a sentence. The next problem has to do with neglecting the independence of the content of a sentence relative to the preceding discourse, a problem that arises with the possibility of using anaphora to refer to the content of individual sentences.

5.2.4. The independence of propositions of the presuppositional context: propositional anaphora

Anaphora such as *that* or *it* can be used to refer to the content of just one sentence or clausal complement, rather than the content of the entire sequence of the preceding sentences or clausal complements. Thus, the last sentences of (96a) and (96b) may just mean that Bill notices that Mary cried, not that John laughed:

(96) a. John laughed. Mary cried. Bill noticed that.
b. Sue believes that John laughed and that Mary cried. Bill noticed that.

This is obviously a problem for the dynamic account. On the dynamic account, a context is the only semantic object there is for a sentence to relate to, since sentence meanings are identified with functions from contexts to contexts. Thus, *that* in (96a) and (96b) should only be able to relate to the primary or secondary context, and these contexts should include both the information that John laughed and that Mary cried.

Given that *that* would have to refer to a context, one might argue that the sentence *Mary cried* simply sets up a new context. The problem with this suggestion is that a *that*-clause may also relate to a discontinuous discourse where such a resetting of a context would not be possible. An example is (97), where Mary may believe that someone broke into the apartment and stole the silver, but not that Sue forgot to lock the door:

(97) Sue believes that someone broke into the apartment. She believes that she forgot to

lock the door. She moreover believes that he stole the silver. Mary believes that too.

The view that propositional anaphora refer to contexts could only be maintained if a context is allowed to be based arbitrarily on any parts of a discourse. But this is in conflict with the way a context is defined, namely as the content of a speaker's pragmatic presupposition (or as his presuppositions about the addressee's presuppositions). Defined that way, a context should accumulate systematically all the information that has been given in a discourse and not just a part of it.

Another problem is that such an arbitrary setting up of a context would lead to excessive accommodation. A context set up at some point would always be subject to possible modifications afterwards, namely when the belief of an agent is being described that does not include all the content of the context, but still has the same content as some sentence used earlier to characterize a belief. Suppose in (97), Mary also believes that Sue forgot to lock the door. Then the context would include the content of both complement clauses in (97). But still it is always possible for the speaker or hearer to continue the discourse by uttering something like (98), which would require a different context, one that consists only in the information that someone broke into the apartment:

(98) John believes that too, but not that Mary locked the door.

The problem is that if a context can always be 'corrected' at a later stage in the discourse, it would be impossible for the speaker to know what he is saying or for the hearer to know what the speaker means at the earlier stage at which the speaker utters (98).

Yet another problem for the proposal has to do with the separation of presuppositional and assertive information. A propositional anaphor may refer to the content of a sentence that provides the proposition or focus of the attitude described ('assertive information') and at the same time relates to another piece of discourse which provides only presuppositional or background information. Thus, in (99), the object of Mary's doubt may just be that he stole the silver, whereas the presupposition, her belief, is that someone broke into the apartment:

(99) Someone broke into the apartment. He stole the silver. Mary doubts that.

The most straightforward way of reintroducing something like propositions within the dynamic account is to take the proposition expressed by the sentence to be a subset of the context, as in (100):

(100) [*he stole the silver*]^{c} = {<w, g> | <w, g> ∈ c & [*stole*]^{w}(g(x), the silver) = 1}

He stole the silver thus denotes the subset of the context in which the object assigned to the variable translating *he* stole the silver. In this way, a sentence comes out equivalent to its conjunction with the preceding parts of the discourse which define its context.

This account apparently eliminates a distinction between presuppositional and assertive information. There is still a way, though, of distinguishing presuppositional information from assertive information, namely by generally associating with a context the propositional attitude of belief (or both belief and desire if the attitude is bouletic). Then only the contribution of the sentence will be the target of negative attitudes like doubt.

A more serious problem for the proposal is that it cannot account for the possibility of reference to the content of a single sentence, where not all of the relevant context should be (presuppositional) part of the content referred to.

Also it cannot account for the identity of propositions relative to different contexts, namely the fact that the content of a sentence may relate to two different contexts simultaneously. Let me call this the *identity problem* for propositions. The problem manifests itself in embedded contexts as in (101), where Sue's and Mary's beliefs have been reported as being different, and thus the sentence *he stole the silver* relates to two different secondary contexts.

(101) Sue believes that someone broke into the apartment. She believes that she forgot to lock the door. Mary believes that Sue locked it. Sue moreover believes that he stole the silver. Mary believes that too.

As in the case of modals and presuppositions, one might argue that a propositional anaphor requires not strict identity, but only similarity of content. But for unbound anaphora there are the same constructions as with modals and presuppositions requiring strict identiy of contents relative to different contexts: existential quantification over propositions, free relative clause contructions, and complex attitude verbs. Thus, (101) can be continued by (102a), (102b), or (102c):

(102) a. There is something Sue and Mary believe, namely that he stole the silver.
b. Mary believes what Sue believes, namely that he stole the silver.
c. Sue convinced Mary that he stole the silver.

The identity problem of propositions arises also with intuitions concerning a discourse. Two speakers may be said to agree about the content of one sentence, but not necessarily the content of all of the preceding discourse, and assertions of the same sentence at different times may intuitively have the same content even if the context changes.

For the possibility of referring to the content of a single sentence and for the identity problem of propositional contents, a proposal needs to be taken into consideration that was entertained, but ultimately not adopted by Heim (1982), namely according to which sentences independently of a context denote relations between worlds and assignments. Let me call such relations *propositional objects*. The propositional object denoted by the second sentence of (99) would be the following relation:

(103) {<g, w> | g(x) stole the silver in w}

As the meaning of sentences, propositional objects have truth conditions that are dependent on the context, as in (104):

(104) A relation R between worlds and assignments is true in a world w relative to a context c if there is an assignment g such that <g, w> $\in$ c $\cap$ R.

Moreover, propositional objects when applied to a context will bring about a context change, which will now be viewed as a pragmatic process. Assertions thus will be subject to the following condition on context change:

(105) For an assertion of a sentence S in a context c:
cc(c + S) = c $\cap$ [S]

A propositional object provides a context-independent argument for propositional attitude relations, but it is an object that is still truth-conditionally dependent on the relevant secondary context.

There are two ways in which such dependence could be implemented. First, a propositional object could constitute together with the secondary context the argument of an attitudinal relation. Then the last sentence of (99) will be represented as in (106):

(106) doubt(Mary, <{<g, w> | g(x) stole the silver in w}), {<g, w> | g(x) broke into the

apartment in w}>)

Each attitude verb on this view takes not only a propositional object, but a pair consisting of a propositional object and a background. Different attitude verbs, for example *believe* and *want*, will require different backgrounds. Propositional anaphora, of course, would only refer back to the propositional object.

This view, however, raises problems for the identity of the content of utterances of the same attitude report. An utterance of an attitude report intuitively has the same content when uttered at an earlier stage of a discourse as when uttered again at a later stage, even after information has been added to the relevant secondary context.

The alternative view is that an attitude report as a whole must be relative to a complex context so that the content of the attitude will be truth-conditionally dependent on part of the global context that is the relevant secondary context. Then, we have truth conditions for the content as in (107), where $c_{\langle believe, a\rangle}$ is the part of the speaker's pragmatic presuppositions that is about a's beliefs:

(107) For a relation R, a world w and an agent *a* such that $[\![believe]\!]^w(a, R) = 1$,
R is true in w relative to a global context c if there is an assignment g such that $\langle w, g\rangle \in R \leftrightarrow c_{\langle believe, a\rangle}$.

Since the propositional-objects view does not take the meaning of sentences to be a context change potential, both independent and embedded sentences lead to context change only as pragmatic processes. For a belief report, context change takes the following form:

(108) Pragmatic rule of context change for belief reports
For a global context c,
cc(c, *John believes that* S) = the global context c' minimally differing from c in that $c'_{\langle believe, John\rangle} = c_{\langle believe, John\rangle} \cap$ [*that* S] and (81) is satisfied

Given that secondary contexts are the result of a pragmatic rule, rather than a semantic one, there will be no principled difference between secondary and derived contexts anymore. Derived contexts differ from secondary ones simply in the way they come about pragmatically. Rather than being the result of a pragmatic rule associated with a particular attitude verb, a derived context comes about, from the perspective of a speaker, by refraining from applying the rule of context change to all the information

there is or by adding information that is not explicitly given. From the perspective of the hearer, context change leading to derived contexts comes about as a requirement on the interpretability of an utterance.

For the treatment of attitude reports with verbs other than *believe*, the selection of the secondary contexts is still the same as on the dynamic view. But unlike the dynamic view, the propositional-objects view is not committed to a lexical analysis of the attitude verb at the level of sentence meaning. The attitude verb is treated simply as denoting a relation between agents and propositional objects.

However, in order to explain the behavior of verbs like *doubt* with respect to anaphora, the propositional-objects view has to posit a different rule of secondary context change than in the case of *believe*. *Doubt* will effect a negative context change, taking away the propositional object doubted from the context of the doubt:

(109) cc(c, *John doubts that* S) = the global context c' minimally differing from c in that $c'_{\langle believe, John\rangle} = c_{\langle believe, John\rangle} \setminus [S]$ and (81) is satisfied

In the case of *want*, the context on which the truth conditions of the propositional argument depend represents the presuppositions about the agent's beliefs and desires. The context change rule will be the same as for *believe*, consisting in the addition to the context of the proposition wanted:

(110) Pragmatic context change rule for *want*:
For a global context c,
cc_{want}(c, *John wants that* S) = the global context c' minimally differing from c in that $c'_{\langle want, John\rangle} = c_{\langle believe, John\rangle} \cap c_{\langle want, John\rangle} \cap [S]$ and (81) is satisfied.

The propositional-objects view of embedded sentences also accounts for attitude reports with verbs like *demand*. Here again the secondary context is that of belief and possibly previously reported demand (analogous to the case of *want*). But semantically *demand* will simply be treated as a relation between agents and propositional objects. *Demand* also is associated with a specific rule of context change. But this rule will act as determining another secondary context representing the information about the agent's demands as well as his belief.

There are problems, though, with the propositional-objects view, arising from the way contexts and propositional objects are conceived.

The first problem is that the meaning of attitude reports cannot itself be construed as a relation between worlds and assignments: there is no way such a relation could be obtained from a propositional object, the attitudinal relation, and an agent. The propositional object itself includes discourse-related information (the assignments) that cannot be reflected in the choice of elements in the relation denoted by the entire sentence: the assignments in the propositional object should not necessarily be contained in the relation denoted by entire sentence, and also they cannot be determined by either the worlds or the assignments that are included in the relation. A belief report then must take the form of a complex proposition consisting of two sets of world-assignment pairs - a view that comes close to the structured propositions view of sentence meaning.

Second, the treatment of anaphora in attitude contexts with variable assignments carries a commitment to merely possible objects as the values of the anaphor. Thus, the familiar problems of individuating such possible objects arise.

Third, the account faces a problem by making a propositional object truth-conditionally dependent on the entire context. The problem, noted by Heim (1982), arises when some of the assumptions represented by the context are false. As long as such assumptions do not involve the resolution of the context-dependencies displayed by the sentence, they won't affect the ability of the sentence to be true. Thus, (109) repeated here as (111a) can be continued by (111b):

(111) a. Sue believes that someone broke into the apartment. She believes that she forgot to lock the door. She moreover believes that he stole the silver. Mary believes that too (but not that Sue forgot to lock the door).
b. What Mary believes is true.

The way the relative truth-conditional independence of a content from a context needs to be accounted for is obvious: only some of the information in the context should matter for the truth conditions of the proposition, namely only information involving anaphora. Thus, in the case of (111a), only information in the context related to the antecedent of *he*, namely that someone broke into the apartment, should be used for the truth conditions of the proposition expressed by *that he stole the silver*, not the information that Sue forgot to lock the door.

This requires giving up a construal of contexts as sets of possible worlds or sets of world-assignment pairs. Each world represents all the information there is and thus a set of worlds does not allow a separation of individual facts. The problem is in no way

diminished when worlds are replaced by situations. When contexts are represented by sets of situations, still each situation will represent all the assumptions defining the context, and hence there will be no way of isolating one assumption from another. The problem thus is a general one that arises whenever contexts are represented by sets of truth-supporting circumstances. In order for different units of information to be separable within a context, the content of the context must have a structure in which at least the contributions of different sentences are separated and can be distinguished from each other as to whether or not they involve information about the anaphor in question.

On a possible worlds view, this could be achieved by taking contexts to consist of various propositional objects. The content of a sentence with an unbound anaphoric pronoun is then truth-conditionally dependent on only those propositional objects in the context which do not include all possible assignments of objects to the variable representing the pronoun.

There is another way of representing contexts as sets of separate units allowing for the identification of the contribution concerning a pronoun, and that is by representing it as sets of structured propositions. We have seen that there are independent reasons for using sets of structured propositions for representing contexts. One of them was that contexts represent the content of propositional attitudes that should not be closed under logical equivalents. The other motivations came from presuppositions requiring a notion of active context which is best represented as a set of structured propositions. Structured propositions moreover can easily be distinguished as to whether they contribute to the evaluation of an anaphoric pronoun. However, using structured propositions requires a particular way of dealing with anaphoric pronouns semantically. Let me therefore lay out more extensively a conception of structured proposition.

6. Structured contexts and structured propositions

6.1. The general view

The account that I want to give uses structured propositions and structured context in the following way:

(112) a. Sentence meanings are context-independent structured propositions and contexts are sets of structured propositions.
b. Only one notion of context is required and that is a global structured context.
c. Truth and acceptability conditions for structured propositions are relative to a

context in that they may take certain propositions in the context into account.

d. Attitudinal and modal predicates take structured propositions as arguments whose acceptability in the discourse depends on related attitudinal or modal structured propositions in the context.

e. The only kind of context change there is consists in adding structured propositions to a structured context.

Let me first say a few things about the notion of structured proposition and its motivations before turning to the notion of structured context.

Structured propositions constitute an alternative of representing contents to sets of truth-supporting circumstances, such as sets of possible worlds or situations. The problem with the latter notion is that it takes belief states to be closed under logical consequences or at least certain kinds of consequences (depending on whether propositions are construed as sets of possible worlds or sets of situations) (cf. Soames 1988). Structured propositions are composed of the meanings of the elementary constituents of the sentence, mirroring the syntactic structure of the sentence. Structured propositions are generally construed as n-tuples consisting in the simplest case of an (n-1)-place property and n-1 arguments, or more generally semantic operations and their arguments. The structured proposition corresponding to *John likes Mary*, for example, is <LIKE, John, Mary> (or some variety of it involving modes of presentations), where LIKE is the property expressed by *likes*. With structured propositions, the problem of closure of logical consequences is avoided in that meaningful aspects of the syntactic structure of the sentence cannot be disregarded when replacing one proposition by another.

The idea underlying structured propositions can I think best be put in this way: rather than applying semantic operations to the meaning of constituents in a sentence to evaluate the sentence as true or false, the operation and its arguments are listed separately to form the content of a sentence. Alternatively, rather than collecting the truth-supporting circumstances (possible worlds or situations) that result from applying the semantic operations, the conditions are made explicit that define those circumstances. The structured propositions view of content, however, relates to the possible worlds view in that for each structured proposition, there is a set of truth-supporting circumstances associated with it. Thus, the structured proposition <LIKE, John, Mary> is associated

with the set of worlds in which the extension of LIKE includes the pair consisting of John and Mary.

Thus, the structured-propositions account need not only specify what the structured propositions are that are denoted by sentences, but also under what conditions such structured propositions are true. This means that semantic properties of expressions can in principle be accounted for at either of two levels: the level of structured propositions or the level of the definition of truth (in a possible world) for a structured proposition.

Given the general idea of structured propositions being lists of semantic operations and their arguments, it is rather straightforward to specify structured propositions also for sentences other than simple ones with referential NPs.

Connectives can be treated as functions applying to propositions. Thus, for conjunctions with two conjuncts denoting the propositions p and q, we will have a proposition of the form <CONJ, p, q>, which is associated with a set of worlds by the condition in (113):

(113) For structured propositions p and q,
<CONJ, p, q> is true in a world w iff the value of CONJ at w for the pair of the values of p in w and q in w is truth.

For conditionals, we will have a proposition of the form <IF-THEN, p, q>, with whatever truth conditions one might want to assume. In the case of indicative conditionals, we will have propositions of the form <IF-THEN, THE KNOWN FACTS, p, q> with the truth conditions along the lines of (114):

(114) For structured propositions p and q,
<IMPL, THE KNOWN FACTS, p, q> is true in a world w if for some w' THE KNOWN FACTS^{w} maximally close to w such that p is true in w', q is also true in w' relative to c.

With structured propositions, quantifiers are best treated as generalized quantifiers, that is, relations between sets, one corresponding to the restriction of the quantifier and the other one to the scope. *Every*, for example, will be treated as the relation EVERY which holds between two sets A and B just in case B includes A. In the structured proposition, restriction and scope will be represented by properties. Thus, *everybody came* will be associated with the proposition <EVERY, PERSON, CAME>, which corresponds to a set of worlds by the condition in (115):

(115) <EVERY, PERSON, CAME> is true in a world w iff the extension of EVERY in w includes <PERSON^{W}, COME^{W}>.

(115) accounts only for the simplest case of quantificational sentences, namely where the arguments of the quantifier are simply the verb and the noun denotation. For constructions with several quantifiers, some mechanism to account for scope has to be introduced, by either quantifier raising or some alternative. Another complication arises when bound variable pronouns are involved, as in (116):

(116) Every man believes that he is great.

This requires a different treatment of quantifier restriction and quantifier scope which I will come to below.

6.2. The treatment of unbound anaphora

Let us turn to the treatment of unbound anaphora based on structured contexts and structured propositions. Here a very different treatment is required than on standard dynamic accounts. Consider (117):

(117) Sue believes that someone broke into the apartment and that she forgot to lock the door. She believes that he stole the silver.

The structured context set up by the first sentence of (117) could not include variable assignments to be taken over by the proposition expressed by the embedded sentence *he stole the silver* in the second the sentence. For anaphora in the complement of an attitude verb, variable assignments have to be tied to the relevant belief alternatives because the assignments may have to take merely possible objects in belief worlds as values and objects only believed to have certain properties. Thus, in (117), the variable assignments cannot be separated from the possible worlds described by both *someone broke into the apartment* and *she forgot to lock the door*. But the belief alternatives include all the information given by the context (representing the information about the described agent's beliefs), for example in (117) also the information that Sue forgot to lock the door. This in turn means that the proposition must take over the variable assignments together with the belief alternatives that include all the information about the belief that

has been given. But instead of that, the proposition should take over from the context only the conditions associated with the antecedent of the anaphor.

An alternative treatment of the antecedent-anaphor relation to variable assignments is by evaluating pronouns as well as indefinites as particular kinds of objects that act in a way similar to variables, namely as what in Situation Semantics is called *parametric objects* (Gawrson/Peters 1990). Similar kinds of objects that have been proposed for the same or related purposes are pegs (Landman 1986, Groenendijk/Stokhof/Veltman 1996), arbitrary objects (Fine 1984) or discourse referents (Karttunen 1974). Parametric object are governed by discourse-related conditions: indefinite NPs always introduce new parametric objects, whereas pronouns refer to given ones. Parametric objects can have all the properties ordinary objects can have. What is crucial about them is that they ultimately serve only to be replaced by actual objects: they act as place holders to be filled in by actual objects in order for the content in which they occur to be true. For a content with a parametric object to be true, no parametric object has to be found in the world; the truth conditions of the content rather involve only actual objects.

Parametric objects are required within any structured propositions account for reasons just explained. But they ultimately are needed also for any dynamic account making use of variable assignments (Groenendijk / Stokhof / Veltman 1996). This is because the dynamic account should ultimately eliminate reference to variables as part of the language in the interpretation and allow for the reuse of quantifier (and thus should not have the interpretation of an individual sentence dictate how the subsequent discourse should look like). But once parametric objects are introduced, it seems, the semantics of pronouns can be reformulated in a static way and the dynamic part can be relegated entirely to the truth conditional evaluation of contents with parametric objects.

Structured propositions as the content of sentences as well as part of a context will take the form <P, .., x,...>, where x is a parametric object representing an indefinite NP or a pronoun. The structured proposition expressed by *he stole the silver* in (111) then will be {<STEAL, x, the silver>} and its context will be {<BREAK IN, x, the apartment > <PERSON, x>, <FORGOT TO LOCK, Sue, the door>}.

Parametric objects may seem problematic when taken as real objects, but not so, it seems, given the separation of the representation of content and truth conditions within the structured-propositions view. Structured propositions represent a way of evaluating a sentence as true or false, and using parametric objects simply captures the possibility that some NPs contribute to the meaning of a sentence in a way dependent on other parts of the sentence. As other constituents in a structured proposition depend for the evaluation of the structured proposition on a function assigning them an extension, parametric

objects also require a function, a function, though, that correlates them with objects only in relation to the context in which they occur.

Parametric objects thus fit into a two-level view of meaning which separates the contribution of the constituent to the content from the way it is evaluated for the purpose of assigning the sentence a truth value. In the case of a sentence, the representation of its content is separated from its truth conditions; in the case of an anaphoric pronoun, its representation in a content is separated from its reference conditions.

Structured propositions containing parametric objects are not truth-conditionally complete, but still they can act as the 'complete' cognitive content of a propositional attitude as can be seen in (118a) and (118b):

(118) a. Sue thinks that if she leaves the door open, someone might come in. She fears that he might wake her up.
b. Sue thought that someone might pass by. The thought that he might be able to help her gave her relief.

In (118a), the object of fear is only about Sue's waking up, not her leaving the door open or someone's coming in. The latter, though, forms the background of the fear. In (118b) the object of Sue's relief is a possible help, not that someone might pass by.

Structured propositions with parametric objects are truth conditionally incomplete contents in a way parallel to presuppositional structured propositions. The truth of a presuppositional content also depends on the truth of another proposition; but at the same time, a presuppositional structured proposition forms a complete cognitive content.

On the structured propositions view of both presuppositional sentences as well as sentences with anaphoric pronouns, meaning is entirely static, but truth and appropriateness conditions for meanings take a quasi-dynamic form.

Let us then turn to the formulation of the truth conditions of parametric structured propositions. Under what conditions is a context-dependent structured proposition, for example {<STOLE, x, the silver>} true in a world w relative to a context such as {<BREAK IN, x, the apartment>, <PERSON, x>, <FORGOT TO LOCK, Sue, the door>}? Obviously, if in w, there is an object *a* that can be assigned to x such that <STOLE, *a*, the silver> is true in w and <BREAK IN, *a*, the apartment> and <PERSON, *a*> are true in w. The existential force of the indefinite, thus, comes in as part of the specification under what conditions a structured content is true. The structured proposition <FORGOT TO LOCK, Sue, the door> will not play a role at all for the truth of {<STOLE, x, the silver>} because it does not contain the parametric object x.

With structured propositions, the identity problem for propositions is accounted for because structured propositions can be shared as the objects of propositional attitudes of different agents even when the contexts the attitudes relate to are different. Moreover, the truth of such shared contents will not depend on the truth of all the propositions in the relevant contexts, but rather only on those that involve the same parametric object. Irrelevant facts will be disregarded.

The definition of the truth of a proposition p with parametric objects, thus, requires only those facts in the relevant context to be true that involve the same parametric objects. Thus, for simple propositions, we have the following definition of context dependent truth:

(119) For a property P and a parametric object x,
<P, x> is true in a world w relative to a context c if there is an anchoring function f such that for all propositions in c of the form <P', x>, <P, f(x)> is true in w and <P', f(x)> is true in w.

For the definition of truth of a structured proposition that is the object of a propositional attitude, all those propositions that are part of the context need to be true which represent the content of the relevant background attitude and involve the same parametric object. Thus, for simple belief reports, we will have:

(120) For an agent a, a property P and a parametric object x,
<BELIEVE, a, <P, x>> is true in a world w relative to a context c if there is an anchoring function f such that for every proposition of the form <P', x> such that <BELIEVE, a, <P', x>> ∈ c, <P', f(x)> is true in w and <P, f(x)> is true in w.

Similar truth conditions obtain for conjunctive modal subordination:

(121) For a property P and a parametric object x,
<MIGHT, <P, x>> is true in a world w relative to a context c if there is an anchoring
function f such that for every proposition of the form <P', x>, whereby <MIGHT, <P', x>> ∈ c, <P', f(x)> is true in w and <P, f(x)> is true in w.

Besides unbound anaphoric pronouns, there are also bound anaphora, as in (122):

(122) Every man believes that he is great.

Parametric objects can be used also for representing bound anaphora, as in (116). The proposition expressed by (116) will then take the form in (123), where λ is an abstraction operator mapping a parametric object and a parametric proposition onto a property:

(123) <EVERY, λx[<MAN, x>], λx[BELIEVE, <GREAT, x>]>.

This may yield an account similar to the one proposed within Situation Semantics, and it would go along with using parametric objects also for referential NPs (Gawron / Peters 1990). Both bound and unbound anaphoric pronouns are thus naturally treated in the same way by using parametric objects.

So far parametric objects have simply been posited as the contributions of unbound and possibly bound anaphora and indefinites to a structured propositions. This still raises the question of what exactly the semantics of indefinite and unbound anaphoric pronouns is.

6.3. The context dependent meaning of definites and indefinites

The ability of indefinite NPs to apparently bind pronouns across sentence boundaries outside its scope and the ability of pronouns to act as bindees is on the dynamic view traced to a discourse-related semantic distinction between the two sorts of NPs. On a view on which both NPs stand for parametric objects, the distinction consists in that indefinite NPs introduce parametric objects not yet in the discourse context, whereas pronouns refer to already present parametric objects.

In order to formulate these two conditions on indefinite NPs and anaphoric pronouns, a notion of context has to be made use of that contains parametric objects, and this context must act as meaning determining, determining the meaning of indefinite NPs and anaphoric pronouns. This does not mean, though, using a context that consists in presuppositional information and thus reintroducing Stalnaker's meaning-determining presuppositional context. Rather a context containing parametric objects can be viewed as an extension of the utterance context which is required independently. The utterance context just has to be extended with parametric objects and specifications as to what parametric objects a speaker intends with the utterance of an anaphoric NP. The required context need not itself contain presuppositional information.

Suppose parametric objects can become part of a context in this sense only by being introduced by an indefinite NP, then the semantics of pronouns does not itself have to make reference to any relation between objects and variables or a syntactic relation between indefinite NPs and pronouns, but rather the pronoun can be viewed as having the same semantics as a deictic or referential pronoun, simply standing for the parametric object in the discourse context that the speaker intends.

Indefinites do not generally introduce pure parametric objects, but also impose restrictions on them, as expressed by the N'. A parametric object introduced by *a man* can be represented by $x_{<MAN, x>}$, which means that it can be assigned those actual objects that fulfill the condition of being a man; that is, for any anchoring function f such that f(x), it must be the case that <MAN, f(x)> is true (cf. Gawron/Peters 1990). There are also parametric objects that depend on other parametric objects, for example the parametric object representing *a man with a dog*. In this case, we have a parametric object of the form $x_{<MAN, x>, <WITH, x, y_{<DOG, y>}>}$.

The semantics of indefinite NPs and anaphoric pronouns then can be formulated as follows, using a meaning-determining utterance context c:

(124) a. $[a\ N]^c = x_{<N, x>}$ for a parametric object x, not occurring in c.

b. $[he]^c$ = the parametric object $x_{<MALE, x>}$ in c the speaker intends with the utterance of *he* in c

Such a meaning-determining utterance context may itself change, namely during the evaluation of a conjunction, conditional, or quantificational sentence where the first conjunct, the antecedent of the conditional, or the restriction of the quantifier may introduce new parametric objects into the context. means there are semantic operatiosn on context

6.4. Truth conditions for complex structured propositions with parametric objects

We can now turn to the most important part of the account, namely truth conditions for structured propositions containing parametric objects, in particular those expressed by *donkey*-sentences. The crucial point is that the truth conditions of structured propositions with parametric objects make use of anchoring functions f replacing parametric objects with actual objects in the structured proposition.

On a structured propositions view, a conjunction of two propositions p and q is represented as <CONJ, p, q>, which, using anchoring functions f, has context-dependent truth conditions as in (123):

(123) For structured proposition p and q,
<CONJ, p, q> is true in a world w relative to a context c if there is an anchoring function f such that p is true in w relative to c and f and q is true in w relative to c and f.

Note that (123) did not have to make appeal to context change.

An indicative conditional, where p and q are the propositions expressed by antecedent and consequent, is represented as <IMPL, THE KNOWN FACTS, p, q> with truth conditions as in (126):

(126) For structured propositions p and q,
<IMPL, THE KNOWN FACTS, p, q> is true in w relative to c if $w \in c$ and for every anchoring function f such that for some $w' \in$ THE KNOWN FACTS^w maximally close to w such that p is true in w' relative to f and c, q is also true in w' relative to f and c.

Again, no appeal has been made to context change. But (126) captures only the universal reading of *donkey*-pronouns in conditionals.

The existential reading, though, can also be accommodated, namely by taking the consequent to be evaluated relative to the context set up by the antecedent and by treating antecedent and consequent like independent sentences. Antecedent and consequent then will be evaluated relative to different context, each, like independent sentences, involving existential quantification over anchoring functions. This gives the following truth conditions:

(127) For structured propositions p and q,
<IMPL, THE KNOWN FACTS, p, q> is true in a world w relative to a context c if for some anchoring function f such that for some $w' \in$ THE KNOWN FACTS^w maximally close to w in which p is true relative to f and c, q is true in w' relative $c \cup \{p\}$.

Let us finally turn to quantificational sentences. Recall that with existential and negative universal quantifiers as in (128a) and (128b), only a weak reading is available:

(128) a. Someone who made a mistake corrected it.
b. Noone who made a mistake corrected it.

This corresponds to the fact that restriction and scope in these two cases stand in a conjunctive relationship. The semantics of conjunctive structured propositions in (125) can then simply be applied to the structured propositions in (129), where Q_{PERSON} is an existential or negative restricted quantifier:

(129) <<Q_{PERSON}>, λx[<CONJ, <MAKE, x, y<MISTAKE, y>>],
λx[CORRECT, x, y>>]>

With universal quantifiers, as we have seen earlier with examples such as (130a) and (130b), both an existential and a universal reading are available:

(130) a. Every man who had a dime put it in the meter.
b. Every student who made a mistake corrected it.

This can be traced to the fact that scope and restriction stand in a relation of implication to each other, which allows for both the weak interpretation in (127) and the strong interpretation in (126). Thus, for (130a) expressing the structured proposition in (131) with an unrestricted one-place quantifier EVERY, there are in principle the same two ways of evaluation available as with conditionals:

(131) <EVERY, λx[<IMPL, <HAVE, x, y<DIME, y>>, <PUT IN, x, y, the meter>>]>

Thus, the existential and the universal reading are treated as fundamentally different in nature for conditional structures. Which of the two evaluations will or can be chosen, depends on lexical or pragmatic aspects of the sentence.

In the case of existential and negative quantifiers, we have a conjunctive relation between restriction and scope, which allows for the same two sorts of evaluations as an conditional structure. However, in this case, the two ways of evaluating the structured proposition yield the same truth conditions.

6.5. The implicit propositions account

If the present account of unbound anaphora is right, then the contents of propositional attitudes may be truth-conditionally incomplete. This itself may not be so problematic as the fact that the contexts on which the truth conditions of a sentence depend are defined as the contents of a propositional attitude. Sentences including those with unbound anaphora seem to be true regardless of whether any agent has any particular propositional attitude.

There is a potential alternative, though, to treating contents as having partly context-dependent truth conditions. It consists in allowing sentences to take implicit propositional arguments which provide antecedent-related information regarding the pronoun. Let me call this the *implicit proposition account*.

The implicit propositional argument generally relates to the rest of the content in a conjunctive fashion. Since such information is always presupposed, it must be marked as background within the structured proposition expressed by the sentence. Thus, the proposition expressed by the second sentence in (132a) will be represented as in (132b), with truth conditions as in (132c):

(132) a. John had a dime. He put it in the meter.
b. <<BACKGR, <HAVE, John, x_{dime}>>, <PUT IN, John, x, the meter>>
c. <<BACKGR, p>, q> is true in w if p is true in w and q is true in w, and false in w if p is true in w and q is false in w.

It is plausible that the implicit proposition is associated with a particular operator in the sentence such as a quantifier, an implication or a modal, since as was noted by Evans, independent sentence are generally subject to a uniqueness condition. Thus, in the case of modal subordination as in (133a), it would be the modal that takes an implicit propositional argument. The antecedent information also here plays the role of a background part in the proposition, as in (133b):

(133) a. Someone might come in. He might steal the silver.
b. <MIGHT, <BACKGR, <COME IN, $x_{<PERSON, x>}$>>, <STEAL, x, the silver>>

Also the existential reading of *donkey*-sentences such as (134a) can be analysed in that way, namley as in (134b):

(134) a. If John had a dime, he put it in the meter.

b. <IMPL, <HAVE, John, x<DIME, x>>, <<BACKGR, <HAVE, John, x<DIME, x>>>, <PUT IN, John, x, the meter>>

The difference between the universal and the existential reading of *donkey*-sentences is thus treated as a matter of either using propositional insertion or not.

The implicit propositions account resembles the E-type account in that it takes propositions expressed by sentences to be truth conditionally complete. But it differs from the E-type account in that the inserted element does not play the role of a part of a full NP requiring the choice of a determiner. Rather it is propositional in content. Another advantage over the E-type account is that such propositional content need not correspond to a syntactically identifiable part in the preceding discourse, but instead is identified as being a maximal presupposition of the speaker or a presupposed background belief of the described agent which involves the parametric object in question. Also the determiner problems of the E-type account are avoided because truth conditions give pronouns together with antecedents maximally wide scope within the proposition.

The proposition-insertion account can also accommodate the Common Source Condition for cross-utterance and cross-attitudinal anaphora. The Common Source Condition can be derived if the insertion of the background part into the proposition is governed by a chain of belief states of different agents that must be linked by common belief states.

7. Conclusions

The notion of context as the content of the speaker's pragmatic presuppositions plays an important role in many semantic theories, both static ones using a proposition-determining notion of context and dynamic ones in which contexts act as the incomplete meaning of the previous discourse and the semantic function of sentences is to operate on such contexts. We have seen, though, that a number of problems arise for both sorts of theories, in particular when they are extended to embedded sentences. They derive both from the way the relation between context and the contribution of a sentence to a context is conceived and from the way contexts are construed.

We have seen that almost all context-related phenomena do not require reference to a particular context for their semantic analysis, but rather make a context-independent, though perhaps context-directed contribution to the propositional content. In particular,

such phenomena cannot be analysed as operations or conditions on a context, either in the proposition-determining or the dynamic sense. Pronominal anaphora constitute the only case where this is not so.

But even in the case of unbound anaphora, the possibility of referring to propositions requires a return to a static view of content, which is best conceived as a structured proposition. Even though structured propositions are static semantic objects, their truth and appropriateness conditions may be dynamic in nature.

Presuppositions, epistemic modals and conditionals, and unbound anaphora require very different treatments within the structured propositions account. Presuppositions (as well as definite 'anaphoric' NPs) make context-independent constributions to a content, which can be formulated as properties of contexts. Epistemic modals and indicative conditionals contribute to a content attributive reference to the 'known facts'. Finally, unbound (and bound) anaphora contribute parametric objects to a structured proposition.

It then appears that dynamic semantic theories, and to some extent more traditional ones using the same notion of context, rest on a number of general mistakes: by identifying the pragmatic effect of assertions with the meaning of sentences in general, by unifying fundamentally different notions of context and the semantics of different context-related phenomena, and finally by construing contexts as sets of truth-supporting circumstances.

But still some important insights remain from the dynamic perspective: contexts as the content of a speaker's pragmatic presuppositions do play some role in the semantics and pragmatics of natural languages, not only primary contexts to which dynamic theories have for the most part restricted their attention, but also secondary and derived context. Such contexts when appropriately conceived, are important for the appropriateness of sentences with presuppositions and the truth conditions of sentences with unbound anaphora.

In the case of unbound anaphora, a number of features of the dynamic account need to be preserved which are missed by the rival E-type account: the use of the notion of (primary, secondary, or derived) context as the content of a propositional attitude (shared assumptions about the world or about another agent's belief state) and the dependence of the evaluation of the anaphor on the overal context in which they occur. It is information in the presuppositional context that is responsible for the evaluation of unbound anaphora, rather than purely formal conditions obtained from the preceding discourse. The role of the presuppositional context moreover can explain the Common Source Condition which is best conceived as an individuation condition on collective belief states that link primary or secondary contexts.

Notes

1 Such a context is sometimes conceived as what is actually shared by speaker and addressee, the common ground. But clearly there are problems with that, since speaker and addressee may not actually share much at all.

2 Stalnaker tries to subsume context in the first sense under context in the second sense. However, this does not seem adequate. As Stalnaker (1996) himself observes, contextual information corresponding to the first notion of context does not change under the addition of the antecedent of a conditional, as in (1):

(1) If I had not uttered this sentence, I would not be noticed.

It is therefore better to keep utterance contexts and dynamic contexts separate.

3 Context change, on Stalnaker's view, is generally a pragmatic process. Stalnaker also allowed semantic rules to apply to a context, though. An indicative conditional, for example, involves a hypothetical change of the context to one in which the antecedent is true, and a conditional speech act (such as *in case you are interested, it is raining*) involves a change of the context to one in which the antecedent is true so that the speech act will be understood as taking place in the new context. Also epistemic modals are supposed to operate on contexts (cf. Stalnaker 1970).

4 As Soames (1982, 1989) points out, there is no way of defining disjunction as a dynamic operation on contexts so that the two disjuncts in both (56a) and (56b) get the right context to operate on.

5 A case that shows the same basic point, but is harder to explain are conditionals in which the antecedent contains the presupposition trigger and the consequent the presupposition satisfying it:

(1) a. I will come if you come too.
b. If you come too, I will certainly come.
(2) a. You may make a mistake if you never repeat it.
b. If you never repeat it, you may make a mistake.

In (1a) and (1b), the presupposition of *too* in the antecedent of a conditional is satisfied by the content of the consequent, and similarly for the presupposition of *repeat* in (2a) and (2b). But this means that the context for the evaluation of the consequent is not the one set up by the antecedent, as any dynamic account would have it. Soames (1982) suggest that in (1a), mere prior mentioning of the presupposed fact by uttering the consequent first may lead to a temporary context that allows for the satisfaction of the presupposition of the antecedent. However, (1b), as well as (2b), shows that temporal order of utterances, rather than truth-conditional order of evaluation, is not at stake either. Thus, the phenomenon needs further investigation. The pragmatic account only provides

an adequate basis for accounting of the data, but does not yet explain it. In general, the pragmatic account of context selection needs to be supplemented by explanations of why contexts are selected in the way they are. In the case of conjunctions, mere temporal order of utterances seems to matter. But in the case of conditionals, more than that is at stake, and, as we have seen, not just the order of truth-conditional evaluation.

6 There is a third question to be asked and that is, can a presuppositional proposition be true without reference to a context and how is the presupposition satisfied then? Clearly, lexical presuppositions need not be satisfied with respect to a context. Thus, that John stopped smoking is true if John smoked before and at the releavnt time ceases to do so, wheteher anyone assumes that John smoked before or not. Perhaps, it makes sense to say that Mary took the exam again is true independent of any context (that is of anyone's propositional attitude), namely just in case is is a truth that Mary took the exam before and that she now takes it. In this case, the context property will be satisfied with respect to the world, not with respect to the set of anyone's beliefs. However, my intuitions in this case are conserably less firm.

7 One might ask the further question of whether it is possible to construe propositions so as to include the presuppositional requirement itself, to the effect that no context dependent conditions of truth and appropriateness are required. For this, it would be necessary to divide a structured proposition into two parts: a background and main part, with the background part being specified. Thus, the presuppositional proposition for Mary took the exam again would be <<B, P, m, t>, <P, m, t'>>. For such a proposition to be the content of a belief the background condition would have to be satisfied with respect to the background of the belief and the main part with respect to the belief in question. A proposition of this sort would be true if both the background and the main part are true and false if the background part is true and the main part is not.

The problem with this proposal is that it would not account for the independence of the presuppositional content representing *again* or *too* from any specific presupposition-satisfying proposition.

8 Another way might try to solve the ignorance problem, suggested by David Lewis (p.c.), is to take attitude reports to involve existential quantification over propositions in a class of propositions characterized by the *that*-clause (propositions each of which relates to a different possible epistemic state). Thus, (59a) would then as in (61) claim that John stands in the belief relation to an element p in the class $C_{\textit{it might be raining}}$, the class of propositions involving an epistemic state, an extension of which supports that it is raining:

(1) $\exists p$ (p $C_{\textit{it might be raining}}$ & BELIEVE(John, p))

This account, though, appears problematic in view of certain linguistic predictions it makes. First, the suggested account yields the wrong result with propositional anaphora as in (2):

(2) John thought that it might be raining and Mary thought that too.

If the *that*-clause in (2) involved existential quantification over propositions, then *it* in the second conjunct would act as an unbound anaphoric pronoun and would have to refer to whatever proposition satisfies the first conjunct. But this would mean that John and Mary's epistemic states are the same, which need not be the case.

The account also predicts scope possibilities for the propositional quantifier that fail to be manifested. Thus, no reading of (3) is available on which the propositional quantifier takes scope over the negation, meaning something like 'some epistemic state — God's state of complete knowledge, for example — fails to be compatible with the possibility that it is raining':

(3) John does not think it might be raining.

9 One might propose that epistemic modals in attitude contexts involve quantification over 'activated extensions' of the epistemic state. *It might be raining* relative to an epistemic state *e* then means that in some activated extension of *e* (ACT-EXT(*e*)) it is raining:

(1) [*it might be raining*] = true relative to e iff ∃e'(e' ACT-EXT(e) & [*it is raining*] is true in e')]

One problem with this view are reports such as (2), which implicitly denies there being an activated extension:

(2) It might be raining, but I would under no circumstances assume that.

10 Such a reading, for some reason is more prominent for indicative conditionals than for epistemic modals.

11 There is clear evidence that the relevant time acts as a parameter of evaluation, rather than as another implicit argument of the sentence. This is that temporal modification of an epistemic modal sentence is hardly possible:

(1) ?? Now it might rain - because now we have the weather report.

12 The term global context has originally been introduced for the initial context to which a complex sentence such as a conditional applies. As such it is then distinguished from the local context set up by the antecedent of the conditional (cf. Heim 1984).

13 The dynamic account cannot handle all cases of modal subordination in the way given in the text, and the cases it cannot handle pose a first problem for the account when extended to embedded sentences. The cases of modal subordination that require a different dynamic treatment belong to what one may call *conditional modal subordination*, as in (1):

(1) a. John might have a dime. He would give it to us.

b. If John has a dime, it would be good. He might give it to us.

Here the second sentences are equivalent to conditionals of the form if *John had a dime, he would (might) give it to us*. On a dynamic view, the second sentence of (1a) must be an operation on some context. However, the context cannot be the context representing the information about what is epistemically possible, since such a context includes alternatives in which John does not have a dime. Rather the context must be a subset of that context, consisting of only those world-assignment pairs satisfying the scope of the modal *John have a dime.*

This means, given the dynamic theory I am presupposing, that the existential quantifier ranging over worlds expressed by *might* acts like a dynamic quantifier, binding the world variable the conditional *would* relates to, or, in other worlds, yielding a set of worlds satisfying the scope of the modal which constitute the set of worlds that also have to satisfy the scope of *would*. Technically, this requires that the modal sentence be translated as a first-order formula with an explicit quantifier ranging over worlds. The dynamic meaning of such a formula then is a context change function as in (2), operating now on contexts construed as sets of world-variable-assignment-object-variable assignment pairs:

(2) $c + \exists w (wRw' \,\&\, \exists x(\text{have}(j, x, w) \,\&\, \text{dime}(x, w))) = \{\langle f, g\rangle \mid \exists k'\exists k (\langle k, k'\rangle \in c \,\&\, g[x]k \,\&\, f[w]k' \,\&\, \{\langle f, g\rangle\} + p \neq \square)\}$

The sentence with *would* in (1a) then basically checks whether the resulting set of world-assignment pairs satisfy the scope of *would*, *he give it to us*, translated as 'give(j, x, us, w)'.

On a semantic dynamic account, conjunctive and conditional modal subordination require two very different logical analyses, none of which can subsume the other: conjunctive modal subordination involves elimination of alternatives from a secondary context consisting of world-variable assignments, whereas conditional modal subordination involves dynamic existential quantification over possible worlds with the resulting assignments representing the relevant conditions. The problem then is that *might*-sentences are made ambiguous between the two analyses, the choice of the analyses being dependent on whether the subsequent sentence relates to the *might*-sentence in a conjunctive or a conditional way. The burden seems to lie on the conditional case. There does not seem to be any other motivation for the kind of dynamic analysis required in this particular case.

The peculiarity of the analysis of conditional modal subordination arises from a general feature of the dynamic account, namely the loss of propositions as objects of reference for embedded sentences. If the scope of *might* were able to refer to a proposition, that proposition could naturally be taken as an implicit argument of *would*, providing the antecedent of the conditional.

14 The Common Source Conditions also manifests itself in modal subordination 'across' the attitudes of different agents, as in the case of conditional modal subordination in (1), which seems to imply that John and Mary have communicated among each other:

(1) John thinks that Bill might come to the party. Sue thinks that Mary would be pleased.

This follows if conditional modal subordination is simply a case of unbouns propositional anaphora.

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There are potential problems with this second alternative, and that is that unbound anaphoric pronouns do not generally behave as existential quantifiers, a problem that is familiar from a version of the E-type account of unbound anaphoric pronouns on which they are replaced by existential quantifiers (cf. Moltmann 1996). Thus, in (46), replacing the pronoun by an existential quantifier leads to a disaster twice if one of the men has more than one daughter:

(46) Every man who has a daughter told the professor she wanted to study with that she is very talented.

Recast from a dynamic perspective, an indicative conditional will express the context change function in (8b), that is, the consequent when applied to the context consisting only of the selected world making the antecedent true, will not lead to the empty context (and thus will be true in it):

b. c + *if* S, *then* S' = { w c | {f([S], w)} + S' ≠ □}

The event-relatedness of propositions might be exploited also for modes of presentations conceived as 'conceptual roles' (cf. Schiffer 1990a). Thus, John and Bill, having different mathematical abilities, may associate quite different modes of presentation with *that 2 + 2 = 4,* but as long as they both believe that 2+2 = 4, they stand in a relation to the same proposition (cf. Schiffer 1990a):

(71) John believes that 2 + 2 = 4.
Bill believes that 2 + 2 = 4.
There is something that John and Bill believe.

Again, this could be accounted for if the modes of presentation are conceived as dependent on the described intenteional state or act and the value of the clause is

construed as a property of intentional states or acts e' with the mode of presentation m(e') associated with the clause being dependent on those states or acts, as in (72):

(72) believe(e, John, λe'[<=, 2 + 2, 4>], m(e')])

The ignorance problem does not arise with presuppositions, and this constitutes a first major difference between anaphora and presuppositions on the one hand and epistemic modals and indicative conditionals on the other hand. Anaphora and presuppositions depend on explicit information (as given by the previous discourse) or at least shared information. By contrast, epistemic modals and conditionals are satisfied with epistemic states that act as implicit arguments, as objects which need not be known to play a part in the meaning of the sentence, but rather act as if they are existentially being quantified over.

<note: In a given sentence, the property of intentional states or acts expressed by the sentence would be related to the concrete state or act that is being described and that can be taken to be the Davidsonian event argument of the attitude verb. Thus, for (59a), we would get an analysis of the form in (67a), where the think-relation implies that its first argument has the property that it takes as its third argument, as in (67b):

(67) a. ∃e think(e, John, λe'[∃e"(e" ACT-EXT(e') & [*it is raining*] is true in e")])
b. for an event e, an agent a and a property P, if think(e, a, P), then P(e) = 1

The *think*-relation then holds between a state of thought e, John and a property of intentional acts or states P just in case e has P and e is a state of thought of John. >

<note: dynamic view of belief reports w.r.t. presuppositions.
A second possibility, made use of by Heim (1992), would be that the *that*-clause embedded under an attitude verb eliminates certain belief states from the list of all possible complete belief states compatible with what the speaker knows about the agent's beliefs, in (15), for example, by eliminating those belief states which do not support that he stole the silver. Then the semantics of a belief sentence would be as in (17), for a sentence S presupposing p:

(17) c+ *John believes that* S = {w | w c and for all w', if w Bel_j w', then S is true in w'}
if for all w c, for all w', if w Bel_j w', then p is true in w'.

But again there are problems with that option. One of them is that such belief states could not possibly contain the information relating to the antecedent of the anaphor, since this is partly information relating to the discourse, rather than the described agent's belief.>

A remark about the use of variables is in order. By using variables (or objects of a similar nature) in the propositions that make up the propositional attitudes, the use of possible objects for the treatment of anaphora in intensional contexts is avoided. But the use of parametric objects raises questions in itself, in particular, how do they behave in a belief contents? Clearly, the particular choice of a particular parametric object should not play a role in the individuation of the content. Note that the same problem arises on an account using assignments. Also there discourse information becomes part of the content of the attitude that is not generally part of what the agent actually believes.

The problem does not arise for the context that determines the object of an attitude. This is because a context has been defined as the content of the pragmatic presupposition of the speaker about the agent and his attitude *and* the way this information has been presented.

One solution to the problem one might propose is that attitude reports involve equivalence classes of contexts and contents, the particular choice of a variable thus not being relevant. But there is a problem with this proposal and that is sentences like (46) with an anaphoric connection between an antecedent outside of an attitude context and an anaphor within the attitude context:

(46) Someone has entered the room. John believes that he is a burglar.

Here, the equivalence classes for John's belief content are constrained by the condition that the variable translating *he* be the same as the variable translating *someone*, but this information can certainly not be part of John's belief. The information about there being a syntactic connection to something outside of the belief context must be disregarded

Another alternative would be to have the context determine a kind of proposition which is independent of linguistic information, for example in (46) just the set of possible worlds in which it is true that someone has entered the room and was a burglar. The problem with this solution is that the pragmatic rule of context change cannot apply to

such a proposition. Contexts and context change involve information about variables, and a proposition that disregards such information cannot change the context in the way it should, in particular when the sentence expressing it contains information about anaphora or antecedents of anaphora.

One remaining solution to the problem then is to distinguish two different belief relations, one relating an agent to the expressed content of a sentence, which includes linguistic information, and another one which relates the agent to a proposition derived from that content which is the actual content of his belief, but does not include any linguistic information. Then, we would have:

(47) For an agent a, a sentence S, and a context c, believe(a, [S]) iff BEL(j, p') for the (or a) proposition p' derived from [S].

The use of the second belief relation with the derived content may be necessary for independent reasons, one being that structured propositions themselves may carry more structure than is actually present in the belief content. Structured propositions mirror the syntactic structure of the sentence, but not all of its structure need to play an individuating role for the actual belief content.

A related solution would be to take the content of the clausal complement to only characterize the actual belief state in such a way that some of the information carried by the content characterizes the belief state, but not necessarily all, and not all of the relevant properties of the belief state need to correspond to anything in the content (cf. Kamp 1990).

<<On the account I have suggested, the context-dependency of epistemic modals and conditionals will be mechanically linked to the described intentional state or act. By existentially quantifying over such states or acts, the ignorance problem is solved, and by construing the value of the *that*-clause as a property of events, the identity problem is taken care of. The reason why John and Mary can be said to think the same thing in (64a) and (64b) then is that they stand in the think-relation to the same property of intentional states or acts.

Using structured propositions, the denotation of a sentence with *might* will be as in (68a) and the denotation of an indicative conditional as in (68b):

(68) a. λe'[<MIGHT, epist(e'), <SICK, John>]
b. λe'[IF-THEN(e', <BE AT THE PARTY, John>, <BE AT THE PARTY, Mary>)]

On this view, MIGHT is a property of propositions relativized to an epistemtic state, and IF-THEN a relation between propositions relativized to an epistemic state (in whatever way the epistemic state then comes in in the evaluation of the relation).>

Accommodation, more generally, is simply a way for the speaker to intend a context that does not all correspond to what he made explicit. From the hearer's perspective, it constitutes ways of figuring out what the speaker's intended context is, on the basis of only partial information. <somewhere else>

In the case of *wish*, similarly, the context will be selected that represents the information about the agent's beliefs and wishes. But the context change rule will affect the context by minimally revising it so as to consistently add the proposition wished to it:

(53) Pragmatic context change rule for *wish*
$cc_{wish}(c, p) = \text{min-rev}_p(c) \approx \{p\}$

<<note: Structured contents now very much resemble discourse representation structures in Discourse Representation Theory (DRT) (Kamp 1981, Kamp / Reyle 1993), with anaphora and their antecedent both basically being treated as variables. Also the difference between anaphora and indefinite NPs is treated in a way similar to DRT: the representation of an anaphor by a variable would have to be subject to a rule that an occurrence of the same variable be found in the context (Familiarity Condition), whereas the translation of an indefinite NPs that an occurrence of the same variable not be found in the context. Besides these similarities, there are many differences, though, between DRT and the present structured-propositions view. >>
<note: Again, this corresponds to the view of DRT, where discourse representation structures are taken to be the objects of propositional attitudes (cf. Kamp 1990).>
<in terms of DRT, if the 'truth' of a partial discourse representation structure requires the satisfaction of all the conditions in the discourse representation structure it is part of>
This then yields an account of the antecedent-anaphor relationship that is quite close to DRT, but provides structured propositions as the content of sentences that are formally independent and truth-conditionally relatively independent of the context.