

# CONVENTIONAL IMPLICATURE<sup>1</sup>

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## 1. INTRODUCTION

The term PRESUPPOSITION is an honorable one, with a respectable, if controversial, history in philosophy and philosophical logic. Such important figures as Frege and Strawson have found it essential to make presupposition a basic notion in their theories. In view of this fact, it is not surprising that linguists should have fastened on the concept when they began to describe those aspects of sentences which seem to be preconditions for successful use or functioning of the sentences in speaking. Beginning with Paul and Carol Kiparsky, a number of linguists have isolated features of sentences that contain certain lexical items or syntactic constructions and identified them as presuppositions of the sentences, propositions which the sentences are not primarily about but which have to be established prior to utterances of the sentences in order for communication to go smoothly. The central theme that runs through the abundant literature on this topic is that presuppositions constitute an aspect of meaning distinct from the kind of semantic content that is the subject matter of ordinary truth-conditional semantics.

<sup>1</sup> This work was supported by the National Science Foundation under grant BNS 76-20307. An earlier version of the first part of the chapter was presented at the Third Annual Meeting of the Berkeley Linguistics Society in February 1977.

We have no quarrel with the idea of recognizing non-truth-conditional aspects of meaning; on the contrary, we are convinced that this is inevitable. But we do take issue with the view that all so called presuppositions are instances of the same phenomenon. We believe that a wide range of different things have been lumped together under this single label and that this fact is, more than anything else, responsible for the continuing controversy about how to analyze presuppositions.<sup>2</sup> To resolve it, we propose to do the sensible thing, namely to divide up this heterogeneous collection and to put the particular cases into other categories of phenomena, such as particularized and generalized conversational implicatures (Grice, 1975), preparatory conditions on speech acts (Searle, 1969), and conventional implicatures.<sup>3</sup> Since something is already known about the nature of these other phenomena, in this way we may actually be able to explain some of the diverse behavior of different things that various linguists have at one time or another called presuppositions.

We begin by giving an example of so called presupposition that we think is a case of particularized conversational implicature, that is, an inference which arises from considerations involving (*a*) what the sen-

<sup>2</sup> This same point has been made in many recent works on the topic, for example, Wilson (1975), Kempson (1975), Boër and Lycan (1976). There is disagreement, however, on what conclusion should be drawn from this. Boër and Lycan take the pessimistic view that the notion of presupposition is entirely misguided. Wilson and Kempson are willing to recognize only very few cases of real "presuppositional phenomena," such as the particle *even*.

<sup>3</sup> An **IMPLICATURE** in Gricean terms means the following. If the uttering of a sentence  $\phi$  in a given context licenses the inference that  $p$  even though the proposition  $p$  is something over and above what the speaker actually says, then he has **IMPLICATED** that  $p$  and  $p$  is an **IMPLICATURE** (or **IMPLICATUM**) of the utterance of  $\phi$ . Grice discusses two kinds of implicatures: **CONVERSATIONAL** and **CONVENTIONAL**. The former sort is ultimately connected with his notion of cooperative conversation, in which the participants observe certain conversational maxims. Conversational implicatures can be divided further into **PARTICULARIZED** and **GENERALIZED** conversational implicatures on the basis of how closely they depend on a particular context of utterance. **CONVENTIONAL** implicatures arise not from the interplay of what is said with conversational maxims, but from the conventional meanings of words and grammatical constructions that occur in the sentence. One typical characteristic of conventional implicatures is that they are **DETACHABLE**, that is, there is another way of saying the same thing which does not give rise to the implicature. Conversational implicatures, on the other hand, are harder to detach because they depend more on the content of what is said and less on how it is expressed. Another difference is that conventional implicatures are **NOT CANCELABLE**; it is contradictory for the speaker to deny something that is conventionally implicated by the sentence he has uttered. Conversational implicatures can always be prevented from arising by being explicitly disavowed. See Grice (1975) for examples and discussion.

tence actually says, that is, its truth conditions, (b) the particular situation in which it is uttered, and (c) Gricean maxims of conversational interaction. In such cases the ordinary truth-conditional account of sentence meaning is in fact perfectly satisfactory and it is misguided to think that the phenomenon in question is evidence for, or to be explained by, some added non-truth-conditional aspect of sentence meaning.

Next we will take up a case of what Grice calls generalized conversational implicature. We show that the so called presupposition can be explained in terms of truth conditions, preparatory conditions on speech acts, and conversational principles. What makes it a generalized rather than a particularized conversational implicature is that the inference in question is not dependent on characteristics peculiar only to certain contexts of utterance.

In both of these cases we argue that the previous analyses, which attribute the phenomenon in question to some special component of sentence meaning called presupposition, are mistaken. Our next step is then to turn to a class of so called presuppositions which we regard as genuine instances of a phenomenon that cannot be accounted for in terms of ordinary truth-conditional semantics and general pragmatic considerations. This class seems to us to fall under Grice's notion of conventional implicature. By way of introduction, we point out some of the differences between conversational and conventional implicatures and discuss the relationship between implicature and felicity. The main objective of our chapter is to show how model-theoretic methods of semantic interpretation can be extended to account for both truth-conditional and conventionally implicated meanings of sentences.

The system that we present here was first outlined in our 1975 Berkeley paper (Karttunen and Peters, 1975) and we have made use of it in our 1976 Chicago paper (Karttunen and Peters, 1976) on indirect questions and in a number of other studies. It is an extension of the system of semantic interpretation developed by Montague in his "Proper Treatment of Quantification in Ordinary English" (henceforth PTQ). In the present chapter, we give a brief summary of its main principles and descriptive apparatus, and then apply it to a number of examples to show how the system can describe some typical cases of conventional implicature that have been called presuppositions. We do not have space to discuss more than a few examples, but we have included in an appendix our complete revised version of Montague's PTQ rules.

## 2. PRESUPPOSITIONS DISBANDED

Let us now turn to a case of so called presupposition that is not a case of conventional implicature and does not provide any clear evidence for the existence of a non-truth-conditional aspect of sentence meaning. It has been said (e.g., in Lakoff, 1970) that subjunctive conditionals, also known as counterfactual conditionals, presuppose the falsity of their antecedent clauses. For example, Sentence (1)

- (1) *If it were raining outside, the drumming on the roof would drown out our voices.*

presupposes that it is not raining outside.

It is indeed true that in most conversational situations the hearer is entitled to assume, upon hearing (1), that the speaker regards the antecedent clause as false. However, it is a mistake to jump from this observation to the conclusion that this fact must somehow be recorded in the semantic description of this particular sentence and that there must be a rule of grammar which accomplishes that. One need not appeal to a counterfactual presupposition in order to explain how the sentence indicates that the speaker believes the antecedent to be false. Note, to begin with, that whenever Sentence (1) is asserted, it will be readily apparent to any listener who understands the sentence that the consequent clause is false. Just by hearing the words clearly, the addressee will immediately recognize that the speaker's voice is not being drowned out. The falsity of the antecedent clause then follows straightforwardly, assuming that the conditional sentence is true. For it is clear, even without going into details about the truth conditions of subjunctive conditionals, that such a sentence cannot be true under conditions where its antecedent clause is true and its consequent clause false. For this reason, the speaker of (1), by overtly committing himself to the truth of what he says, implicitly indicates his belief that his surroundings are free of rain just by choosing such an obviously false consequent clause to utter.

A second important fact about the subjunctive conditional construction is that, besides it being unnecessary to postulate a counterfactual presupposition for a sentence such as (1), it would be incorrect to postulate a general rule to the effect that a subjunctive conditional sentence presupposes that its antecedent clause is false. As a case in point, consider

- (2) *If Mary were allergic to penicillin, she would have exactly the symptoms she is showing.*

This sentence would, if anything, normally tend to suggest that its antecedent clause is true, in contravention of any principle that this construction carries a counterfactual presupposition.

We will shortly come to other examples which can suggest that the antecedent clause is true, and these examples together with Sentence (2) clearly show that subjunctive conditionals do not as a rule presuppose that their antecedent is false, in any sense of presupposing that can be formalized as a part of grammatical theory. Before taking up these other examples though, let us briefly note why Sentence (2) suggests that its antecedent is true. Unlike Sentence (1), (2) has a consequent clause which is obviously true. Therefore the falsity of the consequent clause does not prevent (2) and its antecedent clause from both being true. Moreover, subjunctive conditional sentences are well fitted by virtue of their truth conditions to proposing explanations of known facts, to explaining them on the grounds that the fact stated as the consequent clause follows from the hypothesis stated in the antecedent clause. Of course the known fact is explained only if the hypothesis from which it follows is also true. Therefore, if Sentence (2) is offered as a conjecture as to why Mary has exactly the symptoms she is showing, this has to indicate that at least the speaker does not know the antecedent to be untrue.

Let us now consider some subjunctive conditional sentences whose consequent clauses are neither as blatantly false as that of (1) nor as obviously true as that of (2). For instance, consider

- (3) *If Shakespeare were the author of Macbeth, there would be proof in the Globe Theater's records for the year 1605.*

Certainly it is possible to indicate one's belief that Shakespeare did not write *Macbeth* by uttering this sentence in a context where the Globe Theater's records for the year 1605 have just been searched and found to lack any evidence of Shakespeare's authorship. The existence of this possibility can be explained in a fashion parallel to the explanation we gave of why (1) normally indicates that the antecedent is false. But Sentence (3) does not as a rule indicate that Shakespeare is not the author of *Macbeth*. Such indication occurs only when the sentence is uttered in a particular kind of setting, one where there is reason to believe that the consequent of (3) is false. In a different sort of context, the sentence may indicate that its antecedent could well be true. For example, if Sentence (3) is uttered in the course of speculating about how the authorship of *Macbeth* could be established, where it is not known that the antecedent is false, the sentence indicates that

the speaker does not know whether or not Shakespeare did write Macbeth. In such a context, this sentence behaves somewhat like Sentence (2). Note that the latter sort of context should not be confused with one where it is already agreed that Shakespeare did not write Macbeth, and Sentence (3) is uttered as a way of suggesting how further evidence could be gathered to support this agreed upon proposition. In this sort of context, it is not the uttering of (3) which indicates that Shakespeare did not write Macbeth. Rather, that proposition has been agreed to before Sentence (3) is produced, and so this kind of context provides no evidence for saying that (3) requires the presupposition that Shakespeare did not write Macbeth.

The now-you-see-it-now-you-don't behavior of the supposed counterfactual presupposition is reminiscent of another kind of phenomenon which is by now familiar from the work of Grice—namely, conversational implicature. In the cases where an utterance of a subjunctive conditional sentence indicates that the antecedent clause is false, this conclusion on the hearer's part is necessitated by the need to reconcile the fact, evident in the context of utterance, that the consequent clause is false with the assumption that the speaker is observing Gricean maxims of conversation—in particular the maxim, "Speak the truth!" On the other hand, in the cases where uttering the subjunctive conditional sentence in a given context indicates the speaker's belief that the antecedent might be true, that conclusion is required if the hearer is to reconcile the assumption that the speaker is observing the Gricean maxim, "Be relevant!" with what is known about the truth of the consequent clause of the sentence uttered.

Now certain further consequences flow from our tentative conclusion that no rule associates with the subjunctive conditional sentences a presupposition that the antecedent is false, or for that matter that it is possibly true. Instead the utterance of such sentences conversationally implicates in some contexts that the antecedent is false and in other contexts that the antecedent could be true. Since particularized conversational implicatures like these are highly context dependent, it should be possible to make them come and go by working alterations in the context surrounding the utterance of the sentence. In some cases, these conversational implicatures can be made to disappear by explicitly disavowing them. For instance, a doctor who elaborates on (2) by saying,

- (4) *If Mary were allergic to penicillin, she would have exactly the symptoms she is showing. But we know that she is not allergic to penicillin.*

does not implicate that Mary is, or even might be, allergic to penicillin. The doctor's disavowal of that proposition makes it clear that uttering the subjunctive conditional is simply part of running through the possible causes of Mary's symptoms, not an explanation of them. Likewise, a person who expanded on (3) by saying

- (5) *If Shakespeare were the author of Macbeth, there would be proof in the Globe Theater's records for 1605. Let's go through them once more to make sure we didn't overlook that proof.*

makes it clear that he is not willing to accept that the consequent clause of the subjunctive conditional clause is false, and in that way cancels what might otherwise have been implicated.

Moreover, if a subjunctive conditional clause is embedded as the complement of a higher verb, then even if that higher verb is what Karttunen (1973, 1974) has called a hole to presuppositions the erstwhile counterfactual implicature may be canceled. If I say, for instance,

- (6) *It is unlikely that, if it were raining outside, the drumming on the roof would drown out our voices.*

I in no way suggest that I think it is not raining outside. But the context *It is unlikely that* \_\_\_\_\_ is a hole to presuppositions. For instance,

- (7) *It is unlikely that Mary realizes that John is here.*

presupposes that John is here just as much as

- (8) *Mary realizes that John is here.*

does. In the case of the subjunctive conditional sentence, the reason for the disappearance of the counterfactual implicature in this context is, of course, that the speaker can perfectly well be speaking the truth despite the obvious falsehood of the consequent clause of the embedded conditional sentence. This is so even if the antecedent clause is true, since Sentence (6) does not commit the speaker to the embedded conditional being true.

In summary then, the supposed counterfactual presupposition of subjunctive conditionals is neither present with all subjunctive conditional sentences—for example, (2)—nor does it follow the same laws for projecting presuppositions to complex sentences as the so called factive presupposition of (8) does. The supposed counterfactual presupposition cannot, therefore, be classified in the same group with all

the other presuppositions. However, it behaves exactly as we expect a particularized conversational implicature to behave, which we therefore conclude that it is.

Before leaving the topic of subjunctive conditionals, let us say one further thing to avoid a possible misunderstanding. There is a distinct difference between

(9) *If John were going our way, he would give us a ride.*

and the indicative,

(10) *If John is going our way, he will give us a ride.*

This could conceivably be due to something like a presupposition contributed by the subjunctive mood, though whatever that presupposition is, it is not that the antecedent is false. Perhaps the difference is also due to some characteristic of indicative conditionals lacking in their subjunctive counterparts. By saying (10) I indicate that I think there is a reasonable chance the antecedent might turn out to be true, that is, that there is no good reason to think John is not going our way. In a situation where it is agreed upon or evident that the antecedent clause is false, only the subjunctive conditional can be used. Correspondingly, in a situation where it is evident or agreed upon that the antecedent clause is true, only the indicative conditional is acceptable. If we have already accepted the hypothesis that John is going our way, then we must use the indicative conditional (10) rather than the subjunctive conditional (9) to lay out further consequences of that hypothesis. This suggests to us that indicative and subjunctive conditionals are related to each other in the manner shown in (11).<sup>4</sup>

(11) "If A then B" conventionally implicates:

a. Indicative mood<sup>5</sup>

"It is epistemically possible that A"

b. Subjunctive mood

"It is epistemically possible that  $\neg A$ "

<sup>4</sup> By "epistemically possible" we mean "possible in relation to what is known." A proposition  $p$  is epistemically possible just in case its negation does not logically follow from the set of propositions which are regarded as true. In the case that  $p$  itself is assumed to be true,  $p$  is of course also epistemically possible, while  $\neg p$  is epistemically impossible.

<sup>5</sup> In our view this principle is not in conflict with the fact that indicative conditionals can be used in so-called "indirect proofs," that is, in arguments of the form *If  $\phi$  then  $\psi$ . But  $\psi$  is false. Therefore, not  $\phi$ .* In most cases, of course, a person who puts forth such an argument is well aware in advance that  $\phi$  is false and, therefore, the subjunctive conditional should properly be used. We are forced to say that indirect proofs with an indicative conditional as the key premise involve some pretense or temporary suspension of



In addition, it may well be the case, as Lewis (1973) has argued, that the two kinds of conditionals also have different truth conditions, but that is another matter which we cannot go into here.

We will now turn to another well-known case of so called presupposition, where the analysis originally offered seems as unsatisfactory to us as in the case of subjunctive conditionals. Fillmore (1972), in his paper on verbs of judging, discusses presuppositions associated with a class of evaluative verbs that can be used for reporting what a person said or thought about some situation. In order to save time, we will discuss only one of these verbs, namely *criticize*, and leave it up to the reader to apply similar treatment to the others.

According to Fillmore, a person who says,

- (12) *John criticized Harry for writing the letter.*

presupposes

- (13) *Harry is responsible for writing the letter.*

As evidence he cites that

- (14) *John didn't criticize Harry for writing the letter.*

presupposes Harry's having written the letter, as the affirmative sentence does. As was the case with subjunctive conditionals, the presupposition of a sentence like (12) is not so firmly attached to the sentence that it cannot be canceled. One need only think about sentence sequences like

- (15) *John criticized Harry for writing the letter. Since the letter was actually written by Mary, it was quite unfair of John.*

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belief "for the sake of the argument." Perhaps there is a real rhetorical advantage in doing so, but most likely it is just a matter of dialectic convention. In arguing that a particular proposition is contrary to fact it is customary to start from the supposition that it could be true and, so to speak, "discover" its falsehood only at the end. This is a case of exploiting the conventional implicature that accompanies the indicative conditional, not a counterexample to (11a).

The formula of an indirect proof can itself be further exploited for sarcastic effect, as in *If that is so then I'm a monkey's uncle (the Queen of Sheba, or whatever bizarre)*. The effect of sarcasm is in part produced by the implicature that the antecedent proposition is epistemically possible when in fact the truth of the whole conditional obviously requires that it be false. Note that the feeling of sarcasm disappears if the subjunctive is used instead (*If that were so, then I would be a monkey's uncle*).

Although it is difficult to give any general principle by which one could distinguish true counterexamples from instances where a principle is exploited or flouted, we are convinced that the cases discussed above are of the latter sort as far as (11a) is concerned.

to realize that this presupposition too has the feature of cancelability so characteristic of conversational implicatures. In the case of verbs of judging we want to argue that the so-called presupposition is in fact a generalized conversational implicature, not a particularized one as with the subjunctive conditionals. We will see shortly why this makes a difference.

How might this generalized conversational implicature arise? To answer that question one needs to know what kind of speech act criticizing is, namely the kind that Searle (1975) calls expressive. The essential condition for the performance of an act of criticizing is that the speaker's utterance count as an expression of disapproval of the addressee's involvement in a certain situation. Illocutionary acts of this kind have in general the preparatory condition that the thing towards which the speaker is expressing an attitude must in fact be the case. So, in particular, the act reported by (12) has as a preparatory condition that Harry wrote the letter.

Now the verb *criticize* has a meaning such that the verb is useful for reporting speech acts of just this kind. Unlike some other verbs of judging, it cannot be used performatively for making speech acts of the same kind that it can be used to report; this is merely an idiosyncrasy of the lexical item *criticize*. Now how does it come about that when we report a speech act such as John performed—he may have said to Harry, perhaps in a disapproving tone of voice, “You wrote the letter”—that we usually indicate that Harry did in fact write the letter. The explanation is to be found in what Lewis (1969) has described as a convention of truthfulness and trust prevailing among speakers of a language. Roughly, this says that speakers ought to perform only such illocutionary acts as meet all conditions of felicity and that listeners can trust speakers generally to obey this injunction. Assuming that this convention prevails in a community of speakers, if I report John's speech act by saying (12), then in the absence of further qualification the principle of trust justifies the assumption on the part of my addressee that John's speech act was felicitous. And if it was felicitous, then its preparatory condition had to have been met, that is, the object of John's criticism had to have been responsible for the situation of which John was expressing disapproval. Thus my utterance of Sentence (12) will usually convey that Harry did write the letter.

Of course the convention of truthfulness and trust can be violated on occasion. If I know that John did violate it, even inadvertently and unintentionally, by criticizing Harry for something Harry was not responsible for or which never in fact happened, then to conform to the convention of truthfulness and trust it is incumbent on me to add that

John's criticism was misplaced, lest you, by trusting me, derive a mistaken impression that John's criticism was justified. As a general matter, therefore, you can take it from my saying (12) that Harry wrote the letter, unless I clearly indicate otherwise.

The generation of this conversational implicature is not dependent on particular characteristics peculiar to certain contexts of utterance, as the counterfactual implicatures of subjunctive conditionals were. That is what makes this one a generalized rather than a particularized conversational implicature. It exhibits another feature too that one would expect of a generalized conversational implicature, namely nondetachability. Other verbs that report speech acts differing from that reported by *criticize* just in the strength of disapproval expressed, to wit *chide* and *condemn*, also give rise to the same generalized conversational implicature as *criticize*.<sup>6</sup>

### 3. CONVENTIONAL IMPLICATURE

Let us now proceed to the second topic of this chapter. A large set of cases that have been called presupposition are really instances of conventional implicature. The most obvious examples are those associated with particles like *too*, *either*, *also*, *even*, *only*, and so on. This class also includes the presuppositions of certain factive verbs, such as *forget*, *realize*, *take into account*, and so on, and those that accompany implicative verbs like *manage* and *fail*. Presuppositions of cleft and pseudocleft constructions also seem to be genuine examples of conventional implicature. These are just a few examples; the list could be made much longer. In these cases the notion of there being a rule of the language that associates a presupposition with a morpheme or grammatical construction was on the right track.

As a typical example, let us look at the word *even* in Sentence (16).

(16) *Even Bill likes Mary.*

There are a number of reasons for thinking with Stalnaker (1974) that

<sup>6</sup> One remaining problem is to explain that Fillmore's observation that *John didn't criticize Harry for writing the letter* presupposes just as much as its affirmative counterpart (12) does that Harry is responsible for the letter. The same seems to be true of *Did John criticize Harry for writing the letter?*, *John may have criticized Harry for writing the letter*, and *If John criticized Harry for writing the letter, then Harry is likely to be angry*. In all of these cases, the so called presupposition is cancelable, just as it is in the case of Sentence (12). This leads us to conjecture that we are dealing with a generalized conversational implicature in these cases too, but we are presently unable to explain how it arises. See Rogers (1978) for further discussion.

the word *even* in this sentence plays no role in determining its truth conditions, that the sentence is true in case Bill likes Mary and false otherwise. To say it still another way, as far as the truth-conditional aspects of meaning are concerned, (16) and (17) are equivalent; they express the same proposition.

(17) *Bill likes Mary.*

It is clear, of course, that the presence of *even* in (16) contributes something to the meaning of the sentence. One is entitled to infer from (16) not just that Bill likes Mary but also what is expressed by the sentences in (18).

- (18) a. *Other people besides Bill like Mary.*  
 b. *Of the people under consideration, Bill is the least likely to like Mary.*

By asserting (16) the speaker commits himself to (18a) and (18b) just as much as to (17). If it should happen that (18a) or (18b) is false while (17) is true, the speaker can justly be criticized for having a wrong idea of how things are. Interestingly enough, though, such criticism would normally be rather mild, usually crediting the speaker with saying something that is partially correct. A response to (16) in such circumstances might run *Well yes, he does like her; but that is just as one should expect*. In the contrasting situation, where (17) is false, partial credit would not normally be given even if (18a) and (18b) were true. One would hardly reply to an assertion of (16) in this situation with *Yes, you wouldn't expect Bill to like Mary; as a matter of fact, he doesn't like her*. Stronger criticism is called for because the speaker's principal commitment, which is to the truth of (17), has run afoul of the facts. The milder criticism is warranted only when the principal commitment accords with the facts and the speaker's error concerns one of his subsidiary commitments, to (18a) and (18b). (See Peters, 1977b, for further discussion.)

The disparity just pointed out indicates that the truth of what (16) actually SAYS depends solely on whether Bill likes Mary. Following Grice, we interpret these facts to mean that the propositions expressed in (18) are IMPLICATED by sentence (16), not asserted. Furthermore, these implicatures are CONVENTIONAL in nature. They cannot be attributed to general conversational principles in conjunction with the peculiarities common to certain contexts of utterances; they simply arise from the presence of the word *even*. One indication of the conventional nature of these implicatures is that they cannot be canceled or disassociated from the sentence. A speaker who utters (19), for instance, commits himself to a contradiction.

- (19) *Even Bill likes Mary but no one else does.*

The distinction between the two aspects of meaning in (16) can be brought out even more clearly by considering the meaning of complex sentences such as (20), which contains (16) in an embedded position.

- (20) *I just noticed that even Bill likes Mary.*

Sentence (20) says that the speaker has just noticed that Bill likes Mary. It does not mean that he has just noticed that other people like Mary or just noticed that Bill is the least likely person to do so. In (20), the meaning of *notice* applies only to the proposition that constitutes the truth conditions of (16)—that is, to the one expressed by (17)—not to (18a) or (18b) or to the conjunction of (17) and (18).

Another important fact about the meaning of (20) is that it commits the speaker to the view that (18a) and (18b) are true just as strongly as does Sentence (16). The conventional implicature associated with the complement sentence in (20) is “inherited,” so to speak, by the larger construction in an unchanged form. This example illustrates an important difference in the roles that the truth-conditional part of the meaning and the meaning conventionally implicated play in determining the meanings of larger constructions.

The same point can also be illustrated with examples like (21).

- (21) *If even Bill likes Mary, then all is well.*

It is clear that (21) does not commit the speaker to (17); on the contrary, the conditional suggests that he is unsure of whether (17) is true. In this respect, the meanings of (16) and (21) differ. At the same time, (21) commits the speaker to (18a) and (18b) just as much as (16) does. As in the previous case, the truth-conditional aspect of meaning and the meaning conventionally implicated by (16) have to be distinguished and treated differently by rules that specify the meaning of a complex construction.

This distinction is also important for a pragmatic theory that deals with the ordering of sentences in a discourse. To see why this is so, let us first introduce the notion of COMMON GROUND.

Imagine a group of people engaged in an exchange of talk. At each point in their conversation there is a set of propositions that any participant is rationally justified in taking for granted, for example, by virtue of what has been said in the conversation up to that point, what all the participants are in a position to perceive as true, whatever else they mutually know, assume, and so on. This set of propositions is what we call the common ground or the common set of presumptions (see the definition of “presupposition set” in Stalnaker, 1974). In the course of

the conversation these presumptions may change. Indeed, if the purpose of the conversation is to exchange information, enlarging the common ground may be thought of as one of the participants' goals. When a participant says something, thereby advancing the conversation to a new point, the new set of common presumptions reflects the change from the preceding set in terms of adjunction, replacement, or excision of propositions, depending on the exact relation of what was said to the previous common ground.

It has often been observed that what we here call conventional implicatures play a role in determining the felicity or appropriateness of utterances in conversational settings. As a general rule, in cooperative conversation a sentence ought to be uttered only if it does not conventionally implicate anything that is subject to controversy at that point in the conversation. Since the least controversial propositions of all are those in the common ground, which all participants already accept, ideally every conventional implicature ought to belong to the common set of presumptions that the utterance of the sentence is intended to increment. This observation lies at the heart of many of the definitions of "pragmatic presupposition" found in the literature (e.g., Karttunen, 1973, 1974; Gazdar, 1976).

We believe that the import of conventional implicatures to the pragmatics of discourse arises from the fact that conventional implicatures are not set apart so they can be challenged in a direct way. Challenging them necessitates a digression away from what was actually said. It brings about a disruption in the flow of the discourse, which all parties in a cooperative conversation have an interest in avoiding. For example, consider the case of (16), *Even Bill likes Mary*. Any direct response, such as *No, that's not so! Really? I don't believe it*, will be seen as pertaining only to the proposition that Bill likes Mary, which constitutes the truth conditions of (16). Furthermore, such simple challenges signal tacit acceptance of what the sentence conventionally implicates. If one wishes to take issue with one of the conventionally implicated propositions, one has to spell it out explicitly: *Yes, but no one else does, No, but it would not be at all surprising if he did*. There is no simple way to indicate just the rejection of something that is conventionally implicated. This phenomenon is particularly striking in the case of questions. For example, if the speaker asks *Does even Bill like Mary?* either one of the two casual answers indicates that the answerer is in agreement with what is being implicated. To disassociate himself from these propositions he has to digress from answering the question.

In short, we believe that the well-known connection between con-

ventional implicature and felicity is a phenomenon that can be explained on the basis of the theory we are proposing and further refinement of Grice's COOPERATIVE PRINCIPLE. The main difference between our present approach and the direction taken in most discussions of pragmatic presupposition in earlier literature is that we are content to accept the notion of conventional implicature as primitive and do not attempt to define it in terms of felicity or appropriateness, notions which themselves need clarification. At present we have no answer to questions like "Why is it that there are conventional implicatures?" and "Why are there words like *even* which mean something but which have no effect on truth conditions?" In this chapter we concentrate on presenting an account of HOW this aspect of meaning can be described in an explicit way.

#### 4. DESCRIPTIVE APPARATUS

In order to give an explicit and precise account of the meaning of *even*, and of other elements of language which give rise to conventional implicatures, we need a formal method of semantic description. The most satisfactory one developed so far is Montague's version of model theory. However, it only describes what we have called the truth-conditional aspect of meaning; it is not designed to give any account of conventional implicature. We will explain in a moment how we intend to improve on it after we first say a few words about Montague grammar in general.

One advantage that Montague-style syntactic description has over transformational descriptions is that it makes possible a fairly straightforward technique of semantic interpretation. Each syntactic category (common noun, noun phrase, intransitive verb phrase, etc.) consists of phrases that are either listed in the lexicon (basic phrases) or generated by syntactic rules (derived phrases). A meaning is listed for each basic phrase, and each syntactic rule is accompanied by a semantic rule which assigns to each resulting derived phrase an appropriate meaning constructed from the meanings of its constituent phrases. Montague's semantics is based on the principle of compositionality: The meanings of complex phrases are determined by the meanings of their parts and the particular syntactic rule by which they are derived.

In PTQ (Montague, 1974) meanings are represented by logical expressions. Each phrase of PTQ English has a translation, a corresponding expression of interpreted intensional logic. By "interpreted" we mean that the logical expressions, and hence the English

phrases whose meaning they represent, are systematically related to nonlinguistic objects, such as individuals, truth values, sets, properties, propositions, and the like, in accordance with the principles of model theory. As we mentioned earlier, Montague treated only the truth-conditional aspect of meaning; his system does not give any account of conventional implicature.

To describe the twin aspects of meaning we are concerned with here, we extend Montague's system in the following way. Each English phrase is associated with two expressions of intensional logic. One of these, which we will call the extension expression, is identical to the single translation that Montague would provide. This expression stands for what logicians would call the denotation of the phrase, roughly the things of which the phrase is true. Its sense is the meaning EXPRESSED by the phrase. The second one, the implicature expression, signifies what the phrase conventionally IMPLICATES (if it is a sentence), what it contributes (if it is smaller than a sentence) to the conventional implicatures of sentences having it as a part.<sup>7</sup>

For each basic phrase, the appropriate extension and implicature expression are listed in the lexicon with the phrase. To each phrase derived by means of a syntactic rule, the paired semantic rule (called a translation rule) assigns an extension expression and an implicature expression as a function of the extension and implicature expressions of the phrases from which it is derived. To aid in grasping further details, we will make use of a simple example.

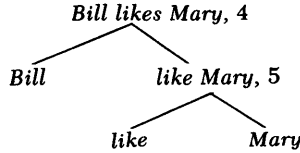
Sentence (17) is derived in the fragment of English Montague described in PTQ from the three basic phrases—*Mary*, *Bill*, and *like*—by means of two syntactic rules, the verb + object rule and the sub-

<sup>7</sup> In translating each English phrase to an ordered pair of formulas, (extension expression; implicature expression), we arrive at a system which is very similar in concept to H. Herzberger's (1973) "two dimensional logic." In Herzberger's semantics each formula is paired with two binary semantic values: a correspondence value and a bivalence value. The former dimension plays the same role as extension expressions in our system; notions like logical consequence and validity are defined solely in terms of correspondence values. Herzberger leaves the semantics of the bivalence dimension quite open. We could think of the bivalence value as being the truth value of our implicature expression. Herzberger's four "composite" semantic values, *T*, *F*, *t*, and *f*, which represent the four possible combinations of correspondence and bivalence values, would therefore correspond to the four possible cases in our system: (a) what the sentence says is true and what it conventionally implicates is true (*T*); (b) what the sentence says is false but what it conventionally implicates is true (*F*); (c) what the sentence says is true but what it conventionally implicates is false (*t*); and (d) what the sentence says is false and what it conventionally implicates is also false (*f*).



ject + predicate rule. The sentence's syntactic structure is displayed as

(22)



(See Montague, 1974, or Partee, 1975, for detailed discussion.)

In explaining how the translation rules function, we shall abbreviate the extension expression assigned to a phrase  $\alpha$  as  $\alpha^e$  and the implicature expression assigned to the same phrase as  $\alpha^i$ . The translation rule correlated with the derivation of *like Mary* from *like* and *Mary*, then, must say how to construct *like-Mary*<sup>e</sup> and *like-Mary*<sup>i</sup> from *like*<sup>e</sup>, *like*<sup>i</sup>, *Mary*<sup>e</sup>, and *Mary*<sup>i</sup>.

The extension expression of *like Mary* is compounded only of *like*<sup>e</sup> and *Mary*<sup>e</sup>; it does not involve the implicatures associated with the two constituent phrases. This is, in fact, a feature of most translation rules, though not of all. Following Montague, we will simply set *like-Mary*<sup>e</sup> equal to *like*<sup>e</sup>( $\hat{Mary}^e$ ); that is, we fill one argument position of the relation *like*<sup>e</sup> with the intension expressed by the noun phrase *Mary* (in intensional logic  $\hat{Mary}^e$  denotes the intension of *Mary*<sup>e</sup>).

Turning to the implicatures, it may not be obvious that sentence (17) implicates anything. For the sake of discussion, though, let us suppose that it implicates three things, arising from the three basic phrases it contains: that Bill is male, that he is acquainted with Mary, and that Mary is female. (This is purely an expository device; we are not really proposing that these are the conventional implicatures introduced by *Mary*, *Bill*, and *like*.)

The conventional implicatures associated with the verb phrase *like Mary* are a slightly more complicated matter than the extension of the phrase. They include on the one hand whatever implicature is introduced by the verb *like*; we are supposing it to be that the affected individual is acquainted with the object of his affection. Another implicature arises from the object noun phrase *Mary*; of this more shortly. But first note that the implicature introduced in Sentence (17) by the verb *like* relates Bill to the extension of the object noun phrase, rather than to what the phrase *Mary* conventionally implicates; Bill is supposed to be acquainted with Mary herself, not merely with her sex. Utilizing our abbreviation *like*<sup>i</sup> for the implicature expression of *like* we can, thus, symbolize this part of the verb phrase's conventional implicatures with the expression *like*<sup>i</sup>( $\hat{Mary}^e$ ).

It may seem that all we need do now is conjoin this implicature with the one, symbolized  $Mary^1$ , arising from the object noun phrase to obtain the conventional implicatures of *like Mary*. Such a maneuver could only be adequate for simple examples such as this one, though; so in the interest of generality we introduce at this point a complication which will not be motivated until after discussion of the present example is completed. We associate with the verb *like* a third expression  $like^h$  (besides  $like^e$  and  $like^1$ ) of intensional logic, which we allow to act on the sense of what the object noun phrase implicates before adding the result to the implicature stemming from the verb. That is, we conjoin  $like^h(Mary^1)$ , rather than  $Mary^1$ , with the expression  $like^1(\hat{Mary}^e)$  obtained in the preceding paragraph.

Thus we want to write something on the order of  $like^1(\hat{Mary}^e) \wedge like^h(\hat{Mary}^1)$  as the implicature expression of *like Mary*. For technical reasons, though, this expression is not well-formed. So we use a variable  $x$  in order to conjoin the two parts of the expression, and set  $like-Mary^1$  equal to

$$\hat{x}[like^1(x, \hat{Mary}^e) \wedge like^h(x, \hat{Mary}^1)].$$

This expresses the property characteristic of precisely those individuals that stand to Mary in the relation conventionally implicated by *like* given that whatever conventional implicature the phrase *Mary* introduces is true.

It is now easy to see how the rule should be stated which assigns the ordered pair  $\langle like-Mary^e, like-Mary^1 \rangle$  as the translation of the verb phrase *like Mary*. In fact let us state both the syntactic rule (numbered 5 by Montague in PTQ) which generates the verb phrase from its constituent phrases, and the associated translation rule.

- (23) If  $\alpha$  is a transitive verb (Montague's Category TV) and  $\beta$  is a noun phrase (Montague's Category T), then  $\alpha\beta$  is a verb phrase (Montague's Category IV), where  $\bar{\beta}$  is the accusative form of  $\beta$ .

*Translation:*  $\langle \alpha^e(\hat{\beta}^e); \hat{x}[\alpha^1(x, \hat{\beta}^e) \wedge \alpha^h(x, \hat{\beta}^1)] \rangle$

Tree (22) records an application of this syntactic rule for the case of  $\alpha = like$  and  $\beta = Mary$ . The translation rule assigns to the phrase generated in this case exactly the extension expression and implicature expression that we argued it should have.

Montague's Rule 4 of PTQ (reproduced here in the Appendix, where we reformulate all his translation rules to take care of conventional implicature as well as truth-conditional aspects of meaning) completes the derivation of Sentence (17), *Bill likes Mary* from the

noun phrase *Bill* and the verb phrase *like Mary*—see (22). The associated translation rule (in our revision) assigns the extension expression and the implicature expression shown in (24).

- (24) a.  $Bill\text{-}likes\text{-}Mary^e = Bill^e(\hat{like}^e(\hat{Mary}^e))$   
 b.  $Bill\text{-}likes\text{-}Mary^i = [Bill^i(\hat{like}^e(\hat{Mary}^e)) \wedge Bill^h(\hat{x}[\hat{like}^i(x, \hat{Mary}^e) \wedge like^h(x, \hat{Mary}^i)])]$

The rule which produces this translation parallels the translation rule just discussed. The extension expression of sentence (17) is compounded of the extension expressions of its subject and verb phrase. From the sentence's extension expression,  $Bill^e(\hat{like}^e(\hat{Mary}^e))$ , it can be seen that the subject noun phrase functions semantically to predicate something of the verb phrase. (See Cooper, 1977, for the motivation of Montague's treatment of noun phrase semantics.) Accordingly, the second conjunct of the implicature expression (24b) shows the conventional implicatures associated with the verb phrase as being inherited by the sentence under the effect of the third expression,  $Bill^h$ , associated with the subject. The first conjunct of the implicature expression represents the conventional implicature contributed by the subject noun phrase *Bill* by predicating that noun phrase's implicature expression of the sense of the verb phrase's extension expression.

Consideration of the interpretation assigned to the logical expressions in (24) would show that the extension expression  $Bill\text{-}likes\text{-}Mary^e$  is equivalent to  $like_*^e(b, m)$ , which more closely resembles the familiar predicate calculus symbolization of sentence (17). Similar consideration would show that, under our expository assumptions (see the Appendix for a formal statement of them),  $Bill\text{-}likes\text{-}Mary^i$  is equivalent to  $male_*^e(b) \wedge be\text{-}acquainted\text{-}with_*^e(b, m) \wedge female_*^e(m)$ .

Now that we have shown how a common variety of translation rule functions to assign extension and implicature expressions to syntactically derived phrases, let us turn to motivating the third expressions such as  $like^h$  and  $Bill^h$ , which were used in constructing the implicature expressions of derived phrases. When one of several phrases that combine to form a larger one functions semantically as a predicate or operator on the meanings of the other phrases (the way a transitive verb does to its object or a sentence-embedding verb does to its complement), then the conventional implicatures associated with those other phrases will in general be inherited by the derived phrase under a transformation that is determined by the predicate or operator. Note that sentences (26a-c), which embed the cleft sentence (25) under different verbs, vary in the mode in which they implicate that someone

tapped Mary's phone, the most salient conventional implicature of (25).

- (25) *It wasn't Bill who tapped Mary's phone.*
- (26) a. *John forgot that it wasn't Bill who tapped Mary's phone.*  
 b. *John hoped that it wasn't Bill who tapped Mary's phone.*  
 c. *John told Sue that it wasn't Bill who tapped Mary's phone.*

Sentence (26a) conventionally implicates everything that sentence (25) does; in particular it commits the speaker to the view that Mary's phone was tapped. In this respect *forget* is similar to verbs like *realize*, *point out*, *discover*, etc. Sentence (26b), in contrast, conventionally implicates only that John believed someone tapped Mary's phone; the speaker of this sentence does not commit himself to the belief's being correct, but only to John's having had it. Besides *hope*, this class includes verbs like *believe*, *suspect*, and *fear*. Finally, sentence (26c) is noncommittal about whether Mary's phone was tapped; it reports only that John told Sue a certain thing, not necessarily the truth.<sup>8</sup> Similar examples with verbs like *say*, *report*, *claim*, etc., are equally noncommittal with respect to the conventional implicatures of the complement sentence.

To deal with such facts, we introduce a heritage function  $h$  which takes as its arguments the extension and implicature expressions of the predicate or operator phrase  $\alpha$  and yields as the corresponding value  $h(\alpha^e, \alpha^i)$  the appropriate transformation (which we have written  $\alpha^h$  for short) to apply to the conventional implicatures of the other

<sup>8</sup> In saying that the conventional implicatures of (25) are not inherited in their original form by (26b) and (26c), we do not mean to deny the fact that in many contexts the utterance of (26b) and (26c) would suggest to the hearer that Mary's phone was tapped. In contrast to (26a), however, this implicature is clearly cancelable in connection with (26b) and (26c); that is, it is a conversational implicature, not a conventional one. In the case of (26c) it arises from the same principle of truthfulness and trust that we discussed earlier in connection with *criticize* (page 10). As far as (26b) is concerned, it conventionally implicates only that John believes that Mary's phone was tapped. If the speaker should know that this belief is false and that the audience is not aware of it, it would be incumbent upon him, by Grice's Cooperative Principle, to indicate how things actually are. If the speaker fails to comment on the matter in a situation where a correction would be in order, the audience can justifiably infer that Mary's phone actually was tapped. A clear sign of the conversational nature of this implicature is the fact that a sentence like *John mistakenly believed that Mary's phone was tapped and he hoped that it wasn't Bill who tapped it* does not give rise to it.

phrases constructed with  $\alpha$ . Thus *forget*<sup>h</sup>(= $h(\textit{forget}^e, \textit{forget}^1)$ ) is something like the identity transformation, *hope*<sup>h</sup> transforms a proposition into an ascription of belief in it, and *tell*<sup>h</sup> transforms every proposition into a trivial one (a truism that requires no commitments).

Referring back to the translation displayed in (24) of the sentence *Bill likes Mary*, note that the verb functions semantically to predicate something of the direct object, as one can see from the extension expression (24a); accordingly it is the verb that, in the implicature expression (24b), determines how to transform the conventional implicatures associated with the object noun phrase into the form appropriate for inheritance by the resulting verb phrase. (We alluded earlier to the fact that the verb *like* occasions no alterations in the implicatures arising from its object; thus *like*<sup>h</sup> is something like the identity transformation.) As we pointed out earlier, the subject noun phrase can be seen in (24a) to predicate something of the verb phrase. Thus the subject is the phrase which determines, via *Bill*<sup>h</sup> in (24b), how to transform the implicatures of the other phrase into the appropriate form; *Bill*<sup>h</sup> specifies, in particular, that it is Bill who is to have the property implicated by the verb phrase (e.g., of being acquainted with Mary). Thus the two heritage expressions *like*<sup>h</sup> and *Bill*<sup>h</sup> in our illustrative example play precisely the role that such expressions play in general.

We will proceed shortly to give a formal description of the conventional implicatures arising from the word *even*, but first let us examine briefly how we could describe the conventional implicatures associated with implicative verbs like *manage* and *fail* with the apparatus under our control. The facts to be described are twofold. For one thing, sentence (27a) is true under exactly the same conditions as (27b); likewise (28a) and (28b).

- (27)            a. *Mary failed to arrive.*  
                   b. *Mary didn't arrive.*  
                   c. *Mary was expected to arrive.*
- (28)            a. *John managed to sit through a Chinese opera.*  
                   b. *John sat through a Chinese opera.*  
                   c. *Sitting through a Chinese opera requires some effort for John.*

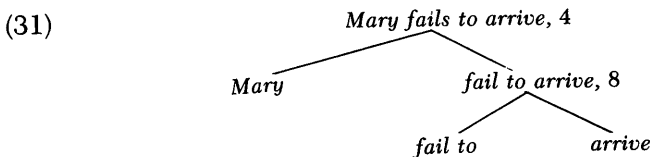
Secondly, asserting (27a) or (28a) commits the speaker to something like (27c) or (28c), respectively, by way of conventionally implicating the latter. One can tell that the (c) sentences are conventionally implicated through considerations like the ones we applied with *even*. Sentence (29a) commits the speaker to (29b) but not to (29c).

- (29) a. *I just discovered that Mary failed to arrive.*  
 b. *I just discovered that Mary didn't arrive.*  
 c. *I just discovered that Mary was expected to arrive.*

Similarly, (30) does not commit the speaker to (28b), but does commit him to (28c) just as much as (28a) does.

- (30) *If John managed to sit through a Chinese opera, he deserves a medal.*

Let us borrow Montague's syntactic rule from PTQ, which generates verb phrases like *fail to arrive* and *manage to sit through a Chinese opera* by combining a verb that takes a special verb phrase complement (*fail to* or *manage to*) with a verb phrase (*arrive* or *sit through a Chinese opera*). This rule is stated in the Appendix (Rule 8), along with our revised version of the associated translation rule. It and the other rules we have just discussed generate the sentence *Mary fails to arrive* with the structural description (31).



The translation rules operating in the fashion we have described assign this structure the following extension and implicature expressions.

- (32)  $Mary\text{-}fails\text{-}to\text{-}arrive^e = Mary^e(\hat{fail}\text{-}to^e(\hat{arrive}^e))$   
 $Mary\text{-}fails\text{-}to\text{-}arrive^1 = [Mary^1(\hat{fail}\text{-}to^e(\hat{arrive}^e))$   
 $\wedge Mary^h(\hat{x}[fail\text{-}to^1(x, \hat{arrive}^e) \wedge fail\text{-}to^h(x, \hat{arrive}^1)])]$

If we require (as a meaning postulate in the Appendix does) that  $fail\text{-}to^e$  be assigned the interpretation essentially of negation, then  $Mary^e(\hat{fail}\text{-}to^e(\hat{arrive}^e))$  comes out equivalent to  $\neg arrive^e(m)$ , and sentence (27a) is true just in case (27b) is. A further assumption concerning the interpretation of  $fail\text{-}to^1$  (the meaning postulate is stated in the Appendix) makes the second conjunct of the implicature expression in (32) imply  $try\text{-}to^e(\hat{m}, \hat{arrive}^e) \wedge \forall y \text{ expect}\text{-}that^e(y, \hat{W} arrive^e(m))$ . The improbability of this formula's first disjunct, which says that Mary tries to arrive, suggests that the second alternative is the one that obtains. Thus (27a) conventionally implicates (27c), while

*My son failed to lift our piano* instead implicates that my son tried to lift the piano.

A similar treatment handles the facts about *manage*. We adopt the meaning postulate  $\hat{\text{manage-to}}^e = \hat{\lambda P} \check{P}$  governing the interpretation of *manage to*'s extension expression; this makes *manage to* vacuous as far as truth conditions go. And we adopt the meaning postulate  $\hat{\text{manage-to}}^i = \hat{\lambda P} \hat{x} \neg \text{easy}^e(\hat{P}\{x\})$  governing the interpretation of the implicature expression; this makes (28a) conventionally implicate that for John to sit through a Chinese opera wasn't easy.<sup>9</sup>

Let us close our discussion of these verbs by pointing out that our analysis predicts an interesting peculiarity of sentence (33).

(33) *Bill managed to catch a fish.*

The feature of particular interest is the specificity or nonspecificity of the indefinite noun phrase *a fish*. The fish which (33) asserts to have been caught—because its truth conditions are just those of *Bill caught a fish*—certainly has to be a specific one. At the same time, there is an ambiguity in what (33) conventionally implicates (roughly: for Bill to catch a fish was not easy). The implicature can either be about a specific fish Bill was angling for, or about fish in general and not any one in particular. The two essentially different ways in which our analysis generates (33), one of them Montague's "quantifying in," correspond to exactly these two meanings. Thus we predict the correct ambiguity in (33), in particular, the interesting fact that the indefinite NP can be specific as far as truth conditions are concerned and at the same time nonspecific for purposes of conventional implicature.<sup>10</sup>

## 5. ANALYSIS OF EVEN

To show how our descriptive apparatus can be adapted to solve a fairly complicated problem, let us return to the word *even*. The analysis we present was first developed in Karttunen and Karttunen (1977), and the insights on which it is based are mostly drawn from the sub-

<sup>9</sup> In many cases of conventional implicature it is difficult to express precisely what is being implicated. Our meaning postulates for *manage*<sup>i</sup> and *fail*<sup>i</sup> are reasonably good approximations but they can undoubtedly be improved with further work. See Coleman (1975) for an interesting discussion. She argues that the implicature associated with *manage* is less specific than what we here take it to be and gives a number of examples which are intended to show that *manage* can implicate a number of things ranging from trying and difficulty to mere unlikelihood.

<sup>10</sup> We are indebted to David Dowty for pointing this out to us.

stantial previous literature on the topic, most notably from Horn (1969), Fraser (1971), Anderson (1972), Heringer (1973), Epstein (1974), Kempson (1975), Fauconnier (1975), and Altmann (1976). These works contain a wealth of observations about the intricacies of this particle. Since it would take too much space to present a formal analysis that would account for all the uses of *even*, we will limit our discussion to a subset of *even* sentences. However, we will also outline how this analysis could be extended to cover the remaining data. The most important limitation is that we only consider cases where *even* "focuses" on a noun phrase—in the sense explained shortly—and where the NP is interpreted *de re* with respect to the particle. That is, we will concentrate on sentences like those in (34). (To highlight the intended reading, we use capitals to mark the focused constituent.)

- (34) a. *Even BILL likes Mary.*  
 b. *Bill likes even MARY.* (=Bill even likes MARY.)

For the moment we leave out of consideration examples of the sort given in (35), where *even* focuses on a constituent that belongs to some other syntactic category, such as verb, verb phrase, adjective, and if-clause.

- (35) a. *Mary even ADMIRES Bill.* [TV-focus]  
 b. *Bill even DRINKS BEER.* [VP-focus]  
 c. *Even INFERIOR coffee is expensive.* [ADJ-focus]  
 d. *Even IF SHE DOESN'T COME,*  
*there will be too many people.* [ADV-focus]

We will return to cases of this sort briefly later on, after we first spell out the details of our analysis for sentences where *even* has NP focus.

Another self-imposed limitation is that we will only consider cases where *even* immediately precedes its focus. In reality *even* can sometimes follow its focus, as in (36a). In case the focused constituent is located inside a verb phrase, *even* typically occurs in the beginning of the verb phrase, as in examples (36b) and (36c). In spoken English, the intended focus of *even* can be marked by stress to reduce ambiguity.

- (36) a. *BILL, even, likes Mary.*  
 b. *Mary even wants to go out with BILL.*  
 c. *John even talked about NIXON in his commencement address.*

Except for the syntactic complications, sentences of this sort are not



problematical for our analysis, and we have no need to consider them here. In the following we therefore adopt the convenient fiction that *even* always occurs in front of the constituent it focuses on.

Before we get down to the formal details of our analysis, it is perhaps useful to discuss the main idea in informal terms. We contend that the implicature associated with *even* in a particular sentence depends on two things: the FOCUS and the SCOPE of the particle. The first of these terms refers to the particular constituent in the sentence with which *even* is associated. The need for this concept can be seen by considering examples (34a) and (34b). *Even BILL likes Mary* implicates, among other things, that some people other than Bill like Mary; *Bill likes even MARY* implicates, among other things, that Bill likes other people besides Mary. In both cases, this "existential" implicature contributed by *even* can be represented roughly as in (37).

- (37) *There are other x under consideration besides*  
*a such that*  $\underbrace{\dots x \dots}_{\text{SCOPE}}$   
 FOCUS

In (37), *a* stands for what we call the FOCUS of *even*: *Bill* in (34a) and *Mary* in (34b). As these examples show, the choice of *even* focus restricts the range of the existential quantifier that implicitly is associated with the particle. By the SCOPE of *even* we mean the open sentence,  $\dots x \dots$  in (37), which is bound by that quantifier. In the examples at hand, this scope sentence can be obtained by deleting the particle and replacing the focused constituent by a variable. Thus in (34a) the scope of *even* is *x likes Mary*; in (34b) *even* has scope over *Bill likes x*. In simple sentences like these, the scope of *even* is determined trivially by the choice of focus. In more complex examples, however, there may be alternative scope assignments with the same focus. For example consider Sentence (38).

- (38) *It is hard for me to believe that Bill can understand*  
*even SYNTACTIC STRUCTURES.*

Although *even* here unambiguously focuses on *Syntactic Structures*, the sentence has two readings, which differ with respect to the understood scope of *even*. On one reading the sentence implicates, among other things, that there are other books about which it is hard for me to believe that Bill can understand them. On this reading *even* has the scope given in (39a). The second reading of (38) gives us the implicature that there are other books that Bill can understand besides *Syntactic Structures*. This interpretation is based on the scope assignment (39b).

- (39) a. *It is hard for me to believe that Bill can understand x.*  
 b. *Bill can understand x.*

Although there undoubtedly is a tendency to interpret *even* with the narrowest possible scope, examples like (38) show clearly that the choice of the focus does not always completely determine the scope of the particle. Therefore we must deal with these matters separately, in spite of the fact that many earlier writers have not done so. (One outstanding exception is Heringer, 1973.)

So far we have discussed only the first of the two implicatures associated with *even*, namely that *there are other x under consideration besides a such that . . . x . . .*. By making use of the concepts of focus and scope, we can now characterize the remaining implicature in an equally general way, although it is a bit harder to put in plain English. Intuitively, (34a) *Even BILL likes Mary* implicates that Bill is an "extreme case," less likely to have the property of liking Mary than any other individual under consideration. Correspondingly, (34b) gives rise to the implicature that Mary is the least likely of those under consideration to be the object of Bill's affection. Schematically this "scalar" implicature of *even* can be represented roughly as in (40).

- (40) *For all x under consideration besides a, the likelihood that . . . x . . . is greater than the likelihood that . . . a . . .*

Here . . . *x* . . . is the open sentence which constitutes the scope of *even*; . . . *a* . . . is the sentence obtained from it by substituting *a* for *x*. As before, *a* stands for the focus of the particle; in cases such as (34), . . . *a* . . . is simply the original sentence without *even*.

As a final illustration of how the existential and scalar implicatures contributed by *even* depend on the focus and the scope of the particle, we sketch our analysis for example (34b):

- (41) *Bill likes even MARY.*  
 Focus of *even*: *Mary*  
 Scope of *even*: *Bill likes x*  
 Existential implicature: *There are other x under consideration besides Mary such that Bill likes x.*  
 Scalar implicature: *For all x under consideration besides Mary, the likelihood that Bill likes x is greater than the likelihood that Bill likes Mary.*

It is interesting to consider the scalar implicature of *even* in connection with examples such as (38). In a case like this, alternative scope assignments—such as (39)—produce a striking contrast in what the focused constituent is supposed to be an extreme case of. The two contrasting scalar implications are given in (42).

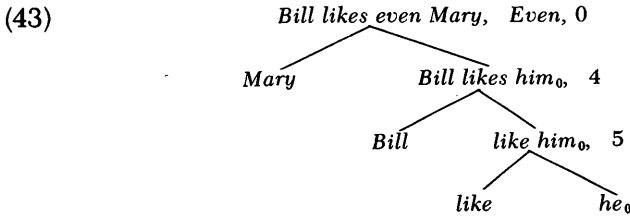
- (42) a. *For all x under consideration besides Syntactic Structures, the likelihood that it is hard for me to believe that Bill can understand x is greater than the likelihood that it is hard for me to believe that Bill can understand Syntactic Structures.*
- b. *For all x under consideration besides Syntactic Structures, the likelihood that Bill can understand x is greater than the likelihood that Bill can understand Syntactic Structures.*

In order to bring out the import of these cumbersome phrases, let us consider the matter in less formal terms. On the wide scope reading of *even*, (38) suggests that *Syntactic Structures* is an easy book to understand; as (42a) says, it is least likely to make me doubt Bill's ability to understand it. The narrow scope reading of *even* in (38) gives us an implicature which suggests exactly the opposite. If *Syntactic Structures* is the least likely work for Bill to understand, as (42b) says, then it probably is a difficult book. The possibility of alternative scope assignments in (38) thus explains the curious phenomenon that this sentence can be understood to implicate what seem like completely opposite things (compare Heringer, 1973).

In the previous section we discussed the conventionally implicated meaning of *even* sentences. We contend, for the reasons explained in Section 3, that this particle makes no contribution to the truth conditions of these sentences: *Even Bill likes Mary* expresses the same proposition as *Bill likes Mary*. Let us now consider the question of how this account of the meaning of *even* can be stated in terms of our formal apparatus.

In order to determine the implicature associated with the particle, we need to know what constituent it focuses on and what scope it has. Here we make the simplifying assumption that the focused constituent is a noun phrase and that it immediately follows the particle. The scope of *even* is an open sentence with a subscripted pronoun (a free variable). Given these assumptions, the natural way to generate *even* sentences in Montague's syntax is by a rule of quantification similar to Montague's Rule 14 in PTQ. The main effect of the rule is to prefix *even* to the focus NP and to substitute the result for the subscripted

pronoun in the scope sentence. Let us call this rule the **EVEN RULE**. (A complete statement of the rule can be found in the Appendix.) As an example of its application, consider the analysis tree (43).



As (43) shows, we treat the particle syncategorematically: The word *even* by itself is not assigned to any syntactic category (see the treatment of *every*, *the*, *a*, and *not* in Montague's PTQ). Furthermore the phrase *even Mary* is not considered to be a constituent phrase either. Given the simplifying assumptions made here, it would of course be possible to let *even* combine with the noun phrase *Mary* to form a derived noun phrase, but this alternative has little to recommend it, considering that in general *even* need not be adjacent to its focus.

Let us now turn to the question of what the corresponding translation rule ought to be. How do we define  $\langle \text{Bill-likes-even-Mary}^e; \text{Bill-likes-even-Mary}^i \rangle$  given the translations of *Mary* and *Bill likes him<sub>0</sub>*? As far as the truth-conditional aspect of meaning is concerned, the matter is simple. Since *even* has no effect on truth conditions and the **EVEN RULE** is essentially a rule of quantification, this part of the translation rule should have the same effect as Montague's T14 in PTQ. For this reason, we have formulated it to give us the result shown in (44).

$$(44) \quad \text{Bill-likes-even-Mary}^e = \text{Mary}^e(\hat{x}_0 \text{ Bill-likes-him}_0^i) \equiv \text{Bill-likes-Mary}^e \equiv \text{like}_x^*(b, m)$$

As for the implicature expression,  $\text{Bill-likes-even-Mary}^i$ , we need first of all to make sure that the conventional implicatures of the focus NP and the scope sentence get inherited in the proper form. This is accomplished by generating the conjunction  $[\text{Mary}^i(\hat{x}_0 \text{ Bill-likes-him}_0^i) \wedge \text{Mary}^h(\hat{x}_0 \text{ Bill-likes-him}_0^i)]$  as part of  $\text{Bill-likes-even-Mary}^i$ . [This is equivalent to  $\text{Bill-likes-Mary}^i$ , as shown in (24b).] To complete our task we only need to augment it with a formula representing the existential and scalar implicatures that arise from the particle itself. For this purpose we introduce in the translation rule a special constant  $\text{even}^i$ , for which we give a meaning postulate in the Appen-

dix. This constant enables us to express the desired implicatures in an optimally concise way, namely as  $even^1(\hat{Mary}^e, \hat{x}_0 Bill\text{-likes-him}_0^e)$ . The complete implicature expression for *Bill likes even Mary* generated by our translation rules is shown in (45).

$$(45) \quad \begin{aligned} Bill\text{-likes-even-Mary}^i &= [[Mary^i(\hat{x}_0 Bill\text{-likes-him}_0^e) \\ &\quad \wedge Mary^h(\hat{x}_0 Bill\text{-likes-him}_0^i)] \\ &\quad \wedge even^1(\hat{Mary}^e, \hat{x}_0 Bill\text{-likes-him}_0^e)] \end{aligned}$$

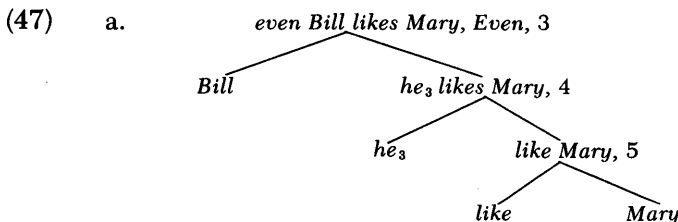
Here  $even^1$  expresses a certain—rather complicated—relation that holds between the sense of *Mary* and the property of being an individual that Bill likes. By virtue of the meaning postulate for  $even^1$  (see the Appendix), the last conjunct of (45) is equivalent to the formula given in (46).

$$(46) \quad \begin{aligned} even^1(\hat{Mary}^e, \hat{x}_0 Bill\text{-likes-him}_0^e) &\equiv \\ &[\forall x[*\{x\} \wedge \neg[x = m] \wedge like_*^e(b, x)] \\ &\quad \wedge \wedge x[[*\{x\} \wedge \neg[x = m]] \\ &\quad \longrightarrow exceed^e(likelihood^e(\hat{like}_*^e(b, x)), \\ &\quad \quad likelihood^e(\hat{like}_*^e(b, m)))]^{11} \end{aligned}$$

The complexity of the right side of (46) reflects the difficulty of expressing precisely what *even* implicates. The easiest way to understand what this formula is designed to say is to compare it with its semi-English paraphrase in (41). The first conjunct expresses the proposition that there are some other individuals under consideration besides Mary whom Bill likes; the second conjunct says that Mary is the least likely individual of those under consideration to be the object of Bill's affection.

As the formulas in (44) and (45) indicate, the translation part of the EVEN RULE correctly accounts for the intuitive meaning of examples like *Bill likes even Mary*. This sentence comes to have the same truth conditions as *Bill likes Mary* and the same conventional implicatures except for the additional implicature which is determined by the focus and the scope of the particle. The same holds for the example *Even Bill likes Mary*, whose derivation and the resulting translation is shown in (47).

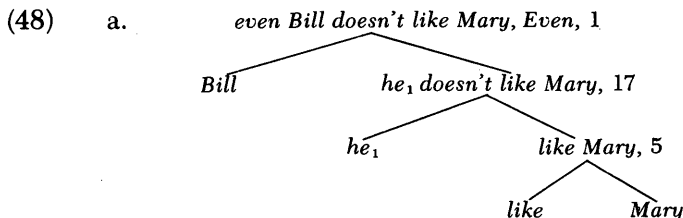
<sup>11</sup> Here \* is a constant (of type  $\langle s, \langle \langle s, e \rangle, t \rangle \rangle$ ) which represents the contextual restriction on things that are being quantified over; it picks out the set of individuals that are "under consideration" on a given occasion. The constant  $likelihood^e$  denotes a (context-dependent) function from propositions to real numbers from 0 to 1;  $exceed^e$  is to be interpreted in the obvious way. The last two constants are used to represent the scalar implicature associated with *even*.



- b.  $even\text{-}Bill\text{-}likes\text{-}Mary^e = Bill^e(\hat{x}_3\ he_3\text{-}likes\text{-}Mary^e) \equiv like_{\hat{x}}^e(b, m)$   
 c.  $even\text{-}Bill\text{-}likes\text{-}Mary^i = [[Bill^i(\hat{x}_3\ he_3\text{-}likes\text{-}Mary^e) \wedge Bill^h(\hat{x}_3\ he_3\text{-}likes\text{-}Mary^i)] \wedge even^i(\hat{Bill}^e, \hat{x}_3\ he_3\text{-}likes\text{-}Mary^e)]$

The last conjunct of (47c) says, in effect, that other people like Mary besides Bill, and Bill is the least likely to do so. This is as it should be.

The fact that the analysis also accounts for negative *even* sentences provides additional support for it. Consider the derivation and translation of *Even Bill doesn't like Mary* in (48).



- b.  $even\text{-}Bill\text{-}doesn't\text{-}like\text{-}Mary^e = Bill^e(\hat{x}_1\ he_1\text{-}doesn't\text{-}like\text{-}Mary^e) \equiv \neg like_{\hat{x}}^e(b, m)$   
 c.  $even\text{-}Bill\text{-}doesn't\text{-}like\text{-}Mary^i = [[Bill^i(\hat{x}_1\ he_1\text{-}doesn't\text{-}like\text{-}Mary^e) \wedge Bill^h(\hat{x}_1\ he_1\text{-}doesn't\text{-}like\text{-}Mary^i)] \wedge even^i(\hat{Bill}^e, \hat{x}_1\ he_1\text{-}doesn't\text{-}like\text{-}Mary^e)]$

As (48b) shows, this sentence comes to have the same truth conditions as *Bill doesn't like Mary*. Because our version of Montague's T17 (see the Appendix) applies negation only to the extension expression, not to the implicatures arising from the constituent phrases, the first conjunct of (48c) is equivalent to the corresponding part of (47c) and hence to  $Bill\text{-}likes\text{-}Mary^i$ . Consequently  $even\text{-}Bill\text{-}doesn't\text{-}like\text{-}$

*Mary*<sup>1</sup> entails, as it should, that Bill is acquainted with Mary. The striking difference in what is conventionally implicated by the two sentences is entirely due to the fact that in (47) *even* has scope over an affirmative sentence, in (48) over the corresponding negative sentence. Given our meaning postulate for the particle, *even*<sup>1</sup>( $\hat{Bill}^e, \hat{x}_1$  *he*<sub>1</sub>-*doesn't-like-Mary*<sup>e</sup>) says, in effect, that there are other people besides Bill who don't like Mary and that Bill would be the most likely person to feel affection toward her (that is, the least likely not to like Mary). Thus (47) and (48) implicate opposite things about Bill.<sup>12</sup> This is reminiscent of Example (38), where a similar phenomenon results from scope ambiguity, from the possibility of applying the EVEN RULE at different points in the derivation of the sentence. (For more examples of this sort, see Heringer, 1973, and F. and L. Karttunen, 1977.)

As we mentioned earlier in connection with the examples in (35), the present treatment of *even* is incomplete because it deals only with cases where the particle has NP focus. In fact *even* can focus on constituents of many other syntactic categories. For example, in (35c) *Even INFERIOR coffee is expensive, even* focuses on the adjective *inferior*. This inadequacy can be corrected without changing any essential features of our analysis. Nothing prevents us from generalizing the EVEN RULE in such a way that phrases of other syntactic categories can be in the focus of the particle. We will not pursue the matter here, however, because the reformulation would require modifications in

<sup>12</sup> It is important to note that this correct outcome is in part due to the way negation is treated in the PTQ syntax. As (48a) illustrates, Rule 17 forms a negative sentence as it combines a subject NP with a verb phrase. In PTQ there is no other way of forming negative sentences, in particular, no rule for adding negation to an affirmative sentence. Since we introduce *even* syntactically by means of a quantification rule that inserts the focus NP into an open sentence, it follows that the existential and universal quantifiers which implicitly are associated with the particle are guaranteed to have wider scope with respect to negation in the same clause. Although this produces the desired outcome in the case at hand, there are examples that show that some rule of "sentential negation" may be needed in Montague's system. For instance, consider a sentence like

- (i) *I hope we don't have to work even on Sundays.*

This obviously expresses the same proposition as *I hope we don't have to work on Sundays*. On the most plausible reading of the sentence, *even* gives rise to the implicature that the speaker considers Sunday to be the least likely day of the week for us to have to work. For this implicature to be generated correctly by our present rules *even* must take scope over the sentence *we have to work on x*. Negation will have to be added by a later rule after *even* and *Sundays* have been quantified in. Note that having *even* take scope over "we don't have to work on x" produces the pragmatically rather implausible implicature that Sunday is the least likely day for us not to have to work.

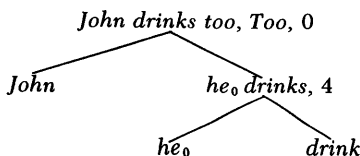




*ther*) and adds a sentence final *too*. In other respects it is similar to our EVEN RULE. (See the Appendix.)

(50) *JOHN drinks too.*

(51) a.



b.  $\text{John-drinks-too}^e \equiv \text{drink}_*(j)$

c.  $\text{John-drinks-too}^i \equiv [\text{John-drinks}^i \wedge \forall x[*\{x\} \wedge \neg[\checkmark x = j] \wedge \text{drink}_*(\checkmark x)]]$

As far as truth conditions go, (50) is equivalent to *John drinks*; this result is expressed in (51b). The implicature brought in by the particle shows up in (51c); *John-drinks-too*<sup>i</sup> entails that there is someone else under consideration besides John who drinks. We will return to this example in the next section.

## 6. COMPOUND SENTENCES

One striking characteristic of conventional implicatures is the manner in which they are inherited by complex sentences from subordinate clauses. Since Langendoen and Savin's 1971 paper several people have given serious study to the rules of inheritance (for example, Karttunen, 1973, 1974; Morgan, 1973; Liberman, 1973; Reis, 1974; Wilson, 1975; Schiebe, 1975; Peters, 1975, 1977a; Soames, 1976; Gazdar, 1976; Hausser, 1976). We have already discussed this problem in Section 4 with regard to embedded sentential and infinitival complements. As we observed, their conventional implicatures are either inherited as such (*know*, *point out*, *discover*, and so on), transformed into implicatures about the beliefs of the subject (*hope*, *believe*, *fear*, and so on), or blocked entirely (*report*, *say*, *claim*, and so on), depending on the kind of verb the complement is embedded under. In our system, this is accounted for in terms of the heritage function, which assigns to every functor phrase a suitable heritage expression that determines what happens to the implicatures of its argument phrases. In the following we discuss compound sentences, sentences formed with connectives such as *and*, *or*, and *if . . . then*. We explain how we propose to account for their conventional implicatures in the framework of our revised PTQ grammar. Those who are familiar with the earlier literature on the topic will notice that the rules in question (see Rules

11–13 in the Appendix) incorporate the same inheritance principles for compound sentences that can be found—in different disguise—in Karttunen (1974) and Peters (1975, 1977a).

Before we embark on this project, let us first review the derivation of compound sentences in PTQ. Montague treats the connectives *and* and *or* syncategorematically: They are not considered to belong to the basic lexicon; instead they are introduced by syntactic rules which form conjoined and disjoined sentences (Rule 11), and verb phrases (Rule 12), and disjoined noun phrases (Rule 13). This feature of PTQ is in itself of no importance—it would be easy enough to do things otherwise—but it has some technical consequences. Since the word *and* by itself has no translation in the system, the heritage function plays no part in determining how the conventional implicatures of a compound sentence like *Bill is an alcoholic and John drinks too* depend on the translations of its component clauses; this is determined solely by the rule that conjoins the two clauses (i.e., Rule 11). Another minor detail, this one a slight inconvenience, is that the original PTQ grammar does not generate conditional sentences at all. Since conditionals are as interesting for us in this connection as conjunctions and disjunctions, we will introduce a new rule that generates sentence adverbials of the form *if*  $\phi$ ; these can then be combined by Montague's Rule 9 with a sentence  $\psi$  to form the compound *if*  $\phi\psi$ . For expository convenience, though, we do not introduce this new rule immediately, but proceed at first as if Montague's Rule 11 generated sentences of the form *if*  $\phi$  *then*  $\psi$  along with  $\phi$  *and*  $\psi$  and  $\phi$  *or*  $\psi$ .

The question that faces us, then, is this: How are the truth conditions and the conventional implicatures of *if*  $\phi$  *then*  $\psi$ , of  $\phi$  *and*  $\psi$ , and of  $\phi$  *or*  $\psi$  related to those of  $\phi$  and of  $\psi$ ? For the truth conditions, we tentatively adopt the traditional position that identifies these English connectives with their standard logical counterparts. Thus we will assign the extension expressions in (52).

- (52) a. *if*– $\phi$ –*then*– $\psi^e = [\phi^e \longrightarrow \psi^e]$   
 b.  $\phi$ –*and*– $\psi^e = [\phi^e \wedge \psi^e]$   
 c.  $\phi$ –*or*– $\psi^e = [\phi^e \vee \psi^e]$

Classical two-valued logic gives us no guidance, however, in deciding what the corresponding implicature expressions ought to look like. This we need to justify by appealing to intuitive judgments alone. Let us first take up the case of *if* . . . *then*. The simplest examples of the relevant sort are sentences such as those in (53).

- (53) a. *If JOHN drinks too, then the bottle is empty.*  
 b. *If the bottle is empty, then JOHN drinks too.*  
 c. *If Bill is not a teetotaler, then JOHN drinks too.*

We pointed out on page 8 that indicative conditional sentences, such as these are, seem to conventionally implicate that their antecedent clause is not known to be false. This implicature is introduced, of course, by virtue of the conditionals being in the indicative mood; it is not inherited from either the antecedent or the consequent clause.

To see what implicatures are inherited, recall that (50) *JOHN drinks too*, where *too* focuses on *John*, conventionally implicates that there is someone else who drinks besides John. Sentence (53a) clearly commits the speaker to this proposition just as much as (50) does. This is a consequence of what appears to be the general rule that a conditional sentence inherits all the conventional implicatures of its antecedent clause. (More examples of this sort can be found in the papers referred to at the beginning of this section.) As a rule, then, we want to make *if- $\phi$ -then- $\psi$*  entail  $\phi^i$ .

Sentences (53b) and (53c) show that the matter is not as simple regarding conventional implicatures that originate in the consequent clause of a conditional. The former sentence seems to suggest that there is someone other than John who drinks; however, (53c) does not implicate this. The difference is obviously due in some way to the fact that in (53c) the proposition implicated by the consequent is entailed by the antecedent clause. The facts deserve a somewhat closer examination and it would be helpful if we had some way of sharpening our raw intuition about what commitments are made in asserting a sentence. One rather good method for assessing what a sentence conventionally implicates is to consider what it would take to assure one that the conventional implicatures of the sentence are true. Karttunen (1973, 1974) considered a wide variety of examples relevant to the inheritance of conventional implicatures (there called pragmatic presuppositions) from the consequent clause of conditionals, and he showed that the antecedent clause can help to assure that the consequent clause's conventional implicatures are true. The generalization that emerged from his study was that a set *S* of hypotheses (such, for example, as those which constitute the common ground—page 13 above) assure the truth of the conventional implicatures of *if  $\phi$  then  $\psi$*  just in case (i) *S* assures that the conventional implicatures of  $\phi$  are true and (ii) *S*  $\cup$   $\{\phi\}$  assures that the conventional implicatures of  $\psi$  are true. [Condition (i) is what requires that a conditional sentence implicate everything its antecedent does—see Peters (1975, 1977a) for

different formulations of the same generalization.] The locution  $S \cup \{\phi\}$  assures that the conventional implicatures of  $\psi$  are true is just another way of saying that, whenever  $\phi$  and every sentence in  $S$  is true, then all conventional implicatures of  $\psi$  are true—that is,  $S$  together with  $\phi$  entails each and every conventional implicature of  $\psi$ . Since  $\phi$  is true just in case  $\phi^e$  is, and since the conventional implicatures of  $\psi$  add up to  $\psi^i$ , clause (ii) just says that  $S \cup \{\phi^e\}$  entails  $\psi^i$ . Given the logical properties of entailment and of the material conditional, this is equivalent to saying that  $S$  entails  $[\phi^e \longrightarrow \psi^i]$ . So Karttunen's generalization boils down to this:  $S$  entails *if- $\phi$ -then- $\psi^i$*  just in case (i)  $S$  entails  $\phi^i$  and (ii)  $S$  entails  $[\phi^e \longrightarrow \psi^i]$ , which in turn clearly holds just in case  $S$  entails  $[\phi^i \wedge [\phi^e \longrightarrow \psi^i]]$ . What this means is that we can equate the conventional implicature of *if  $\phi$  then  $\psi$*  with  $[\phi^i \wedge [\phi^e \longrightarrow \psi^i]]$ . Adding to this the implicature of epistemic possibility discussed on page 8, we have (54).<sup>14</sup>

$$(54) \quad \text{if-}\phi\text{-then-}\psi^i = [\neg K \neg \phi^e \wedge \phi^i \wedge [\phi^e \longrightarrow \psi^i]]$$

Reverting to plain English, what we have seen is that the conventional implicatures of the consequent clause are inherited as conditional propositions by a conditional sentence. In particular, the implicature contributed to (53b) by its consequent clause is

- (55) *If the bottle is empty, then there is someone other than John who drinks*

and the implicature which the same consequent clause contributes to (53c) is

- (56) *If Bill is not a teetotaler, then there is someone other than John who drinks.*

How does this conclusion jibe with our first intuition about what (53b) and (53c) conventionally implicate? In the case of the latter sentence, our naive feeling was that the implicature brought in by *too* disappeared completely from the list of implicatures of the conditional sentence; this is fully in accord with our formal conclusion that the implicature of the consequent clause is transformed into the proposition expressed by (56). The proposition in question is trivially true (given that Bill and John are different people), and therefore committing oneself to its truth is no commitment at all. Indeed, any conven-

<sup>14</sup> As we pointed out in connection with (11), indicative and subjunctive conditionals differ in what they implicate about the epistemic possibility of the antecedent clause. We do not have the means yet to account for this difference formally.

tional implicature of a consequent clause which is entailed by the antecedent clause will be "filtered out" in this manner, the conditional proposition into which it is transformed being necessarily true.<sup>15</sup> It is important to realize that this "filtering" is caused by the semantic relation between the antecedent clause and the implicature of the consequent clause, not by the mere appearance in (53c) of the name *Bill* in the antecedent. Note, for example, that (57) is like (53b) in suggesting that there is someone other than John who drinks.

(57) *If Bill is not present, then JOHN drinks too.*<sup>16</sup>

What of our feeling that (53b) indicates that John is not the only drinker? Does our technical conclusion that (53b) conventionally implicates the proposition expressed by (55) agree with this intuition? The answer seems to us affirmative. We believe that the naive feeling that (53b) conventionally implicates that someone else besides John drinks is partly illusory, stemming from the tendency to assess what commitments inhere in a sentence by the method of imagining the sentence asserted in various contexts. Let us examine more closely what commitments a speaker actually does make by asserting the indicative conditional sentence (53b). One of those commitments is to have adequate grounds for believing the conventional implicatures of (53b) to be true, which according to our analysis includes having adequate grounds for believing that, if the facts should turn out to be such that the antecedent clause is true, then the conventional implicatures of the consequent clause will also be true. What could those grounds be? One conceivable ground might be that the speaker knows that the antecedent clause is false, and knows therefore that this obligation is

<sup>15</sup> We should point out that committing oneself to the truth of a trivality by conventionally implicating it differs in an important way from making that commitment by asserting a trivially true sentence. Because an assertion of a trivial kind may seem utterly pointless at first blush, it can generate conversational implicatures by means of the maxims of conversation—along lines sketched in Grice (1975). Conventionally implicating a trivality while asserting a contingently true sentence, however, will often have a perfectly clear point; the speaker may just wish to avoid incidentally committing himself to any possibly controversial proposition. Therefore, conventionally implicating a trivality will not usually give rise to conversational implicatures in the same way that asserting a trivality will.

<sup>16</sup> Examples of this sort may sound a bit strange in isolation. It requires some mental effort to imagine a situation where it would make sense to say something like (57). Suppose that it has been established that some of the prospective guests at a party use alcohol and the hostess wants to know what to expect of John. In that context, if one knew that John generally drinks but never in the presence of his boss, (57) would be a natural thing to say.

an empty one. This is eliminated as a possibility, however, by the fact that the speaker of (53b) commits himself to not knowing the antecedent clause to be false. It follows, then, that the speaker must allow for the possibility that the antecedent clause could turn out to be true and must have adequate reasons for thinking that, if it does, then the conventional implicatures of the consequent will likewise be true. We can divide this possibility into two cases:

- I The speaker has reasons independent of what the antecedent clause says for thinking that the consequent's conventional implicatures are true.
- II The speaker knows enough about facts attending the particular occasion of utterance to be morally certain that, for the various ways in which the antecedent might turn out to be true (i.e., ways consistent with everything the speaker knows), all of them would also make the conventional implicatures of the consequent clause true.

Case II might obtain, for example, on a typical occasion when Sentence (58a) is asserted.

- (58) a. *If Tommy can name at least three colors, he can name a NONPRIMARY color too.*  
 b. *If Tommy can name at least three colors, then he can name a primary color.*

Anyone who holds the widespread belief that the first color terms learned tend to be names of primary colors is unlikely to take the speaker of (58a) to be implicating that Tommy can name a primary color, despite the fact that its consequent clause clearly does conventionally implicate this proposition. Rather, he would likely assent to the conventional implicature (58b) of (58a) without regard to how many colors Tommy can name. Another example of the same sort is (59a).

- (59) a. *If there is a depression, THE PRESIDENT OF GENERAL MOTORS will lose his job too.*  
 b. *If there is a depression, someone other than the president of G.M. will lose his job.*

Given our factual knowledge about the effects of depression on employment, (59b) is an obvious truth. Its very triviality accounts for the subjective impression which many people have that the implicature contributed by *too* in (59a) disappears completely.

For many sentences, though, including Sentence (53b), it is highly implausible that the speaker could have the kind of knowledge which

Case II requires; then the only way he could be meeting his obligations in speaking is to have adequate grounds for believing the conventional implicatures of the consequent clause to be true, independently of the truth or falsity of the antecedent clause. It is this fact which leads one to feel that (53b) implicates not the proposition expressed by (55), but the stronger proposition that someone else besides John drinks. Thus the rule that produces (54) is evidently the correct one.<sup>17</sup>

<sup>17</sup> If the implicatures of the antecedent clause are inherited in an unchanged form, as we claimed above, conditional sentences exhibit a kind of asymmetry with respect to the inheritance phenomenon. There has been much discussion of this issue in the literature. Karttunen 1973, which was the first paper to address this question, claimed that this asymmetry was characteristic of all compound sentences; that is, in *if  $\phi$  then  $\psi$* ,  $\phi$  and  $\psi$ , and  $\phi$  or  $\psi$  the presuppositions of  $\phi$  were inherited by the compound in an unchanged form while those originating in  $\psi$  were 'filtered' (in effect, changed to conditionals with  $\phi^e$  or  $\neg\phi^e$  as the antecedent). Counterexamples to asymmetric filtering conditions have been presented, for example, in Liberman 1973 (with respect to *or*), Reis 1974 (with respect to *and*), Wilson 1975 (with respect to all connectives), and Soames 1976. Karttunen 1974 acknowledged that *or* was most likely symmetric but retained asymmetry for *if . . . then* and *and*. We take the same position here because we find the counterarguments inconclusive. But contrary to Wilson (1975, p. 37), asymmetry is not "the most important claim" of our theory. It would be a simple matter to replace (54) by

- (i)  $\text{if-}\phi\text{-then-}\psi^i = [\psi^e \longrightarrow \phi^i] \wedge [\phi^e \longrightarrow \psi^i]$ .

This would make the conventional implicatures of  $\phi$  undergo a similar change to those originating in  $\psi$  and this would account for Wilson's judgments (which we disagree with) about sentences like "If all of Bill's friends have encouraged him, he must have friends." Opting for this alternative would obligate us to find a new explanation for the fact that sentences like (53a) intuitively seem to implicate everything that their antecedent clauses implicate, not something weaker, that is,  $[\psi^e \longrightarrow \phi^i]$ , as (i) stipulates.

There is one problematic type of example that in fact has made us consider adopting (i) or something else like it in place of (54). Consider sentence (ii).

- (ii) *I'll leave if YOU leave too.*

This sentence can clearly be used in a situation which involves only two people: the speaker and his addressee. In that case one would not understand (ii) as implicating that the speaker will leave. Under these circumstances (ii) has approximately the force of *I'll leave if you leave with me*. Note that if *too* in (ii) is interpreted as having scope over *x leaves*, then *YOU leave too* implicates that someone other than you is leaving, and so our analysis predicts that (ii) as a whole will implicate this. But as we just observed, no such implication is present in the situation we described. This apparent insufficiency of our treatment could easily be remedied by replacing (54) by (i), in which case the implicature contributed by *too* under the above analysis would be transformed into a triviality (*If I leave then there is someone other than you who leaves*). We do not regard this as desirable, because we think that there is a genuine ambiguity in (ii) with regard to conventional implicature. The preferred reading of (ii) (or at least something close to it) is obtained in our present system by letting *too* take scope over *I'll leave if x leaves*, which

Having discussed the inheritance rules for conditionals at such length, we can deal with conjunctions and disjunctions more quickly. The inheritance rule for conjunctions is stated as (60)—cf. (54).

$$(60) \quad \phi\text{-and-}\psi^t = [\phi^t \wedge [\phi^e \longrightarrow \psi^t]]$$

As far as the inheritance of conventional implicatures is concerned, conjunctions behave exactly like conditionals. This can be seen from the examples in (61).

- (61) a. *JOHN drinks too and Mary doesn't like it.*  
 b. *Bill is not present and JOHN drinks too.*  
 c. *Bill indulges in booze and JOHN drinks too.*

Sentence (61a) obviously commits the speaker to every proposition conventionally implicated by the first conjunct. Examples (61b) and (61c) differ just as the corresponding sentences in (53) do. Note that, although (61c) does commit the speaker to the proposition that there is someone other than John who drinks, it does so because of its truth conditions, that is, by virtue of what the first conjunct—*Bill indulges in booze*—says, not because of *too* in the second conjunct. This can be

gives rise to the implicature that there is some *y* other than you (viz. the speaker himself) such that the speaker leaves if *y* does. Since this is an obvious truth the analysis does account for the fact that on this reading *too* in (ii) gives rise to no absolute commitment by the speaker to leave.

In order to avoid possible misunderstandings we emphasize, however, that we are not rigidly committed to (54) or any other such detail of our theory. What is important to us is that the right inheritance principle, whatever it is, be expressible in our general framework.

One interesting consequence of the asymmetry of 'filtering' of conventional implicatures, depending on whether they originate in the antecedent or the consequent clause of a conditional, is that the rule of contraposition fails to preserve meaning. Clearly

(iii) *If John is at home, then Bill will realize that John is at home*

and

(iv) *If Bill won't realize that John is at home, then John isn't at home*

do not mean the same thing although they do have exactly the same truth-conditions, according to our analysis. Because "filtering" of conventional implicatures is asymmetric, (iv) implicates that John is at home and thus commits its speaker to the proposition that Bill will realize that John is at home; that is, (iv) is a perverse way of saying what *Bill will realize that John is at home* expresses concisely. [Sentence (iv) may have another meaning—reading it as containing "external" negations—which is the same as the meaning of (iii).] Sentence (iii), on the other hand, does not implicate that John is at home, because that implicature of (iii)'s consequent clause is "filtered out"; therefore (iii) means something different than (iv), something which (iii) is in fact quite a concise way of saying. (We are indebted to John Searle for bringing these facts to our attention.)



shown conclusively by embedding (61c) in a suitable larger sentence that differentiates between these two aspects of meaning. For example, consider (62)

- (62) *If Bill indulges in booze and JOHN drinks too, then I will be amazed.*

As we observed earlier, a conditional sentence inherits all of the conventional implicatures of the antecedent clause. Since (62) obviously does not commit the speaker to the view that there is someone other than John who drinks, it shows that this aspect of the meaning of (61c) is not a matter of conventional implicature. What is conventionally implicated by (61c) is the conditional in (63).

- (63) *If Bill indulges in booze then there is someone other than John who drinks.*

Since (63) is an obvious truth, the word *too* in (61c) and (62) does not give rise to any substantive commitment on the part of the speaker.

In stating the inheritance rules for conditionals and conjunctions, that is, (54) and (60), we have postulated a left-to-right asymmetry: The conventional implicatures of the first member of the pair are inherited by the compound sentence in an unchanged form; those of the second member are transformed into conditionals. Contrary to what was proposed in Karttunen (1973), such an asymmetry does not seem to hold for sentences of the form (*either*)  $\phi$  or  $\psi$ —see Liberman (1973), Karttunen (1974), Wilson (1975). Consequently, our inheritance rule for disjunctions is symmetric.

- (64)  $\phi\text{-or-}\psi^i = [[\phi^i \vee \psi^e] \wedge [\phi^e \vee \psi^i]].$

This rule is supported by examples such as those in (65).

- (65) a. *Either JOHN drinks too or I will lose my bet.*  
 b. *Either I will lose my bet or JOHN drinks too.*  
 c. *Either JOHN drinks too or Bill doesn't use any liquor.*  
 d. *Either Bill doesn't use any liquor or JOHN drinks too.*

Examples (65a) and (65b) both suggest that there is someone other than John who drinks. According to (64), they conventionally implicate (66).

- (66) *Either I will lose my bet or there is someone other than John who drinks.*

That this is the correct conventional implicature to assign can be shown by means of an argument similar to the one given on pages 37–39 for inheritance from the consequent clause of a conditional sentence. Rather than repeat that argument here, we will simply note that the proposition expressed by (68) seems clearly to be the correct conventional implicature for sentences (67a) and (67b).

- (67) a. *Either Tommy can name at most two colors or he can name a NONPRIMARY color too.*  
 b. *Either Tommy can name a NONPRIMARY color too or he can name at most two colors.*
- (68) *Either Tommy can name at most two colors or he can name a primary color.*

In contrast to (65a) and (65b), (65c) and (65d) are clearly noncommittal as to whether anybody drinks. According to (64) they conventionally implicate (69)

- (69) *Either Bill doesn't use any liquor or there is someone other than John who drinks.*

Since (69) expresses a trivially true proposition, the particle *too* gives rise to no substantive commitments in these examples.

In concluding this section we would like to emphasize once more that the rules which we have given for generating the implicature expressions of compound sentences<sup>18</sup> are equivalent to the admittance

<sup>18</sup> The implicature expressions of conjoined and disjoined sentences—(60) and (64)—are assigned by Rule 11 of the Appendix, which generates these two forms of sentence. Since that rule does not really generate conditional sentences, we need to make good now on our promise to state the rule generating *if*-clauses as sentence adverbials. Recall that these will be combined with other sentences by Rule 9 of the Appendix to make conditional sentences. The rule we need is stated as (i).

- (i) If  $\alpha$  is a subordinating conjunction (Montague would assign it category  $((t/t)/t)$  and  $\phi$  is a sentence (Montague's category  $t$ ), then  $\alpha\phi$  is a sentence adverbial (Montague's category  $t/t$ ).

Translation:  $\langle \alpha^e (\hat{\ } \phi^e); \lambda q[\alpha^t (\hat{\ } \phi^e) (q) \wedge \alpha^h (\hat{\ } \phi^t) (q)] \rangle$

This rule together with those in the Appendix generates "If Bill is not a teetotaler JOHN drinks too" in the manner shown in (iia), and assigns it the extension expression (iib) and implicature expression (iic).

- (ii) a. if Bill is not a teetotaler John drinks too, 9

If Bill is not a teetotaler, (i) John drinks too

if Bill is not a teetotaler

principles in Karttunen (1974), which was an attempt to develop a pragmatic theory of presupposition. In this connection, it is worth noting that the uncomprehending critique of Karttunen's theory in Katz and Langendoen (1976) is completely incorrect in concluding that no formal theory is possible of how presuppositions of compound sentences are "contextually filtered." The syntactic and semantic rules of our Appendix (and Footnote 18) assign precisely the conditional sort of "presuppositions" that are needed to account for "context-dependent filtering," as we have argued in the preceding pages, with no need for the hand-waving about linguistic performance which Katz and Langendoen indulge in.<sup>19</sup>

- b. *if-Bill-is-not-a-teetotaler-John-drinks-too*<sup>e</sup>  
 = *if*<sup>e</sup> (*Bill-is-not-a-teetotaler*<sup>e</sup>)  
 (*John-drinks-too*<sup>e</sup>)
- c. *if-Bill-is-not-a-teetotaler-John-drinks-too*<sup>1</sup>  
 = [ $\lambda q$  [*if*<sup>1</sup> (*Bill-is-not-a-teetotaler*<sup>e</sup>)(*q*)  
 $\wedge$  *if*<sup>h</sup> (*Bill-is-not-a-teetotaler*<sup>1</sup>)(*q*)  
 (*John-drinks-too*<sup>e</sup>)  
 $\wedge$  *if-Bill-is-not-a-teetotaler*<sup>h</sup>  
 (*John-drinks-too*<sup>1</sup>)]

To obtain equivalence with the extension expression (52a) and the implicature expression (54), we need only adopt the meaning postulates (iii) and require that the heritage function *h* have the values shown in (iv) on *if* and on *if*-clauses, as we clearly are able to do.

- (iii) a.  $\Box[\textit{if}^e(p)(q) \leftrightarrow [\checkmark p \longrightarrow \checkmark q]]$   
 b.  $[\textit{if}^1(p)(q) \leftrightarrow \neg K \neg p]$
- (iv) a.  $h(\textit{if}^e, \textit{if}^1) = \lambda p \lambda q \checkmark p$   
 b.  $h(\textit{if}^e\textit{-}\phi^e, \textit{if}^1\textit{-}\phi^1) = \lambda q [\phi^e \longrightarrow \checkmark q]$

<sup>19</sup> It is not only in their critical remarks that Katz and Langendoen fall seriously into error. For instance, contrary to their claims the account they present does not explain the 'filtering' of the consequent clause's factive presupposition in

- (i) *If Nixon appoints J. Edgar Hoover to the cabinet, he will regret having appointed a homosexual.*

For in the sentence *If Nixon appoints J. Edgar Hoover—who, as we all know, is a homosexual—to the cabinet, he will regret having appointed a homosexual*, into which Katz and Langendoen contend Sentence (i) is somehow pragmatically interpreted, the appositive relative clause does not fall within the scope of the conditional's "hypotheticality" but rather its truth is entailed; thus it will not trigger Katz's heavy parenthesis wipe-out rule. In contrast to their ad hoc and unsuccessful treatment, our rules assign to the original sentence the conventional implicature expressed by *If Nixon appoints J. Edgar Hoover to the cabinet, he will have appointed a homosexual*; this implicature is true if Hoover is a homosexual (and is appointed by Nixon), if Nixon appoints some homosexual—not Hoover—to the cabinet, and under many other conditions as well.

Exactly the principles we have formalized here can also be incorporated in a “classical” semantic theory of presupposition by defining the truth tables for *and*, *or*, and *if . . . then* in a suitable way, as was shown in Peters (1977a). So far as their empirical consequences are concerned, the differences between these two competing approaches are actually more elusive than most people, including the present authors, have assumed. We should briefly point out, in this connection, how close the so-called “strong projection method” incorporated in Kleene’s three-valued truth tables is to the treatment of connectives in Karttunen (1974) and in this paper. Unfortunately, the far-reaching similarities have eluded most people who have written on this topic (e.g., Hausser, 1976).

Kleene’s three-valued truth tables (reproduced from Hausser, 1976) are given in (70) (“#” stands for the third, “indeterminate” truth value).

(70)

$\phi$	$\neg\phi$	$\rightarrow$	1	0	#	$\wedge$	1	0	#	$\vee$	1	0	#
1	0	1	1	0	#	1	1	0	#	1	1	1	1
0	1	0	1	1	1	0	0	0	0	0	1	0	#
#	#	#	①	#	#	#	#	②	#	#	①	#	#

(The truth tables in Peters, 1977a, are identical to these except that the circled values are all #s.)<sup>20</sup>

By the usual semantic definition of presupposition, sentence  $\phi$  presupposes  $\psi$  if  $\psi$  is true whenever  $\phi$  is bivalent (either true or false). One interesting consequence of this definition is that every sentence presupposes the disjunction of itself and its negation. This can be seen from the table in (71). (Sentence  $\phi$  has 1 or 0 as its value just in case  $[\phi \vee \neg\phi]$  has the value 1.)

---

Thus our rules succeed in capturing the variable ways in which the “presupposition” of (i) can be satisfied.

Moreover, it is far from clear that Katz and Langendoen’s device of heavy parentheses can represent the sort of “presuppositions” associated with implicative verbs such as *manage* and *fail*, particles like *even* and *too*, or in fact anything other than existential and factive presuppositions. Yet the former kinds of “presupposition” are filtered in just the same way as the latter, which strongly indicates that they ought to be treated within the same theory of presupposition inheritance. See Gazdar 1978 for other cogent criticisms of Katz and Langendoen’s position.

<sup>20</sup> Peters (1977a) took Karttunen (1974) to be proposing asymmetric filtering of presuppositions with *or* as well as with *and* and *if . . . then*, unlike the interpretation we give here to Karttunen (1974).

(71)

$\phi$	$\neg\phi$	$\phi \vee \neg\phi$
1	0	1
0	1	1
#	#	#

Furthermore,  $[\phi \vee \neg\phi]$  is the “maximal presupposition” of  $\phi$  since it entails every other presupposition of  $\phi$  and is entailed by the sum of all the other presuppositions. Using  $\phi^p$  to abbreviate the maximal presupposition  $[\phi \vee \neg\phi]$  of  $\phi$ , for any sentence  $\phi$ , we have in particular (72).

- (72) a.  $[\phi \longrightarrow \psi]^p \equiv [\phi \longrightarrow \psi] \vee \neg[\phi \longrightarrow \psi]$   
 b.  $[\phi \wedge \psi]^p \equiv [\phi \wedge \psi] \vee \neg[\phi \wedge \psi]$   
 c.  $[\phi \vee \psi]^p \equiv [\phi \vee \psi] \vee \neg[\phi \vee \psi]$

The formulas on the right side of (72) are equivalent in Kleene’s system to their counterparts in (73). (This can be shown easily by making use of familiar rules of inference that hold in this system as well as in classical two-valued logic: De Morgan’s Laws, interdefinability of  $\longrightarrow$  and  $\vee$ , distributivity of  $\wedge$  over  $\vee$ , and vice versa, associativity and commutativity of  $\wedge$  and  $\vee$ .)

- (73) a.  $[\phi \longrightarrow \psi]^p \equiv [\neg\psi \longrightarrow [\phi \vee \neg\phi]] \wedge [\phi \longrightarrow [\psi \vee \neg\psi]]$   
 b.  $[\phi \wedge \psi]^p \equiv [\psi \longrightarrow [\phi \vee \neg\phi]] \wedge [\phi \longrightarrow [\psi \vee \neg\psi]]$   
 c.  $[\phi \vee \psi]^p \equiv [\neg\psi \longrightarrow [\phi \vee \neg\phi]] \wedge [\neg\phi \longrightarrow [\psi \vee \neg\psi]]$

Since  $[\phi \vee \neg\phi]$  and  $[\psi \vee \neg\psi]$  are abbreviated  $\phi^p$  and  $\psi^p$ , respectively, the formulas in (73) merely express the equivalences (74).

- (74) a.  $[\phi \longrightarrow \psi]^p \equiv [\neg\psi \longrightarrow \phi^p] \wedge [\phi \longrightarrow \psi^p]$   
 b.  $[\phi \wedge \psi]^p \equiv [\psi \longrightarrow \phi^p] \wedge [\phi \longrightarrow \psi^p]$   
 c.  $[\phi \vee \psi]^p \equiv [\neg\psi \longrightarrow \phi^p] \wedge [\neg\phi \longrightarrow \psi^p]$

This should make transparent the connection between Kleene’s three-valued truth tables and the present treatment using conventional implicature. The equivalences in (74) correspond to our (54), (60), and (64). (The maximal presupposition  $\phi^p$  is analogous to our implicature expression  $\phi^!$ , the sentence  $\phi$  to our extension expression  $\phi^e$ .) Rule (64) matches exactly with (74c), because of the interdefinability of  $\longrightarrow$  and  $\vee$ . In the other cases there is a difference due to the fact that Kleene’s truth tables “filter” symmetrically in conditionals and conjunctions (where we do not) as well as in disjunctions (where

we do). To make the semantic projection method filter asymmetrically where we do, one would have to replace the circled values by “#” in the tables for  $\rightarrow$  and  $\wedge$  in (70). While linguistic intuition supports asymmetrical filtering, this move would destroy some of the beauty of Kleene’s system by doing away with many of the classical equivalences that he carried over from two-valued logic. Nevertheless, we believe that sentences such as

(75) *If John drinks too, then Bill doesn’t drink*

and

(76) *John drinks too and Bill isn’t a teetotaler either*

show that we are right not to “filter” the presupposition which *too* contributes to these sentences, and that the Kleene “strong projection method” is not empirically adequate as Hausser (1976) contends.

There has been much controversy in the literature about the inheritance of conventional implicatures (presuppositions) under negation. In our discussion—and in restating Montague’s Rule 17 (see the Appendix)—we have assumed that a negative sentence shares all the conventional implicatures of its affirmative counterpart. However, in some instances negation seems to block off the implicatures of the sentence it has scope over. This is evidenced by the fact that discourses such as the following are not perceived as self-contradictory, although in each the second sentence explicitly denies what the first would implicate if its conventional implicatures were unaffected by negation.

- (77) a. *John didn’t fail to arrive. He wasn’t supposed to come at all.*  
 b. *Bill hasn’t already forgotten that today is Friday, because today is Thursday.*  
 c. *Mary isn’t sick too. Nobody else is sick besides her.*

The traditional solution to this problem is to recognize two kinds of negation. In the context of three-valued logic this can be accomplished in the manner shown below.

	a.	$\phi$	$\neg\phi$		b.	$\phi$	$\neg\phi$
	INTERNAL	1	0		EXTERNAL	1	0
	NEGATION	0	1		NEGATION	0	1
		#	#			#	1

Ordinary negation—the “internal” negation—of  $\phi$  has the third, indeterminate truth value whenever  $\phi$  is indeterminate; thus  $\phi$  and  $\neg\phi$  have the same semantic presuppositions. The “external” negation of  $\phi$ , which might be rendered in English as *it is not true that  $\phi$* , never has the indeterminate truth value; consequently, it has no falsifiable presuppositions at all. On this view, the lack of contradiction in (77) can be explained by interpreting the negation in the first sentence of each example as a case of external negation.

We think that there is ample justification of a pragmatic, semantic, syntactic, and even phonological kind for regarding the negation in (77) as something other than ordinary negation. But since our logic is bivalent, we of course will not characterize this difference in the manner of (78). Negative sentences of the sort in (77) have a special function in discourse. They contradict something that the addressee has just said, implied, or implicitly accepted. One indication of their role is that they tend to be produced with a distinctive intonation contour (Lieberman and Sag, 1974). Another characteristic property of this kind of negation is that it does not affect the distribution of polarity items—note the appearance of *already* in (77b) and *too* in (77c).

We think that contradiction negation differs semantically from ordinary negation only by virtue of having a broader target. As we see it, ordinary negation pertains just to the proposition expressed by the corresponding affirmative sentence; it does not affect conventional implicatures. Contradiction negation, on the other hand, pertains to the total meaning of its target sentence, ignoring the distinction between truth conditions and conventional implicatures. Letting  $\phi$  be an affirmative sentence whose meaning we represent as  $\langle\phi^e; \phi^i\rangle$ , the two negations of  $\phi$  in our system have the translations shown in (79).

- (79) a. ORDINARY NEGATION OF  $\phi$ :  $\langle\neg\phi^e; \phi^i\rangle$   
 b. CONTRADICTION NEGATION OF  $\phi$ :  $\langle\neg[\phi^e \wedge \phi^i];$   
 $[\phi^i \vee \neg\phi^i]\rangle$

A sentence with contradiction negation is by itself non-specific (in the absence of contrastive intonation) in regard to what it is that the speaker is objecting to. Although the discourse fragments in (77) were intentionally designed so as to show that the speaker was objecting to something that had been conventionally implicated, this is not a necessary feature of contradiction negation—compare (77b) with *Bill hasn't already forgotten that today is Friday. I know for sure that he still remembers it.*

From what we have said earlier, it follows that there should be a separate rule, in addition to Montague's Rule 17, for forming sen-

tences with contradiction negation. We have not included such a rule in the Appendix, mainly because we do not know how to represent their prosodic characteristics in the present framework. Another unsolved problem of formalization concerns the contextual linkage of such sentences. How to capture the fact that the contradiction negation of  $\phi$  seems to require that the addressee has just indicated his acceptance of  $\phi^e$  and  $\phi^i$  requires further research. (This could conceivably be an instance of Searle's preparatory conditions on felicitous assertion.)

## 7. FINAL REMARKS

In this chapter we have attempted to do two things. First of all we have tried to show that so-called presuppositions are not instances of a single phenomenon. We believe that this fact is in part responsible for the continuing controversy about how to analyze presuppositions. The two examples of so-called presupposition that we have examined in detail—subjunctive conditionals and the particle *even*—are at extreme ends of the spectrum. In the first case it is simply a mistake to think that the phenomenon in question is to be described in terms of some separate presuppositional component of sentence meaning. In the second case such an analysis is clearly on the right track. These two examples seem to constitute paradigm cases of what Grice has called PARTICULARIZED CONVERSATIONAL and CONVENTIONAL implicatures, respectively.

We have not attempted to do a complete inventory of so-called presuppositions but we think that many of the genuine cases involve conventional implicatures, including the so-called existential presuppositions that accompany quantifiers like *all*, *every*, and the definite article. In some cases we are not sure what the correct analysis is; aspectual verbs like *stop* and *begin* are a case in point. As we point out in our discussion of *criticize*, the distinction between generalized conversational implicatures and conventional implicatures is sometimes hard to draw. We hope that these outstanding problems can be solved by extending and deepening the theory we have outlined here.

Our second objective has been to show how model-theoretic methods of semantic interpretation can be extended to account both for truth-conditional and conventionally implicated meaning. By presenting a detailed analysis of *even* and by discussing the problems posed by compound sentences we hope to have shown that the insights obtained in previous studies can be incorporated in our framework.



APPENDIX: REVISED PTQ RULES

RULE 2. If  $\zeta$  is a CN-phrase, then  $F_0(\zeta)$ ,  $F_1(\zeta)$ , and  $F_2(\zeta)$  are T-phrases, where  $F_0(\zeta)$  is *every*  $\zeta$ ,  $F_1(\zeta)$  is *the*  $\zeta$ , and  $F_2(\zeta)$  is a  $\zeta$  or *an*  $\zeta$  according as the first word of  $\zeta$  takes *a* or *an*.

Translation of  $F_0(\zeta)$ :  $\langle \hat{P} \wedge x[\zeta^e(x) \longrightarrow P\{x\}]; \hat{P} \vee x[\zeta^e(x) \wedge \zeta^i(x)] \rangle$   
 $F_1(\zeta)$ :  $\langle \hat{P} \vee y[\wedge x[\zeta^e(x) \longleftrightarrow x = y] \wedge P\{y\}]; \hat{P} \vee y[\wedge x[\zeta^e(x) \longleftrightarrow x = y] \wedge \zeta^i(y)] \rangle$   
 $F_2(\zeta)$ :  $\langle \hat{P} \vee x[\zeta^e(x) \wedge P\{x\}]; \hat{P} \vee x \zeta^i(x) \rangle$

Value of  $h$  on translation of

$F_0(\zeta)$ :  $\hat{P} \wedge x[\zeta^e(x) \longrightarrow P\{x\}]$   
 $F_1(\zeta)$ :  $\hat{P} \vee y[\wedge x[\zeta^e(x) \longleftrightarrow x = y] \wedge P\{y\}]$   
 $F_2(\zeta)$ :  $\hat{P} \vee x[\zeta^e(x) \wedge P\{x\}]$

NOTE: What we have written after "Translation" in Rule 2 is shorthand for "If  $\zeta$  is a CN-phrase and  $\zeta$  translates to  $\langle \zeta^e, \zeta^i \rangle$ , then  $F_0(\zeta)$  translates to  $\langle \hat{P} \wedge x[\zeta^e(x) \longrightarrow P\{x\}]; \hat{P} \vee x[\zeta^e(x) \wedge \zeta^i(x)] \rangle$ ,  $F_1(\zeta)$  translates to . . .". We will follow the same convention throughout. At some point we have to specify what value the heritage function  $h$  takes on pairs of expressions of INTENSIONAL LOGIC. It is convenient to do this as we go along in the translation rules for the pairs of expressions where the value of  $h$  will matter.

RULE 3. If  $\zeta$  is a CN-phrase and  $\phi$  is a t-phrase, then  $\zeta$  such that  $\phi^{(n)}$  is a CN-Phrase, where  $\phi^{(n)}$  comes from  $\phi$  by replacing each occurrence of  $he_n$  or  $him_n$  by

$\left\{ \begin{matrix} he \\ she \\ it \end{matrix} \right\}$  or  $\left\{ \begin{matrix} him \\ her \\ it \end{matrix} \right\}$ ,

respectively, according as the first basic CN in  $\zeta$  is of

$\left\{ \begin{matrix} masc. \\ fem. \\ neut. \end{matrix} \right\}$

gender.

Translation:  $\langle \hat{x}[\zeta^e(x) \wedge [\lambda x_n \phi^e](x)]; \hat{x}[\zeta^i(x) \wedge [\lambda x_n \phi^i](x)] \rangle$

RULE 4. If  $\alpha$  is a t/IV-phrase and  $\delta$  is an IV-phrase, then  $\alpha\delta'$  is a t-phrase, where  $\delta'$  is the result of replacing the first verb in  $\delta$  by its third person singular present.

Translation:  $\langle \alpha^e(\hat{\delta}^e); [\alpha^i(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^i)] \rangle$

NOTE: In translation Rule 4 we have written  $\alpha^h$  as shorthand for  $h$  ( $\langle \alpha^e; \alpha^h \rangle$ ), the value of the heritage function  $h$  on the argument  $\langle \alpha^e; \alpha^h \rangle$ . We will adhere to this convention throughout.

RULE 5. If  $\delta$  is an IV/T-phrase and  $\beta$  is a T-phrase, then  $F_5(\delta, \beta)$  is an IV-phrase, where  $F_5(\delta, \beta)$  is  $\delta\beta$  if  $\beta$  does not have the form  $he_n$  and  $F_5(\delta, he_n)$  is  $\delta him_n$ .

Translation:  $\langle \delta^e(\hat{\beta}^e); \hat{x}[\delta^h(\hat{\beta}^e)(x) \wedge \delta^h(\hat{\beta}^h)(x)] \rangle$

RULE 6. If  $\delta$  is an IAV/T-phrase and  $\beta$  is a T-phrase, then  $F_5(\delta, \beta)$  is an IAV-phrase.

Translation:  $\langle \delta^e(\hat{\beta}^e); \lambda P \hat{x}[\delta^h(\hat{\beta}^e)(P)(x) \wedge \delta^h(\hat{\beta}^h)(P)(x)] \rangle$

Value of  $h$  on translation:  $\lambda P \hat{x}P\{x\}$

RULE 7. If  $\delta$  is an IV/t-phrase and  $\beta$  is a t-phrase, then  $\delta\beta$  is an IV-phrase.

Translation:  $\langle \delta^e(\hat{\beta}^e); \hat{x}[\delta^h(\hat{\beta}^e)(x) \wedge \delta^h(\hat{\beta}^h)(x)] \rangle$

RULE 8. If  $\delta$  is an IV//IV-phrase and  $\beta$  is an IV-phrase, then  $\delta\beta$  is an IV-phrase.

Translation:  $\langle \delta^e(\hat{\beta}^e); \hat{x}[\delta^h(\hat{\beta}^e)(x) \wedge \delta^h(\hat{\beta}^h)(x)] \rangle$

RULE 9. If  $\delta$  is a t/t-phrase and  $\beta$  is a t-phrase, then  $\delta\beta$  is a t-phrase.

Translation:  $\langle \delta^e(\hat{\beta}^e); [\delta^h(\hat{\beta}^e) \wedge \delta^h(\hat{\beta}^h)] \rangle$

RULE 10. If  $\delta$  is an IV/IV-phrase and  $\beta$  is an IV-phrase, then  $\beta\delta$  is an IV-phrase.

Translation:  $\langle \delta^e(\hat{\beta}^e); \hat{x}[\delta^h(\hat{\beta}^e)(x) \wedge \delta^h(\hat{\beta}^h)(x)] \rangle$

RULE 11. If  $\phi$  and  $\psi$  are t-phrases, then  $\phi$  and  $\psi$  and  $\phi$  or  $\psi$  are t-phrases.

Translation of  $\phi$  and  $\psi$ :  $\langle [\phi^e \wedge \psi^e]; [\phi^h \wedge [\phi^e \longrightarrow \psi^h]] \rangle$   
 $\phi$  or  $\psi$ :  $\langle [\phi^e \vee \psi^e]; [[\phi^h \vee \psi^h] \wedge [\phi^e \vee \psi^h]] \rangle$

RULE 12. If  $\gamma$  and  $\delta$  are IV-phrases, then  $\gamma$  and  $\delta$  and  $\gamma$  or  $\delta$  are IV-phrases.

Translation of  $\gamma$  and  $\delta$ :  $\langle \hat{x}[\gamma^e(x) \wedge \delta^e(x)];$   
 $\hat{x}[\gamma^i(x) \wedge [\gamma^e(x) \longrightarrow \delta^i(x)]] \rangle$   
 $\gamma$  or  $\delta$ :  $\langle \hat{x}[\gamma^e(x) \vee \delta^e(x)]; \hat{x}[[\gamma^i(x) \vee \delta^e(x)] \wedge [\gamma^e(x) \vee \delta^i(x)]] \rangle$

RULE 13. If  $\alpha$  and  $\beta$  are T-phrases, then  $\alpha$  or  $\beta$  is a T-phrase.

Translation:  $\langle \hat{P}[\alpha^e(P) \vee \beta^e(P)]; \hat{P} [[\alpha^i(P) \vee \beta^e(P)] \wedge [\alpha^e(P) \vee \beta^i(P)]] \rangle$

Value of h on translation:  $\hat{P}[\alpha^e(P) \vee \beta^e(P)]$

RULE 14. If  $\alpha$  is a T-phrase and  $\phi$  is a t-phrase, then  $F_{10,n}(\alpha, \phi)$  is a t-phrase, where either (a)  $\alpha$  does not have the form  $he_k$  and  $F_{10,n}(\alpha, \phi)$  comes from  $\phi$  by replacing the first occurrence of  $he_n$  or  $him_n$  by  $\alpha$  and all other occurrences of  $he_n$  or  $him_n$  by

$$\left\{ \begin{array}{l} he \\ she \\ it \end{array} \right\} \text{ or } \left\{ \begin{array}{l} him \\ her \\ it \end{array} \right\},$$

respectively, according as the gender of the first basic CN or T in  $\alpha$  is

$$\left\{ \begin{array}{l} \text{masc.} \\ \text{fem.} \\ \text{neut.} \end{array} \right\},$$

or (b)  $\alpha$  is  $he_k$  and  $F_{10,n}(\alpha, \phi)$  comes from  $\phi$  by replacing all occurrences of  $he_n$  or  $him_n$  by  $he_k$  or  $him_k$ , respectively.

Translation:  $\langle \alpha^e(\hat{x}_n \phi^e); [\alpha^i(\hat{x}_n \phi^e) \wedge \alpha^h(\hat{x}_n \phi^i)] \rangle$

RULE 15. If  $\alpha$  is a T-phrase and  $\zeta$  is a CN-phrase, then  $F_{10,n}(\alpha, \zeta)$  is a CN-phrase.

Translation:  $\langle \hat{y} \alpha^e(\hat{x}_n \zeta^e(y)); \hat{y} [\alpha^i(\hat{x}_n \zeta^e(y)) \wedge \alpha^h(\hat{x}_n \zeta^i(y))] \rangle$

RULE 16. If  $\alpha$  is a T-phrase and  $\delta$  is an IV-phrase, then  $F_{10,n}(\alpha, \delta)$  is an IV-phrase.

Translation:  $\langle \hat{y} \alpha^e(\hat{x}_n \delta^e(y)); \hat{y} [\alpha^i(\hat{x}_n \delta^e(y)) \wedge \alpha^h(\hat{x}_n \delta^i(y))] \rangle$

RULE 17. If  $\alpha$  is a T-phrase and  $\delta$  is an IV-phrase, then  $F_{11}(\alpha, \delta)$ ,  $F_{12}(\alpha, \delta)$ ,  $F_{13}(\alpha, \delta)$ ,  $F_{14}(\alpha, \delta)$ , and  $F_{15}(\alpha, \delta)$  are t-phrases, where as in PTQ  $F_{11}(\alpha, \delta)$  is the negation,  $F_{12}(\alpha, \delta)$  the future,  $F_{13}(\alpha, \delta)$  the negative future,  $F_{14}(\alpha, \delta)$  the present perfect, and  $F_{15}(\alpha, \delta)$  the negative present perfect of  $F_4(\alpha, \delta)$ .

Translation of  $F_{11}(\alpha, \delta)$ :  $\langle \neg \alpha^e(\hat{\delta}^e); [\alpha^l(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^l)] \rangle$   
 $F_{12}(\alpha, \delta)$ :  $\langle W\alpha^e(\hat{\delta}^e); W[\alpha^l(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^l)] \rangle$   
 $F_{13}(\alpha, \delta)$ :  $\langle \neg W\alpha^e(\hat{\delta}^e); W[\alpha^l(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^l)] \rangle$   
 $F_{14}(\alpha, \delta)$ :  $\langle H\alpha^e(\hat{\delta}^e); H[\alpha^l(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^l)] \rangle$   
 $F_{15}(\alpha, \delta)$ :  $\langle \neg H\alpha^e(\hat{\delta}^e); H[\alpha^l(\hat{\delta}^e) \wedge \alpha^h(\hat{\delta}^l)] \rangle$

**EVEN RULE.** If  $\alpha$  is a T-phrase and  $\phi$  is a t-phrase containing an occurrence of  $HE_n$  (*he<sub>n</sub>*, *him<sub>n</sub>*, or *his<sub>n</sub>*), then  $F_{\text{even},n}(\alpha, \phi)$  is a t-phrase and is derived from  $\phi$  by replacing the first occurrence of  $HE_n$  by *even*  $\alpha$  and each of its subsequent occurrences by the corresponding unsubscripted pronoun whose gender matches the gender of  $\alpha$ .

Translation:  $\langle \alpha^e(\hat{x}_n\phi^e); [[\alpha^l(\hat{x}_n\phi^e) \wedge \alpha^h(\hat{x}_n\phi^l)] \wedge \text{even}^l(\hat{\alpha}^e, \hat{x}_n\phi^e)] \rangle$

### Basic Expressions

Expression	Category	Translation	Value of h
<i>Bill</i>	T	$\langle \hat{P} P\{\hat{b}\}; \hat{P} \text{male}^e(\hat{b}) \rangle$	$\hat{P} P\{\hat{b}\}$
<i>Mary</i>	T	$\langle \hat{P} P\{\hat{m}\}; \hat{P} \text{female}^e(\hat{m}) \rangle$	$\hat{P} P\{\hat{m}\}$
<i>he<sub>o</sub></i>	T	$\langle \hat{P} P\{x_o\}; \hat{P} x_o = x_o \rangle$	$\hat{P} P\{x_o\}$
<i>be</i>	TV	$\langle \lambda\mathcal{P} \hat{x}\mathcal{P}\{\hat{y} [ \hat{y} = \hat{x} ]\}; \text{be}^l \rangle$	$\lambda\mathcal{P}$ $\hat{x}\sqrt{P\mathcal{P}\{P\}}$
<i>necessarily</i>	t/t	$\langle \hat{p} \square \hat{p}; \hat{p} p = p \rangle$	$\hat{p} p$
<i>like</i>	TV	$\langle \text{like}^e; \text{like}^l \rangle$	$\text{like}^h$

where *like<sup>e</sup>*, *like<sup>l</sup>*, and *like<sup>h</sup>* are constants of INTENSIONAL LOGIC of type  $f(\text{TV})$ —as *love'* is in PTQ—and similarly for the other basic expressions of PTQ which Montague translates there as constants.

### Meaning Postulates

$\hat{\text{like}}^l = \hat{\lambda}\mathcal{P} \hat{x}\mathcal{P}\{\hat{y} \text{be-acquainted-with}^e(\hat{x}, \hat{y})\}$   
 $\hat{\text{like}}^h = \hat{\lambda}\mathcal{P} \hat{x}\sqrt{P\mathcal{P}\{P\}}$   
 $\hat{\text{assert-that}}^h = \hat{\lambda}p \hat{x}p = p$   
 $\hat{\text{hope-that}}^h = \hat{\lambda}p \hat{x} \text{believe-that}^e(x, p)$   
 $\hat{\text{forget-that}}^h = \hat{\lambda}p \hat{x}[\hat{p}]$   
 $\hat{\text{fail-to}}^e = \hat{\lambda}P \hat{x}\neg P\{x\}$   
 $\hat{\text{fail-to}}^l = \hat{\lambda}P \hat{x}[\text{try-to}^e(x, P) \vee \sqrt{y} \text{expect-that}^e(y, \hat{WP}\{x\})]$

$$\begin{aligned}
 \hat{\text{fail-to}}^h &= \hat{\lambda}P \hat{x}P\{x\} \\
 \hat{\text{forget-that}}^1 &= \hat{\lambda}p \hat{x}[ \check{p} \wedge H\text{know-}\hat{\text{that}}^e(x, p)] \\
 \hat{\text{even}}^1 &= \hat{\lambda}P \hat{Q} \hat{\mathcal{P}}\{\hat{y}[\check{\forall}x[ \check{*}\{x\} \wedge \neg[\check{x} = \check{y}] \wedge Q\{x\}] \wedge \wedge x[\check{*}\{x\} \wedge \\
 &\quad \neg[\check{x} = \check{y}]] \longrightarrow \text{exceed}^e(\text{likelihood}^e(\hat{Q}\{x\}), \text{likeli-} \\
 &\quad \text{hood}^e(\hat{Q}\{\check{y}\}))]\}
 \end{aligned}$$

### Note

NOTE: One problem with these rules is that they do not assign the correct conventional implicatures to sentences such as *Someone managed to succeed George V on the throne of England*. What the rules given here predict is (correctly) that this sentence is true iff someone succeeded George V to the throne and (incorrectly) that it conventionally implicates that it was difficult for someone to do that. This is unsatisfactory because the implicature just stated is true (you or I would have found it extremely difficult), but the sentence is in fact an odd thing to say precisely because it conventionally implicates a falsehood—namely that George V's successor had difficulty ascending to the throne. What our rules as stated lack is any way of linking the choice of a person who is implicated to have difficulty to the choice of a person who is asserted to have succeeded. We expect that this deficiency will be remedied through further research, but we note here that this task is not a trivial one. If we simply changed our rules so that the sentence above would conventionally implicate that someone who succeeded to the throne had difficulty in doing so, then we would predict incorrectly that *If someone managed to succeed George V on the throne of England, then that country is still a monarchy* and *Did someone manage to succeed George V on the throne of England?* both conventionally implicate the same proposition, and therefore conventionally implicate that someone did succeed to the throne.

While the problem of giving a correct account of the conventional implicatures of sentences containing expressions with indefinite reference (including indefinite reference by past or future tenses) is quite a challenging one, it is not peculiar to the formal framework we present here for describing those implicatures. Instead the problem arises directly from the decision to separate what is communicated in uttering a sentence into two propositions. In particular, it exists in connection with the notion of conversational implicature and also with any theory of presupposition that separates these from truth conditions (i.e., does not treat them simply as conditions for having a determinate truth value).

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