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Source: *Linguistic Inquiry*, Vol. 4, No. 2 (Spring, 1973), pp. 169-193

Published by: The MIT Press

Stable URL: <http://www.jstor.org/stable/4177763>

Accessed: 16/10/2009 11:38

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Lauri Karttunen

Presuppositions of Compound Sentences*

o. In spite of the bumper crop of papers on presuppositions in recent books and journals, presupposition itself still remains a very unclear concept.¹ There are two basic types of definitions for this mysterious term: for some scholars, such as the logician Bas Van Fraassen (1968, 1969, 1971), presupposition is a *semantic* notion, defined in terms of truth and consequence. According to Van Fraassen, sentence A semantically presupposes another sentence B, just in case B is true whenever A is either true or false. In other words, the truth of B is a *condition for the bivalence* of A. If A presupposes B and B is false, then A is neither true nor false: it is without truth value or has some third indeterminate truth value. In this sense, presupposition is a semantic relation between two sentences; it does not directly involve the speaker or the listener or the context in which the sentence is uttered. People don't presuppose anything, only sentences do.

The other concept of presupposition, discussed recently by Edward L. Keenan (1971) and Robert C. Stalnaker (1970) is a *pragmatic* notion and involves both the speaker and the listener. According to the pragmatic conception, the speaker, rather than the sentence he utters, has presuppositions. To presuppose something as a speaker is to take its truth for granted and to assume that the audience does the same. Strictly speaking, it would be meaningless to talk about the pragmatic presuppositions of a sentence. Such locutions are, however, justified in a secondary sense. A phrase like "the sentence A pragmatically presupposes B" can be understood as an abbreviation for "whenever A is uttered sincerely, the speaker of A presupposes B (i.e. assumes

* The original research for this paper was done in connection with the courses I taught at the University of California at Santa Cruz in the Summer of 1971 and at the University of Texas in the Fall of 1971. Some of the material has also been presented in public lectures at the University of Texas, Princeton University, the Second NELS Meeting in Montreal, the University of Helsinki, and Indiana University. An earlier version of the paper was circulated under the title "Plugs, Filters, and Holes". I am indebted to a great many people who have heard parts of the paper at these various places and shared their ideas with me. In particular, I want to thank the following persons: Gilbert Harman, Hans Herzberger, Laurence Horn, Frances Karttunen, Asa Kasher, John Lawler, and John Murphy. Special thanks go to George Lakoff, whose unpublished paper (Lakoff and Railton 1971) anticipates some of the work done here. Of course, the responsibility for the possible mistakes is mine alone. This work was supported in part by grants from the National Institutes of Health (Grant No. 5 To1 HD00111) and the National Institute of Mental Health (5 Po1 MH13390).

¹ See e.g. Fillmore (1971), Garner (1971), Heringer (1972), Horn (1969 and 1972), Hutchinson (1971), Karttunen (1971b), Keenan (1971 and 1972), Lakoff (1970), Langendoen and Savin (1971), Morgan (1969), Stalnaker (1970), Thomason (1972), Van Fraassen (1968, 1969, and 1971), and Zuber (1972).

B and believes that his audience assumes B as well).” If I understand Keenan and Stalnaker correctly, pragmatic presuppositions (in this secondary sense) are to be thought of as *sincerity conditions* for the utterance of a sentence. It may be useful in this connection to use the term “linguistic context of an utterance” for the set of assumptions that the speaker of the utterance thinks he shares with his intended audience. Thus we can say that, in determining what the pragmatic presuppositions of a given sentence are, we thereby define a class of linguistic contexts in which it could be sincerely uttered.

There is no conflict between the semantic and the pragmatic concepts of presupposition. They are related, albeit different notions. Consequently, it is easy to get confused. For example, consider the examples in (1).

- (1) a. A: All of Jack’s children are bald.
 B: Jack has children.
 b. A: Bill doesn’t know that baldness is hereditary.
 B: Baldness is hereditary.
 c. A: Fred has stopped beating his wife.
 B: Fred has been beating his wife.
 d. A: Fred no longer resents Zelda’s infidelity.
 B: Zelda has been unfaithful.

All of the B sentences are traditionally regarded as presuppositions associated with the corresponding A sentences. It does not seem to matter much whether we consider them to be semantic or pragmatic presuppositions. If we take the semantic point of view, we mean that, for example, the sentence A in (1a) is indeterminate (= nonbivalent = neither true nor false) under all valuations that assign falsehood to B. If we adopt the pragmatic notion, we mean that the A-sentence can be sincerely uttered only in situations where the truth of the B-sentence is taken for granted, that is, B is part of the linguistic context in which A is uttered. Under one concept, presuppositions are conditions on bivalence, under the other notion they are sincerity conditions.

It would seem very desirable to find a formal way to link the two notions of presupposition with each other. So far that has not been achieved, although suggestive proposals have been made. For example, Stalnaker makes the observation that, in general, if A semantically presupposes B, then B is always a pragmatic presupposition of A as well, although the converse does not always hold.²

² See Stalnaker (1970, 279). If this hypothesis is correct, then the appropriateness conditions for the utterance of a sentence are not met unless the speaker assumes that its semantic presuppositions are part of the linguistic context in which the sentence is to be uttered. That is, there should be a mutual understanding that the semantic presuppositions of the sentence are fulfilled. However, one can think of many counterexamples to Stalnaker’s generalization. For example, consider counterfactual conditionals. It seems clear that a sentence like “If Bill had a dime, he would buy you a Coke” can be a felicitous utterance even in contexts where the truth of “Bill does not have a dime” is not taken for granted by anybody else but the speaker himself. One can utter a counterfactual conditional “in good faith” with the intent of thereby informing the listener, among other things,

Be that as it may, I think that the two notions, in particular the concept of semantic presupposition, still have not been given satisfactory definitions. We run into problems immediately when we try to apply Van Fraassen's definition in cases that involve modal operators. I don't want to pursue this issue here but I have discussed it at some length in another article.³ For the time being, let us simply assume that we understand what is meant by a presupposition in the case of simple sentences, such as the examples in (1), and turn our attention to more complicated cases.

As far as the rest of the article is concerned, we may even forget about the distinction between semantic and pragmatic presuppositions. What is said about one kind of presupposition will apply to the other as well (I hope). However, the results of this investigation suggest to me that the difficulties we face in trying to construct a coherent semantic definition for presupposition are even greater than in the case of the pragmatic notion.

1. The problem in this article was first discussed in two papers given in the spring of 1969: one by D. T. Langendoen and H. B. Savin, the other by Jerry Morgan. Langendoen and Savin called it the "projection problem". The term refers to the

that the antecedent clause is false. By Stalnaker's hypothesis, if the falsehood of the antecedent is not a pragmatic presupposition, it cannot be a semantic presupposition either, contrary to what linguists and logicians have assumed.

³ See Karttunen (1971b). The problem with Van Fraassen's definition (A presupposes B if and only if A entails B and $\neg A$ entails B; Van Fraassen 1969, 69) is that it does not account for the fact that, from "Fred may have stopped beating his wife," one can (unless one assumes a larger modal context) validly infer "Fred has been beating his wife". In ordinary language (i) is a valid scheme of inference.

- (i) (a) A presupposes B
- (b) A is possible
- (c) Therefore, B.

By defining presupposition in terms of entailment, as Van Fraassen does, one can only justify a weaker conclusion, namely (c').

- (c') Therefore, B is possible.

Of course, it may be that the trouble does not arise from our notion of presupposition but from the ordinary language sense of *possible*. However, it is significant that modal contexts which involve entailments justify only the weaker type of inference. From "Fred may be married", one can only conclude "Fred may have a wife". It does not entail "Fred has a wife". (ii) is a valid scheme for entailments.

- (ii) (a) A entails B
- (b) A is possible
- (c) Therefore, B is possible.

The same distinction between presupposition and entailment shows up in indicative conditionals. From "If Fred is married, there are no bachelors in this room", one can only infer "It is possible that Fred has a wife". But if the antecedent involves a presupposition, we get a stronger inference. In ordinary language, one can validly conclude "Fred has been beating his wife" from "If Fred has stopped beating his wife, he is no longer a male chauvinist" (again, assuming that no larger hypothetical context is given). The first case, where the inference is based on entailment, is consistent with Stalnaker's theory of conditionals (Stalnaker 1968). But the fact that presuppositions permit a stronger inference shows that Van Fraassen's definition is not satisfactory.

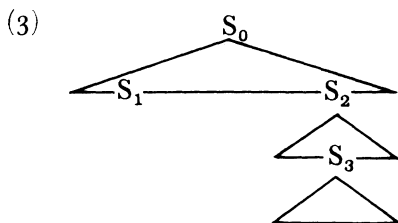
Contrary to what is suggested in Karttunen (1971b), I do not think that the intuitive validity of (i) can be accounted for by giving a more adequate semantic definition of presupposition. (I am grateful to Hans Herzberger for enlightening me on this point.) Instead we have to appeal to the cumulative principle explained in the next section and our classification of *possible* as a hole (section 4).

question of how the presuppositions of a complex sentence are determined by the presuppositions of the clauses it contains. For instance, consider the examples in (2).

- (2) a. Bill does not know that all of Jack's children are bald.
 b. If Fred has stopped beating Zelda, then Fred no longer resents Zelda's infidelity.

The sentence in (2a) contains as a complement the sentence "All of Jack's children are bald", which in isolation presupposes that Jack has children. It is obvious that the compound sentence, (2a) itself, also presupposes that Jack has children. The second example, (2b), is a conditional sentence, in which the antecedent clause, "Fred has stopped beating Zelda", presupposes that Fred has been beating Zelda. The consequent clause, "Fred no longer resents Zelda's infidelity", presupposes that she has been unfaithful. When we consider the conditional sentence in (2b) as a whole, we see that it presupposes both that Fred has been beating Zelda and that she has been unfaithful. The conditional thus seems to have all the presuppositions that its antecedent and consequent have independently.

On the basis of such examples, Langendoen and Savin proposed a simple solution for the projection problem. In their view, the presuppositions of a complex sentence can be defined as the logical sum of the presuppositions of its constituent sentences plus those that are associated with the main clause itself. Given a complex structure, such as (3), one would determine the presuppositions associated with S_0 by a bottom-to-top recursive function.



One first determines the presuppositions of S_3 on the basis of the semantic properties of the lexical items it contains. The same procedure is then applied to S_2 , which in addition will have all the presuppositions that S_3 has and so on. This Langendoen-Savin proposal is what Morgan called the "cumulative hypothesis" in his paper.

Although the principle seems valid for the examples we have discussed so far, it does not work in general. As Morgan pointed out, the cumulative hypothesis leads to wrong predictions in cases like (4).

- (4) If Jack has children, then all of Jack's children are bald.

In (4) the consequent clause presupposes that Jack has children. Nevertheless, the conditional as a whole has no such presupposition. Although Morgan discussed several examples of this sort, he was not able to make a concrete proposal for dis-

tinguishing the cases in (2) where the cumulative hypothesis does work from those like (4) where it does not work.⁴ Another case where the Langendoen-Savin system fails is presented in (5).

(5) Bill ordered Fred to stop beating Zelda.

In (5) the complement sentence seems to presuppose that Fred has been beating Zelda. But (5) itself carries no such presupposition. For example, assume that Bill mistakenly believed that Fred was beating Zelda and ordered him to stop. In reporting on what Bill did, the speaker does not have to commit himself to the false belief which led Bill to issue his order. In semantic terms, the bivalence of (5) does depend on whether the presupposition of the complement is true. If Bill in fact did order Fred to stop beating Zelda, then (5) is true, although Fred may have never beaten Zelda at all.⁵ The cumulative hypothesis fails to distinguish between cases like (5) and the one in (6), which does have the predicted presupposition.

(6) Bill forced Fred to stop beating Zelda.

2. In the remainder of this article I will argue first that an adequate solution to the projection problem makes it necessary to distinguish between three different types of complementizable predicates, which I will informally call “plugs”, “holes”, and “filters”.

Second, I will start from the assumption that the basic idea in the Langendoen-Savin proposal is correct. It should be possible to determine the presuppositions of a

⁴ Morgan stated his solution in somewhat metaphorical terms (1969, 171): “the presuppositions of the sentence flow down the tree. But there are certain verbs which can block this flow by defining a new set of presuppositions which consists of the downflowing set plus changes overtly defined within the sphere of this lower world-creating verb.” In a sense, Morgan’s proposal is the Langendoen-Savin cumulative hypothesis in reverse: presuppositions flow “down” rather than “up” the tree. Morgan did not attempt to state what constitutes a “change overtly defined in the sphere of a verb”. His class of “world-creating” predicates includes the conditional *if . . . then* and verbs like *dream*, *wish*, and *imagine*. Putting the conditional into the same category with *dream* was probably a mistake. In discussing examples like “I dreamed that Bill was a German and that I regretted it”, Morgan assumed that the presupposition of the *regret* clause, “Bill was a German”, becomes void because the main verb is *dream*. As we will see shortly, the filtering is due to the fact that the complement sentence is a conjunction; it has nothing to do with the main verb itself. Morgan did not seem to notice that all logical connectives, not just the conditional, involve filtering of presuppositions.

The same oversight also mars other papers on this topic, e.g. Lakoff (1970) and Horn (1972), although both authors at the same time argue that there are other kinds of “cancelling phrases” in addition to *if* clauses whose presence can make a presupposition void. Unfortunately, Lakoff and Horn do not succeed in distinguishing the cancellation of presuppositions from other similar phenomena, such as the suspension of invited inferences (see Karttunen 1971c for further discussion). Consequently, they make little progress towards solving the problem of exactly what it takes to cancel a presupposition.

⁵ Since some people have expressed disagreement on this point, it may be useful to elaborate a little. I do not accept the view that the fulfillment of all felicity conditions is necessary for the performance of an illocutionary act. According to this view, if Bill addresses Fred with the words “Fred, stop beating Zelda!” in the false belief that Fred has been beating her, no illocutionary act of ordering has taken place. If it were so, one could not truthfully report the event by saying “Bill ordered Fred to stop beating Zelda”. Instead, one should say something like “Bill thought he ordered . . .”, etc. Although I can see why someone might find this view attractive, I think it is based on a bad theory of speech acts, surely not on the actual use of words like *order*. Cf. Searle (1969, 54): “There are various kinds of possible defects of illocutionary acts but not all of these defects are sufficient to vitiate the act in its entirety”.

complex sentence from the sentence itself by a recursive procedure that operates in the bottom-to-top fashion. However, that function is far more complicated than what they imagined. Eventually, it will turn out that even the most sophisticated version of their proposal that I can think of is inadequate. Consequently, at the end I will have to give up the view that the presuppositions of a compound sentence are always uniquely determined by its composition, even assuming that we know all the presuppositions that the constituent sentences have independently.

The three groups of predicates that we need to distinguish are characterized as follows:

Plugs: predicates which block off all the presuppositions of the complement sentence;

Holes: predicates which let all the presuppositions of the complement sentence become presuppositions of the matrix sentence;

Filters: predicates which, under certain conditions, cancel some of the presuppositions of the complement.

3. The first group, plugs, contains verbs that are commonly called “verbs of saying” or “performatives”, such as *say, mention, tell, ask, promise, warn, request, order, accuse, criticize, blame*, etc. What is common to them is that they can be used to report on what has been said or what illocutionary act (in the sense of Austin 1962) has been performed. As I mentioned already in connection with (5), one can surely report that a certain illocutionary act has taken place without thereby committing oneself to the presuppositions of whatever was said on that occasion. More examples are given in (7).

- (7) a. Harry has promised Bill to introduce him to the present king of France.
(Does not presuppose that the king exists.)
- b. Sheila accuses Harry of beating his wife. (Does not presuppose that Harry has a wife.)
- c. Cecilia asked Fred to kiss her again. (Does not presuppose that Fred had kissed Cecilia before.)

In all of these cases, the complement sentence has a presupposition which is not a presupposition for the main sentence. (I assume here that infinitival and gerundive clauses originate as complete sentences in the underlying syntactic representation. Nothing important hinges on this assumption.) For example, suppose that (7c) is true, that is, Cecilia did in fact ask Fred to kiss her again. It does not follow from the truth of (7c) that Fred had kissed her before. Of course, if Cecilia was sincere in making her request, then she must have believed that Fred had done so. But the question of whether Cecilia was right has no bearing on either the truth value of (7c) or the sincerity of the act of stating (7c). The presupposition that the complement sentence has in isolation is blocked, and does not become a presupposition of the compound sentence. This phenomenon is of course especially clear in cases where the complement

is a direct quote of what Cecilia said. It is perhaps less evident at first that the same holds for sentences with indirect quotes and even for purely reportive sentences (as in (7)), but it is true nevertheless.

One notable exception (at least for pragmatic presuppositions) is the case where the subject of the main sentence is the speaker himself and the sentence is used performatively. In this case, the verb must be in the simple present tense.

(8) I ask you to stop beating Zelda.

In order to count as a sincere utterance, (8) requires that it be part of the linguistic context that the addressee has been beating Zelda. If you want to carry on with my metaphorical terminology, you may describe this phenomenon by saying that, in special cases like (8), all the plugs are leaky.⁶

At this point, one may begin to wonder whether the class of plugs is still too narrowly defined. What about so-called "verbs of propositional attitudes", such as *think*, *believe*, *doubt*, *suspect*, *fear*, or Morgan's "world-creating predicates", verbs like *dream* and *imagine*? Shouldn't they be regarded as plugs too? I think that the matter is less clear than it first appears to be, but since I cannot justify my answer until I have talked about filters, I will postpone this question until later.

4. I will now move on to the second group of predicates I mentioned above. The class of holes contains all ordinary run-of-the-mill complementizable predicates, such as *know*, *regret*, *understand*, *surprise*, *be significant*, *begin*, *stop*, *continue*, *manage*, *avoid*, *be able*, *be possible*, *force*, *prevent*, *hesitate*, *seem*, *be probable*, etc. As far as I can see, the group includes all of Kiparsky's factives, Newmeyer's aspectual verbs, and my one- and two-way implicatives. I will suggest later on that the propositional attitude verbs and some of Morgan's world-creating predicates may also be in the class of holes. For all such verbs, the cumulative hypothesis works without a hitch. If the main verb of the

⁶ Another case of defective plugging has recently been brought to my attention by Sylvia Permesly. In her dissertation (1973, Ch. 2), she observes that although verbs of saying, such as *tell*, *say*, *mention*, *explain*, *announce*, are plugs with respect to the presuppositions of *that* clauses, they are holes with respect to the presuppositions of indirect questions. There is a striking difference between (i) and (ii).

(i) Bill told John that Harry insulted the present king of France.

(ii) Bill told John who insulted the present king of France.

It is clear that *tell* is a plug in (i), since the sentence is noncommittal as to whether there really is a present king of France. On the other hand, (ii) appears to have all the presuppositions of the direct question in (iii).

(iii) Who insulted the present king of France?

(iii) and (ii) not only presuppose the existence of the king but also that someone insulted him.

Whether a verb that accepts indirect questions is a plug or a hole with respect to the presuppositions of the embedded question seems to depend on whether it can be construed as a "verb of inquiring" or as a "verb of answering". Unlike *tell*, which is of the latter type, verbs like *ask* and *wonder* are plugs with respect to indirect questions. This can be observed by contrasting (ii) with (iv).

(iv) Bill asked John who insulted the present king of France.

It is easy to see that (iv) does not share the presuppositions of (iii). At this time I have no explanation for these surprising facts. Note also that factive verbs, such as *realize*, which admit both *that* complements and indirect questions, are holes irrespective of the type of the complement.

sentence is a hole, then the sentence has all the presuppositions of the complement sentences embedded in it. Consider the examples in (9).

- (9) a. Fred has a wife.
 b. Fred has been beating his wife.
 c. Fred stopped beating his wife.
 d. Fred hesitated to stop beating his wife.
 e. It surprised Mary that Fred hesitated to stop beating his wife.
 f. Cecilia knew that it surprised Mary that Fred hesitated to stop beating his wife.

In this set of examples, we can see that (9a), “Fred has a wife”, which is presupposed by (9b), is a presupposition for all of the sentences that contain (9b), as long as all the intervening predicates are holes. Similarly, (9b) is presupposed by (9c) and, consequently, by all the following sentences up to (9f). On the other hand, (9d) does not presuppose or entail (9c), and neither do the other sentences containing it. (9e) presupposes (9d) and is presupposed by (9f). Thus, from the truth of (9f) we can conclude that (9a), (9b), (9d), and (9e) are true, although we cannot conclude anything about the truth or falsehood of (9c). Incidentally, since there is no entailment or presuppositional relation between (9d) and (9c), the fact that (9d) and the sentences containing it share all the presuppositions of (9c) cannot be attributed to the transitivity of these semantic relations or to the possibility of defining presupposition in terms of entailment (as suggested by Van Fraassen). Some kind of “cumulative principle” is surely needed no matter how presupposition is defined.⁷

5. The third group of complementizable predicates, filters, contains only logical connectives: *if . . . then*, *and*, and *either . . . or*. Of course, grammarians do not usually call such words predicates, but I find it convenient here to follow the logical rather than grammatical tradition, ignoring also the distinction that logicians usually make between connectives and ordinary predicates. For example, I will simply regard the discontinuous conditional morpheme *if . . . then* as a predicate that takes two sentential complements, the “antecedent” and the “consequent”.

⁷ If it weren't for the lack of entailment relation between (9d) and (9c), the example would not show that there is a need for a cumulative principle that assigns the presuppositions of an embedded clause to its superordinate sentence. Given the usual definitions of semantic entailment and presupposition, it is a trivial matter to show that, if A presupposes B and B either entails or presupposes C, then A presupposes C. Therefore, one might argue that, for example, (9f) has all the presuppositions of (9e) by definition. One needs a sentence like (9d) to show that something else is needed in addition to the definitions of these semantic relations. The following three sentences illustrate the same point.

- A: Mary forced Fred to stop beating his wife.
 B: Fred stopped beating his wife.
 C: Fred used to beat his wife.

These sentences are related as follows: A entails B, B presupposes C. What is the relation between A and C? Intuitively it is clear that C is a presupposition for A as well as for B. However, we cannot show this without the cumulative principle. The usual semantic definition of presupposition yields only the weaker result that C is entailed by A.

The problem is to find some way of distinguishing cases like the examples in (10) and (11b), where the cumulative hypothesis works, from those like (11a), where it fails.

- (10) a. If baldness is hereditary, then all of Jack's children are bald.
 b. If all of Jack's children are bald, then baldness is hereditary.
- (11) a. If Jack has children, then all of Jack's children are bald.
 b. If all of Jack's children are bald, then Jack has children.

In (10a), the consequent clause, "all of Jack's children are bald", presupposes that Jack has children, and so does the conditional as a whole. In (10b), it is the antecedent clause that carries this presupposition, and so does (10b) itself. In these two examples, whatever is presupposed by the antecedent or the consequent is presupposed by the whole conditional. On the other hand, in (11a) the presupposition of the consequent clause gets filtered away, since (11a) as a whole does not presuppose that Jack has children. (11b) is a somewhat peculiar example. There would be no point in uttering such trivial tautologies unless one were engaged in some painstaking deductive reasoning, trying to track down all the logical consequences of "all of Jack's children are bald." What concerns us here is that, unlike (11a), (11b) is similar to the examples in (10) in presupposing that Jack has children.

What makes (11a) special is that there is a certain relation between the antecedent and the consequent. The antecedent consists of the presupposition of the consequent. In such cases, the presupposition seems to become void. However, when we look at some more complicated examples, we see that, for the filtering to take place, the antecedent does not have to be identical with the presupposition of the consequent. Consider the examples in (12).

- (12) a. If it is true that Jack has children, then all of Jack's children are bald.
 b. If Fred has managed to kiss Cecilia, Fred will kiss Cecilia again.
 c. If Harry is married, then his wife is no longer living with him.

In (12a), the antecedent is not identical with the presupposition of the consequent. However, in this case the antecedent *semantically entails* the presupposition. In general, we say that A semantically entails B ($A \models B$) if (and only if) B is true whenever A is true.⁸ We find the same relation in (12b). In (12b) the consequent presupposes that Fred has kissed Cecilia. The truth of "Fred has kissed Cecilia" follows from the truth of the antecedent clause, "Fred has managed to kiss Cecilia."⁹ Again, the presupposition is filtered out. Similarly in (12c), where the antecedent "Harry is married" entails "Harry has a wife", which in turn is just what the consequent presupposes. The original example in (11a) is simply a special case of this type. There the antecedent not only entails but is identical with the presupposition.

⁸ For a discussion of semantic entailment, see Van Fraassen (1971). Another term for the same relation is "necessitation" (Van Fraassen 1968). See also Footnote 13.

⁹ The properties of *manage* and other similar "implicative" verbs are discussed in Karttunen (1970, 1971a).

On the basis of these observations, we can tentatively postulate the following *filtering condition* for *if . . . then* sentences. (It will be revised slightly later on.)

- (13) Let S stand for any sentence of the form “If A then B”.
- (a) If A presupposes C ($A \gg C$), then S presupposes C ($S \gg C$).
 - (b) If B presupposes C ($B \gg C$), then S presupposes C ($S \gg C$) unless A semantically entails C ($A \Vdash C$).¹⁰

This condition accounts for all the data we have looked at so far. The first part, (13a), stipulates that any presupposition of the antecedent becomes a presupposition of the conditional. The second part, (13b), states that any presupposition of the consequent becomes a presupposition of the conditional unless it is entailed by the antecedent. Thus the rule accounts for the difference between (11a) and (11b), as well as for the difference between (12b) and (14).

- (14) If Fred has agreed to kiss Cecilia, then Fred will kiss Cecilia again.

In (14), the antecedent clause “Fred has agreed to kiss Cecilia” does not entail “Fred has kissed Cecilia”. Consequently, (14) presupposes Fred has kissed Cecilia, while (12b) does not presuppose it.

6. Let us now turn to conjunctions. It is easy to see that, whenever the two clauses involved are semantically unrelated, their conjunction has all the presuppositions of its constituents. The examples in (15) are analogous to those in (10).

- (15) a. Baldness is hereditary and all of Jack’s children are bald.
 b. All of Jack’s children are bald and baldness is hereditary.

What about conjunctions corresponding to the conditionals in (11)? Consider (16).

- (16) a. Jack has children and all of Jack’s children are bald.
 b. All of Jack’s children are bald and Jack has children.

(16b) is even stranger than (11b); since the second conjunct is a consequence of the first, why bother with it at all? One may want to rule out such conjunctions altogether as violations of some pragmatic principle. (“Thou shalt not be utterly pointless.”) However, the only thing that matters for us here is that (16b) as a whole seems to share the presupposition of its first conjunct. The interesting case is (16a). As far as I can see, it does not presuppose that Jack has children. If it should turn out that the first conjunct is false, then the whole conjunction surely ought to be false, not indeterminate or truthvalueless.

¹⁰ In case A and B have the same presupposition, the conditional will have it too, since (13a) is sufficient to guarantee this. The *unless* clause in (13b) applies only to the presuppositions of B; it does not cancel any presupposition that is contributed by the antecedent. This point needs to be emphasized because of the fact that, if A presupposes C, then A also entails C. Consequently, if A and B both presuppose C, then C as a presupposition of B is filtered out by (13b). Nevertheless, the conditional does presuppose C, since by (13a) it has all the presuppositions of its antecedent.

As far as the filtering of presuppositions is concerned, these examples show that conjunctions behave just like conditionals. The filtering condition for *and*, given in (17), is the same as the rule for *if . . . then*.

- (17) Let S stand for any sentence of the form "A and B".
- a. If $A \gg C$, then $S \gg C$.
 - b. If $B \gg C$, then $S \gg C$ unless $A \Vdash C$.

More examples are given in (18) to illustrate the second part of the condition.

- (18) a. It is true that Jack has children and all of Jack's children are bald.
 b. Fred has managed to kiss Cecilia and Fred will kiss Cecilia again.
 c. Harry is married and his wife is no longer living with him.

In (18b), for example, the second conjunct has a presupposition, which, although it is not identical with the first conjunct, is nevertheless entailed by it. Consequently, (18b) does not presuppose that Fred has ever kissed Cecilia. Of course, if (18b) is true, then Fred must have done so, but this is an entailment rather than a presupposition. Admittedly, the distinction is a subtle one, but it is real. In doubtful cases, the difference between an entailment and a presupposition can be brought out more clearly by placing the sentence in question in a modal context. We can show that (18b) involves an entailment rather than a presupposition by prefixing it with "it is possible that . . .". The result is given in (19).

- (19) It is possible that Fred has managed to kiss Cecilia and that he will kiss her again.

The speaker who utters (19) does not commit himself to the claim that Fred has kissed Cecilia. He is committed only to the view that it *may* have happened. Compare (19) with (20), where the same test has been applied only to the second conjunct of (18b).

- (20) It is possible that Fred will kiss Cecilia again.

Unlike (19), (20) commits the speaker to the claim that Fred not only may have, but actually *has*, kissed Cecilia.

I have written more about this in another context (Karttunen 1971b), where I showed that modal environments provide us with a test for distinguishing presuppositions from mere entailments (see footnote 3). The fact that (19) and (20) differ in the aforementioned way in what they entitle us to infer from them confirms the observation that the presupposition of the second conjunct indeed gets filtered out in (18b), just as the second filtering condition in (17) predicts. If it were otherwise, (19) should yield the same inference as (20).

7. We still have one more connective to worry about. It turns out that for *either . . . or* we have to set up a filtering condition which is a little different from the previous one.

Again, no filtering is needed for simple cases where the two disjuncts are not semantically related. The examples in (21) have all the presuppositions of the individual components.

- (21) a. Either baldness is not hereditary or all of Jack's children are bald.
 b. Either all of Jack's children are bald or baldness is not hereditary.

Consider now cases where there is a presuppositional relation between the disjuncts.

- (22) a. Either Jack has no children or all of Jack's children are bald.
 b. Either all of Jack's children are bald or Jack has no children.

For reasons that I don't quite understand, I don't find (22b) any more acceptable than the corresponding examples with *if . . . then* and *and*, (11b) and (16b). Leaving out the negation from the second disjunct would make (22b) even worse. Since I am not able to fully decipher this example, I cannot tell what (22b) presupposes, if anything.¹¹

On the other hand, (22a) is a clear case. It does not presuppose that Jack has any children. Note that the relation between the two clauses is different from what we had in the corresponding examples with *if . . . then* and *and*, (11a) and (16a). The first disjunct in (22a) negates the presupposition of the second. Consider also the more complicated examples in (23).

- (23) a. Either it is false that Jack has children or all of Jack's children are bald.
 b. Either Bill has always refrained from beating his wife or Bill has already stopped beating her.
 c. Either Harry is not married at all or his wife is no longer living with him.

In all of these cases, the second disjunct has a presupposition which does not become a presupposition for the whole disjunction. In other similar examples, (12) and (18), the first clause entails the presupposition of the second. Here the suppressed presupposition is entailed by the negation of the first clause. For example, the second part

¹¹ Several people have constructed contexts in which (22b) or some sentence just like it might actually occur. To take one similar example, let us assume that Jack's wife knows that her husband is a POW in North Vietnam but has not received any letters from him. She might explain the lack of correspondence by saying (i).

- (i) Either all of Jack's letters have been held up or he has not written any.

Unless there is something wrong with (i), the asymmetry of our filtering conditions is in jeopardy. It is clear that, if (i) is all right, it does not presuppose the existence of any letters. In that respect it is identical with (ii), in which the same disjuncts come in the opposite order.

- (ii) Either Jack has not written any letters or all of them have been held up.

The forthcoming filtering condition for disjunction (in (24)) handles (ii) but would not work for (i). This could be remedied by making the condition symmetric, but I fear that the change would soon lead to trouble elsewhere. For the time being, I am still inclined to claim that (i), (22b), and other sentences like them are not fully grammatical.

of (23b) presupposes that Bill has been beating his wife. The negation of the first disjunct, "Bill has not always refrained from beating his wife," entails that he has beaten her.¹² The presupposition becomes void.

These examples lead us to postulate the following filtering condition for disjunctions.

- (24) Let S stand for any sentence of the form "A or B".
- a. If $A \gg C$, then $S \gg C$.
 - b. If $B \gg C$, then $S \gg C$ unless $\lceil \sim A \rceil \Vdash C$.

Except for the negation sign in (24b), the condition is the same as for the other connectives.

8. This concludes the first part in our study of filters. I will argue next that all of the conditions have to be revised slightly in the light of new evidence. But first a couple of final remarks on what has been achieved this far.

Depending on what you think about the relation between classical logic and natural language semantics, you may or may not be disturbed by the fact that the filtering conditions for *and* and *or* are not symmetric. If the natural language connectives are like the logical ones, symmetry is to be expected. Since the crucial examples, (11b), (16b), and (22b), seem so strange to me, I cannot decide whether the conditions are right or wrong in this respect.

Having identical conditions for *if . . . then* and *and* also seems at first a bit suspicious from the point of classical logic. However, this is not so. As Gilbert Harman (personal communication) has pointed out to me, the conditions for conditionals and conjunctions should in fact be identical, provided that we accept the following three principles: (i) the (internal) negation of a sentence has the same presuppositions as the sentence itself, (ii) if two sentences are logically equivalent, they have identical presuppositions, and (iii) certain logical equivalences carry over from classical logic; in particular, the equivalence of $\lceil A \supset B \rceil$ and $\lceil \sim A \vee B \rceil$ and the equivalence of $\lceil A \& B \rceil$ and $\lceil \sim(\sim A \vee \sim B) \rceil$ hold. Given our filtering condition for *if . . . then*, from (i) it follows that $\lceil A \supset B \rceil$ has the same presuppositions as $\lceil A \supset \sim B \rceil$, which in turn is equivalent to $\lceil \sim A \vee \sim B \rceil$. Therefore, by (ii) $\lceil A \supset B \rceil$ and $\lceil \sim A \vee \sim B \rceil$ have the same presuppositions. By (i) again, the latter formula has the same presuppositions as its negation, $\lceil \sim(\sim A \vee \sim B) \rceil$, which is equivalent to $\lceil A \& B \rceil$. Consequently, $\lceil A \supset B \rceil$ and $\lceil A \& B \rceil$ have the same presuppositions. The filtering rule for conditionals should work for conjunctions as well. Since the principles (i) and (ii) seem entirely uncontroversial, this result is mainly due to accepting the familiar equivalences in (iii). Having identical filtering conditions for *if . . . then* and *and* is not at odds with classical logic.

¹² The verb *refrain* (*from*) belongs to the class of "negative two-way implicatives" discussed in Karttunen (1970, 1971a).

By similar reasoning we can also demonstrate that conditionals and disjunctions should be treated differently. The formula $\lceil A \vee B \rceil$ is classically equivalent to $\lceil \sim A \supset B \rceil$, which does not have the same presuppositions as $\lceil A \supset B \rceil$. This asymmetry derives from the fact that the filtering rule for conditionals, (13), talks about what B presupposes and what A entails. Although B and $\lceil \sim B \rceil$ share presuppositions, A and $\lceil \sim A \rceil$ in general do not have the same entailments. Therefore, we do not expect the rule for conjunction to work for disjunction. Furthermore, the filtering conditions for conditionals, (13), and disjunctions, (17), differ in a way one might expect on the basis of the equivalence between $\lceil A \supset B \rceil$ and $\lceil \sim A \vee B \rceil$.

9. There is a class of compound sentences that I have so far avoided, since they add another complication to our filtering conditions. Before giving the first example, I have to do some preliminary groundwork in setting the stage.

Suppose that our speaker, Fred, believes that Mormons are required to wear a special kind of undergarment, called “holy underwear”. (I don’t know if this is a fact, but so I have been told.) Furthermore, Fred has some reason to believe that a certain girl, Geraldine, is a Mormon. However, Fred has never caught even a glimpse of what Geraldine is wearing under her dress. One evening, Fred manages to peer into Geraldine’s bedroom and sees her in an ordinary bra and a pair of panties. Being somewhat surprised Fred utters (25).

(25) Either Geraldine is not a Mormon or she has given up wearing her holy underwear.

What, if anything, is presupposed by (25)?

The second disjunct of (25), “Geraldine has given up wearing her holy underwear” does presuppose that she has worn holy underwear. However, from the way we have set up the example it is obvious that (25) as a whole should have no such presupposition. Fred can utter (25) quite sincerely without having to assume that Geraldine has ever worn a Mormon-type undergarment. After all, his observation suggests that Geraldine might not be a Mormon at all.

The problem for us is that the negation of the first disjunct, (26), does not semantically entail what the second disjunct presupposes, namely (27).

(26) Geraldine is a Mormon.

(27) Geraldine has worn holy underwear.

The filtering condition for disjunctions, (24b), which we postulated on the basis of the previous simpler examples, does not work here, since it requires that the suppressed presupposition of the second disjunct be entailed by the negation of the first disjunct *alone*. To get the entailment here we need something more; we must take into account the speaker’s beliefs. Remember, in setting the stage for (25) we stipulated that Fred would accept some statement like (28).

(28) All Mormons have worn holy underwear.

This is crucial for our example, since (26) and (28) jointly entail (27). Anyone who holds the same belief as Fred is in the position to conclude "Geraldine has worn holy underwear" from "Geraldine is a Mormon". (28) provides him with the needed additional premiss. We need to relax our filtering condition so as to allow the suppression of a presupposition in all such cases.

Note that if we had introduced the example differently, (25) would carry the presupposition in (27). For instance, we could have set up a context where Fred believes that in order to be a Mormon one must not wear holy underwear. Try to force yourself to accept this assumption. If you can, I don't think you could utter (25) without committing yourself to (27).

The revised form of (24b) is given below.

(24b') If $B \gg C$ then $S \gg C$ unless there is some (possibly null) set X of assumed facts such that $X \cup \{\ulcorner \sim A \urcorner\} \Vdash C$.

To rule out irrelevant entailments, certain restrictions have to be placed on X . First of all, it must not be the case that $X \Vdash A$, otherwise $X \cup \{\ulcorner \sim A \urcorner\}$ would entail anything whatsoever. Secondly, the entailment should be based in part on $\ulcorner \sim A \urcorner$. It must not be the case that $X \Vdash C$.¹³ If these conditions are not met the presupposition is not filtered out. Since X may be null, the revised condition works just as well as the original one in the simple cases we looked at first, (22a) and (23). The phrase "assumed fact", of course, is an embarrassingly unclear notion, but at this point I don't have anything better to offer, especially when I am trying not to worry about the distinction between the semantic and the pragmatic concept of presupposition. The gist of (24b') is that we have been forced to give up the basic idea of the original cumulative hypothesis. We are no longer trying to derive the presuppositions of a complex sentence solely from its constituents. What (24b') says is that the presuppositions of a compound that involves logical connectives are, in general, definable only in relation to a given set of other sentences.

As you might expect, the filtering condition for *if . . . then* and *and* has to be relaxed in the same way. Examples similar to (25) can be constructed just as easily with the other connectives as with *either . . . or*. For instance, instead of (25) Fred

¹³ These restrictions were suggested to me by John Murphy. They are not sufficient to solve all our problems. The main difficulty is with the notion of semantic entailment, which is too broad for our purposes. Some narrower concept of "relevant entailment" is needed. The following sentence is a case in point.

(i) Either John is dumb, or he knows that if it rains, it rains.

The embedded complement, "if it rains, it rains," which is presupposed by the second disjunct in (i), happens to be a tautology. As such, it is semantically entailed by any sentence whatsoever, including the sentence "John is not dumb," which is the negation of the first disjunct in (i). Consequently, according to our revised (and original) filtering condition for disjunction, "if it rains, it rains" is not presupposed by (i). Our intuitions tell us otherwise.

The only way to avoid this unacceptable result is to try to define a narrower notion of entailment which would not commit us to the view that every logical truth is necessarily entailed by every sentence. This issue has been the subject of much controversy among logicians, and we cannot expect to settle it here. For a survey of the field, see Anderson and Belnap (forthcoming).

might have uttered the conditional in (29a) or the exclamatory conjunction in (29b). Assuming that the speaker has the beliefs we have attributed to him, the examples in (29) do not carry the presupposition that Geraldine has worn holy underwear.

- (29) a. If Geraldine is a Mormon, she has given up wearing her holy underwear.
 b. Geraldine is a Mormon and she has given up wearing her holy underwear!

The revised form of (17b), which is identical with (13b), is given below.

- (17b') If $B \gg C$, then $S \gg C$ unless there is some (possibly null) set X of assumed facts such that $X \cup \{A\} \Vdash C$.
 (Constraints on X : $X \not\# \ulcorner \sim A \urcorner$ and $X \not\# C$.)

As another piece of evidence in favor of our revised filtering conditions, consider the examples in (30), which were pointed out to me by George Lakoff.¹⁴

- (30) a. If Nixon appoints J. Edgar Hoover to the Cabinet, he will regret having appointed a homosexual.
 b. Nixon will appoint J. Edgar Hoover to the Cabinet and he will regret having appointed a homosexual.
 c. Either Nixon does not appoint J. Edgar Hoover to the Cabinet or he will regret having appointed a homosexual.

In these sentences, the second clause presupposes (31).

- (31) Nixon will have appointed a homosexual.

Whether or not this is a presupposition for the sentences in (30) clearly depends on whether (32) is regarded as a fact.

- (32) J. Edgar Hoover is a homosexual.

In contexts in which the truth of (32) is assumed, the sentences in (30) do not carry the presupposition that Nixon has appointed a homosexual, since (32) together with (33) entails (31).

- (33) Nixon will appoint J. Edgar Hoover to the Cabinet.

¹⁴ Examples of this type are easy to multiply; the original one may have been the following sentence, which has been attributed to James D. McCawley.

If Nixon invites Angela Davis to the White House, Nixon will regret having invited a black militant to his residence.

Given the fact that Angela Davis is a black militant and that the White House is the residence of whoever is President and that Nixon is President, the sentence does not presuppose that Nixon will have invited a black militant to his residence in spite of the factive verb *regret*.

A condition similar to our (17b') was first proposed by Lakoff and Railton (1971). They discuss only examples with conditionals and apparently did not notice that the same problems arise with all logical connectives.

The effect of these revised filtering conditions is to make the notion of presupposition relative with respect to linguistic contexts, that is, to sets of sentences whose truth is taken for granted. We can no longer talk about the presuppositions of a compound sentence in an absolute sense, only with regard to a given set of background assumptions. If we consider the two notions of presupposition mentioned in the beginning of this paper, it appears that the pragmatic concept at least is fully compatible with the cumulative principle and our filtering and plugging conditions. After all, the definition of pragmatic presupposition says absolutely nothing about how compound sentences get their presuppositions. The matter is somewhat different with the semantic notion of presupposition, since the proponents of this concept in general wish to retain classical logic as much intact as possible. The acceptance of our filtering conditions, however, forces one to give up any hope of constructing a presuppositional language with truthfunctional connectives, which is a more radical departure from classical logic than what at least some proponents of the semantic definition have envisioned (e.g. see Keenan 1972). I am not sure what this will ultimately mean for the semantic concept of presupposition and I do not know whether the filtering conditions are really compatible with such a notion. I can only hope that there is no basic inconsistency or circularity hidden somewhere in our seemingly simple rules.

10. Let us now make a brief excursion away from the main topic. The filtering conditions that we have set up for ordinary language have been justified simply on the basis of how ordinary language intuitively seems to work. I have not tried to relate them to any of the many formal systems that logicians have constructed over the years for dealing with presuppositions. Now is the time to look at some of these nonbivalent logics. In particular, we are interested in seeing what sort of principles have been employed in determining the presuppositions of complex sentences from the presuppositions of their constituents. It is curious to find out that the filtering conditions incorporated in these formal systems are of an entirely different sort than what we have postulated for ordinary language.

As I understand it, there are essentially two ways to extend classical logic to make room for presuppositions. One way is to abandon bivalence and to construct three-valued truth tables for logical connectives. An extensive discussion of such nonclassical logics is found in Rescher (1969). The best known system of this kind was developed by Łukasiewicz. (It is sometimes said of his system that "It contains all the vices and none of the virtues of two-valued logic."¹⁵) The Russian logician D. A. Bochvar has also constructed two related systems with the explicit intent of dealing with presuppositions. They are similar to Łukasiewicz' three-valued logic in the respect that bivalence is rejected while the connectives retain their classical truthfunctional character. Recently, there has been a new development. In a series of papers (1968, 1969, 1971), Van Fraassen has developed a theory of presuppositional languages based

¹⁵ The quotation is from Herzberger (1970) who attributes it to Storrs McCall.

on supervaluations. It is a novel and ingenious approach which avoids many of the pitfalls inherent in the earlier nonclassical logics. However, it turns out that from our point of view Van Fraassen's theory of supervaluations has the same features as Łukasiewicz' three-valued logic. The connectives in Van Fraassen's system are not truthfunctional in the usual sense. However, since it would take us too far astray to discuss supervaluations, I will present a quasi-truthfunctional matrix for one of his connectives.¹⁶ I don't think that this slight misrepresentation has any bearing on the issues we are discussing here.

In the following I will only look at the truth tables for "&". Choosing the conjunction has no particular significance. Any other connective would do just as well, and discussing more than one connective would not add anything to the picture. The truth tables for "&" in Łukasiewicz', Van Fraassen's, and the two Bochvar systems are given in (34). The third, indeterminate, truth value is represented by "#".

(34) a.

&	T	F	#
T	T	F	#
F	F	F	#
#	#	#	#

Bochvar's "internal"
conjunction

b.

&	T	F	#
T	T	F	#
F	F	F	F
#	#	F	#

Łukasiewicz'
conjunction

c.

&	T	F	#
T	T	F	#
F	F	F	F
#	#	F	{ # F}

Van Fraassen's
conjunction

d.

&	T	F	#
T	T	F	F
F	F	F	F
#	F	F	F

Bochvar's "external"
conjunction

(The choice of value assignments in the lower righthand corner of (34c) is due to the way in which Van Fraassen's supervaluations are defined. When both A and B suffer from failure of presupposition, the value of 'A & B' is either F or # depending on whether the sentence is a contradiction in classical two-valued logic.)

Leaving all other questions aside, we can simply look at these tables as solutions to our projection problem. The important thing for us to see is what happens in cases where one of the constituents suffers from failure of presupposition, that is, has the

¹⁶ In presenting Van Fraassen's system this way I follow Herzberger (1970). The advantages of Van Fraassen's supervaluation approach over truthfunctional threevalued systems are discussed in Thomason (1972).

third, indeterminate truth value. If the conjunction has the same value, then it also has a failing presupposition. Otherwise the presupposition of the constituent has been filtered out.

Here we have three entirely different principles at work. From (34a), we see that the so-called “internal” Bochvar system incorporates the same cumulative principle that was proposed by Langendoen and Savin.¹⁷ There is no filtering at all. If either one of the two components has the indeterminate truth value, so does the conjunction as a whole. In our terms, the internal Bochvar connectives are holes.

On the other hand, the external Bochvar conjunction, (34d), has the opposite property. In this system, ‘A & B’ is always either true or false, even if one of the components should suffer from failure of presupposition. In other words, the external Bochvar connectives are plugs, since they shut out all the presuppositions of the constituent sentences.¹⁸

The two remaining systems, (34b) and (34c), employ a similar filtering principle, but it is of an entirely different sort than the ones we have been discussing. Consider the case where one of the conjuncts is true and the other is indeterminate. This yields the indeterminate value for the conjunction in both Łukasiewicz’ and Van Fraassen’s systems, which we can interpret as meaning that the failing presupposition of one component is also a presupposition for the conjunction itself. However, if one of the constituents happens to be false while the other component is indeterminate, then both

¹⁷ Keenan (1972, 457) gives a truth table for *and* which is identical to (32a). On the other hand, Keenan’s *or* coincides with Łukasiewicz’ disjunction. Nothing is gained by this strange compromise between the internal Bochvar and the Łukasiewicz systems.

¹⁸ The two Bochvar systems are related in the following way. Given the truth tables for classical connectives, we can define the external connectives with the help of a truth operator, “t”, which has the following truth table.

(i)	A	‘t(A)’ “it is true that A”
	T	T
	F	F
	#	F

For example, the external Bochvar conjunction is defined as ‘t(A) & t(B)’. Note that “t” is a plug in Bochvar’s system, and since it introduces no presuppositions of its own, ‘t(A)’ is always bivalent. The distinction between internal, “~”, and external, “¬”, negation exhibited below is achieved by defining the external negation in terms of ordinary negation and the truth operator. Thus (iii) can be obtained from (ii) and (i) by defining ‘¬A’ as ‘~t(A)’.

(ii)	A	‘~A’ (internal negation of A)
	T	F
	F	T
	#	#

(iii)	A	‘¬A’ (external negation of A)
	T	F
	F	T
	#	T

This is an important distinction for ordinary language. However, the most natural way to capture it in our framework is to distinguish between two senses of *not*. As internal negation (choice negation), *not* is a hole and lets through all of the presuppositions of the sentence it negates. The external *not* (exclusion negation) is a plug that blocks off all of them. The fact that the ordinary (internal) negation of a sentence has the same presuppositions as the sentence itself need not be made a defining feature for the notion of presupposition in the usual manner. Instead it follows naturally once we observe that *not* itself carries no presuppositions and that, like many other complementizable predicates, it lets through all of the presuppositions of the complement.

Łukasiewicz and Van Fraassen regard the conjunction as false. This may not look so bad until you consider the corresponding sentences in ordinary language.

- (35) a. Paris is the capital of France, and the king of France is bald.
 b. Marseilles is the capital of France, and the king of France is bald.

Assuming that the facts are as we know them to be, in Łukasiewicz' and Van Fraassen's system (35a) presupposes that France has a king, since the sentence is neither true nor false in case the king does not exist. On the other hand, given the actual state of affairs, (35b) in their logics does not presuppose the existence of the king, since the falsehood of the first conjunct is sufficient to make the conjunction bivalent. From the point of view of ordinary language, this outcome is definitely unacceptable. Relative to our actual world, where the form of government a country has is not determined by the choice of the capital, both sentences surely presuppose that France has a king.

In general, whether or not a presupposition of a particular constituent gets filtered out in (34b) and (34c) depends on the truth value of the other constituent, not on the semantic relation between them as the case seems to be in ordinary language. As promising as Van Fraassen's theory of supervaluations is from a purely logical standpoint, as an approach to natural language semantics it appears to be just as unsatisfactory as Łukasiewicz' older system.

I understand that most logicians have a distaste for three-valued logics in general. In all such systems, if truthfunctionality is strictly maintained, then some classically valid sentences or arguments will be lost. In this respect, many-valued logics differ from modal logic and other similar extensions of classical logic which maintain bivalency but admit some nontruthfunctional operators. Therefore, it is only comforting to find out that, with regard to natural language semantics, nonclassical logics with truthfunctional connectives have nothing to recommend themselves either. They do not provide us with a viable notion of presupposition. It is an unexpected disappointment, however, that Van Fraassen's approach appears to be equally unrewarding in this respect.

11. Let us now leave logical connectives and turn back to ordinary complementizable predicates. As we mentioned above, they seem to fall into two groups. Plug verbs like *say* and *order* have the property that the presuppositions of the complement sentence are not presuppositions of the superordinate sentence. Hole verbs like *manage* and *stop* let through all of the presuppositions of the complement. Most complementizable verbs can easily be assigned to one or the other category. Difficulties seem to arise only in connection with verbs of propositional attitude. The typical members of this class are *believe*, *think*, *doubt*, *suspect*, and *hope*. Does the sentence (36) presuppose what its complement presupposes? Does it have to be the case that Fred has been beating Zelda?

- (36) Bill believes that Fred has stopped beating Zelda.

It is interesting to observe that judgments seem to differ in such cases. It has proved difficult to get speakers to agree on what the right answer should be, which may indicate that the question has been put in a wrong way. As I understand it, the situation is as follows.

Those who feel that (36) carries no such presupposition are thinking of (36) not as an isolated sentence but as part of a certain kind of larger context. For example, (36) might appear in a sequence which describes Bill's (possibly erroneous) beliefs. This is the case in (37).

- (37) Bill believes that Fred has been beating Zelda, and furthermore, Bill believes that Fred has stopped beating Zelda.

It is clear that, when it appears in a context like (37), the sentence in (36) does not presuppose that Fred has been beating Zelda. However, this fact can be explained without necessarily assuming that *believe* is a plug. One is tempted to say that without the presence of some implicit context of this kind the sentence in (36) does carry all the presuppositions of its complement clause. The judgment on what the presuppositions of (36) are perhaps depends on whether one thinks of the sentence in isolation or whether one allows for additional context. This would explain the lack of agreement that one finds on that question. Assuming now that *believe* is a hole, the fact that (37) carries no presupposition of Fred's having beaten Zelda does not directly follow from our filtering conditions, since the first conjunct in (37) does not entail what the second conjunct presupposes. However, we can explain it in an indirect way by pointing out that (37) has the form of (38a) and that the two expressions in (38) are equivalent.¹⁹

- (38) a. a believes that A and a believes that B
b. a believes that A and B

Consequently, (37) is equivalent to (39) below.

- (39) Bill believes that Fred has been beating Zelda, and furthermore, that Fred has stopped beating her.

Now, (39) has the form of (38b); the embedded clause is a conjunction. In this case our filtering condition does apply, since the first conjunct entails what the second presupposes. Thus the condition correctly predicts that (39) carries no such presupposition. It does not matter whether the verb *believe* in the superordinate sentence is a plug or a hole. The blocking of the presupposition in any case is due to the semantic relations in the embedded conjunction.

On the basis of the above facts, it appears feasible to maintain the view that *believe* and other similar propositional attitude verbs are holes even in the face of examples like (37) which at first seem to indicate otherwise. However, this carries an expensive price tag. The filtering conditions will have to be complicated considerably

¹⁹ As far as I know, most students of epistemic logic accept the equivalence of (38a) and (38b). For example, see Hintikka (1962).

since we will have to make provisions for the possibility that certain equivalence relations, such as in (38), are also involved in the blocking of presuppositions. On the other hand, the assumption that *believe* and other verbs are plugs involves no additional complications and is equally compatible with our intuitions about (37) and (39). Since the facts about (36) are so unclear, I am not sure what the right policy should be.

Looking at examples like (39) can be instructive for another reason. It has not always been realized that the filtering of presuppositions in such cases need have nothing to do with the verb of the superordinate clause. For example, consider the sentence discussed by Morgan (1969).

(40) I dreamed that I was a German and that I regretted it.

As Morgan observed, (40) does not presuppose that the speaker is a German. He concluded from it that the verb *dream* must belong to a class of “world-creating” predicates which block presuppositions. In reality, the blocking is not due to *dream* but to the fact that the embedded clause is a conjunction which meets the filtering condition in (17). In order to determine whether *dream* is a plug or a hole one has to look at sentences like (41).

(41) Bill dreamed that Mary regretted that Henry was a German.

According to Morgan, (41) does presuppose that Henry was a German; for him, *dream* lets through all of the presuppositions of a simple complement. However, it seems that the facts are somewhat unclear here, just as they are in the case of (36). Some of my informants insist that (41) and (36) do not share presuppositions of their complements, but others think they do.

There is a type of sentence (first pointed out to me by John Lawler) which is even more difficult to account for, except by assuming that propositional attitude verbs are plugs. Consider (42).

(42) Bill believed that Fred had been beating his wife and hoped that Fred would stop beating her.

It is clear that (42) as a whole does not presuppose that any wife-beating has taken place. Unless we are ready to accept the view that *hope* is a plug, we are in trouble, since our filtering condition does not block any presupposition which is not entailed by the first conjunct. Since the verb in question is *believe*, no entailment relation holds between the superordinate sentence and the complement. Furthermore, we cannot appeal to a logical equivalence of the kind illustrated in (38) because two distinct verbs are involved; (42) has the form of (43).

(43) a believes that A and a hopes that B

Because of examples like (42) we do not seem to have any other alternative except to classify all propositional attitude verbs as plugs, although I am still not convinced that this is the right approach.

12. I believe that the following are the most important points in this article. First, I have argued that, in general, one cannot talk about the presuppositions of a compound sentence in an absolute sense. The notion of presupposition must be relativized with respect to linguistic contexts, that is, to sets of background assumptions. The statements about presuppositions will not be of the form "A presupposes B" but "A presupposes B relative to X".²⁰ Secondly, I believe that the cumulative principle is basically correct; one derives the presuppositions of a compound by adding up the presuppositions of its constituent sentences. The cumulative principle is, however, modified by certain blocking conditions. In some cases a presupposition of a constituent is not shared by the superordinate sentence. There is a class of verbs, called plugs, which block all of the presuppositions of their complement sentences. This class contains at least all verbs of saying and possibly also the propositional attitude verbs.

Filtering of presuppositions takes place if the compound sentence involves some logical connective, *and*, *or*, *if . . . then*. The filtering conditions given above are not symmetric. If the compound is of the form "A and B", "A or B", or "If A then B", it will share all of the presuppositions of A. It is only the presuppositions of B that can become void. This asymmetry of the conditions, in particular for *or*, is open to doubt, but the evidence presented above tends to support it. The filtering conditions for *if . . . then* and *and* are the same. Assuming that B presupposes C (relative to X), a sentence of the form "If A then B" or "A and B" need not have this presupposition (relative to X) provided that C is entailed by the set which results from adding A to X. For sentences of the form "A or B", the filtering condition is the same except that C must be entailed by the set which results from adding the negation of A to X. In spite of the somewhat complicated formulation of the conditions, the principle itself is really a very simple one, and all available evidence seems to support it.

The most important aspect of the filtering conditions is that the cancelling of presuppositions depends on the semantic relation between the sentences involved, not on their actual truth values. This kind of filtering principle is surely compatible with any definition of pragmatic presupposition that might be proposed. It remains to be seen what the consequences are for the semantic concept of presupposition.

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²⁰ Of course, there are plenty of simple sentences which have the same set of presuppositions irrespective of any context. We have only shown here that the context has to be taken into account in dealing with compound sentences which involve logical connectives. However, the same appears to be true of sentences of the form "A before B", which contain neither *and* nor *or* nor *if . . . then*. As Orvokki Heinämäki (1972) has shown, sometimes "A before B" presupposes B, sometimes it entails $\lceil \sim B \rceil$. This depends crucially on the semantic relation between A and B. B is a presupposition for "A before B" except in the case where A and some set of assumed facts jointly entail $\lceil \sim B \rceil$. For this reason, the presuppositions of "A before B" can only be determined with respect to a given context.

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