equally a consequence; so none of them is implied differentially with respect to U^*. To take an entirely typical example, his 'If x is an emerald, then there is a nongrue emerald not belonging to U^*' does indeed follow from the pertinent information together with the assertion that x is not grue; but so also, obviously, does 'For any class U, if x is an emerald, then there is a nongrue emerald not belonging to $U - \{x\}$'. Thus Zabludowski has not shown that 'All emeralds are grue' wantonly embeds 'All emeralds are green', and he is left with no argument whatsoever to sustain his claim that the principle of wanton embedding fails to distinguish between illicit and licit rivalries.[7]

Zabludowski's arguments have accomplished nothing toward showing either that "projectibility is no good" or that an adequate theory of projectibility requires any departure from extensionalism.

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COUNTERFACTUALS WITH DISJUNCTIVE ANTECEDENTS

IN a recent article * Donald Nute has sketched semantics for counterfactuals which he believes "are superior to those proposed in Stalnaker and Lewis for the purposes of representing the logical structure of counterfactuals" (778). Nute's primary objection to Lewis semantics is that in them

SDA: $((A \vee B) > C) \supset ((A > B) \& (B > C))$

[7] There was not meant to be any mystery surrounding the "information and assumptions deemed pertinent," which we called 'ρ'. Typically this includes statements telling what the allegedly competing hypotheses are, what the class U of undetermined instances is, and, perhaps, unquestioned and useful assumptions on a par with 'Emeralds are precious stones'. No harm to add to ρ any further statements that are beyond question at the time in point; but no need either. What ρ will certainly not contain is a definition that licenses us to regard some single indissoluble symbol as a name of $U - \{x\}$. By the way, observe that if 'U^*' is understood, as well it might be, as having 'U' as a part and denoting a function of U, then reinstatement of unabbreviated notation is unnecessary in the above. Nor should there be any mystery about our use of 'implies'; it stands for logical implication. A study now in preparation will explicate further the notion of "loose composite" that was used in our statement of the principle of wanton embedding.

* "Counterfactuals and the Similarity of Words," this JOURNAL, LXXII 21 (Dec. 4, 1975): 773–778. I will refer to his counterfactual system as *Nute*.

is not valid. Nute thinks that SDA should be valid in an adequate counterfactual logic, since he believes that in English the inference from a sentence of the form

(K) If *A* or *B* were the case then *C* would be the case.

to a sentence of the form

(L) If *A* were the case then *C* would be the case and if *B* were the case *C* would be the case.

is intuitively valid. He realizes that adding SDA as an axiom to Lewis has the unwelcome result of making $(A > B) \supset \Box(A \supset B)$ a theorem. ($\Box A$ is contextually defined as $\sim A > A$.) A proof of this is:

$A > B$	
$((A \mathbin{\&} B) \vee (A \mathbin{\&} \sim B)) > B$	substitutivity of equivalent formulas
$(A \mathbin{\&} \sim B) > B$	SDA
$(A \mathbin{\&} \sim B) > (\sim A \vee B)$	weakening consequent
$\sim(\sim A \vee B) > (\sim A \vee B)$	substitutivity
$\Box(A \supset B)$	definition of $\Box$

David Lewis has given convincing arguments to demonstrate the undesirability of this result.[1] Nute proposes to avoid it by devising a logic of counterfactuals in which substitution of logically equivalent formulas in the antecedent of a counterfactual is not generally permitted. In this note I argue that this is much too high a price to pay for the validity of SDA. Furthermore, Nute's willingness to pay it seems based on a misconception of the relation between natural and formal languages.

A model for Nute semantics consists of a set of worlds *W* and a function *f* whose domain is the set of ordered pairs $\langle A,i \rangle$, where $i \in W$ and *A* is a formula of the counterfactual language L, and whose range is the power set of *W*. *f* must satisfy the following conditions:

(i) *A* must be true in every world in $f(A,i)$.

(ii) If *A* is true in *i*, then *i* is in $f(A,i)$.

(iii) If $f(A,i)$ is empty, then $\Box \sim A$ is true in *i*.

(iv) $f(A \vee B,i) \supset f(A,i)$.

The counterfactual $A > B$ is true at *i* iff *B* is true at each member of $f(A,i)$.[2]

[1] *Counterfactuals* (Cambridge, Mass.: Harvard, 1973). I will refer to Lewis's system as *Lewis*.

[2] In Lewis, worlds are ranked relative to a given world *w* by a similarity relation *R* which is a weak ordering on *W*. $A > B$ is true at *W* iff there is no world at which $A \mathbin{\&} \sim B$ holds which precedes a world at which $A \mathbin{\&} B$ holds. If Lewis's limit assumption (57–60) is satisfied, then one can define a choice function *g* that plays a role similar to that of *f* in Nute. One important difference, however, is that where *g*'s arguments are pairs $\langle$proposition, world$\rangle$ *f*'s arguments are pairs $\langle$formula, world$\rangle$.

Condition iv guarantees the validity of SDA. Notice also that in Nute, in contrast to Lewis, $(A \,\&\, B) \supset (A > B)$ is not valid. Although this may be counted as an advantage of Nute over Lewis, it has nothing to do with the validity of SDA. An unusual feature of Nute is that the first argument of f is not a proposition but a formula. It is because of this that substitutivity of logically equivalent formulas does not hold. This blocks the proof of $(A > B) \supset \Box (A \supset B)$, since one cannot freely substitute $(A \,\&\, B) \vee (A \,\&\, {\sim} B)$ for A in the antecedent of a counterfactual; it also has the result that none of the following are valid:

$$(A > B) \equiv ((A \vee A) > B) \qquad (A \,\&\, B > C) \equiv (B \,\&\, A > C)$$

$$(A \,\&\, (B \vee C)) > D) \equiv ((A \,\&\, B) \vee (A \,\&\, C) > D) \qquad (A > C) \equiv ({\sim}{\sim} A > C)$$

The problem, of course, is due to the fact that the set of worlds one looks at in evaluating $A > B$ depends not on the proposition expressed by A (the set of worlds at which A is true) but on A's syntactic form. This situation is entirely unsatisfactory. The trouble is not merely that many formulas we would like to regard as valid are invalid in Nute semantics. On Lewis semantics one has to know how to rank worlds as more or less similar in order to learn the truth conditions of counterfactuals. But in Nute's semantics one has to learn for each formula separately what worlds are relevant in order to evaluate a counterfactual with that formula in the antecedent. Since f may be very irregular, it is difficult to see how one could ever learn the truth conditions of counterfactuals on Nute's account. The situation might be remedied somewhat by placing further restrictions on f; for example, $f({\sim}{\sim}A) = f(A)$. But it is hard to see how one might do this in such a way as to obtain the formulas one wants to be valid while avoiding the validity of $(A > B) \supset \Box (A \supset B)$.

Nute's belief that Lewis is inadequate to represent the logic of counterfactuals is based on his assuming that the appropriate paraphrase of an English sentence of the form (K) into a counterfactual language is $(A \vee B) > C$. Underlying this assumption is a simplistic view of the relationship between English sentences and their paraphrases into a formal language. The assumption is that the "surface logical structure" of an English sentence and the logical structure of its formal paraphrase should be identical. In this case, Nute seems to reason that, since 'or' occurs between A and B in (K), 'v' should occur between A and B in the formal paraphrase of (K). However, there are numerous examples that show that one-to-one translation from English to a formal language is untenable. I do not think that anyone would be willing to claim that the usual truth-functional treatment of negation is inadequate because '$\sim\sim A \supset A$' is a theorem, although in English a doubly negated sentence seldom has the same meaning as the unnegated sentence. An example more similar to the situation we are considering is provided by sentences like

(M) It is permissible that *A* or *B*.

Such a sentence seems to have the same import as

(N) It is permissible that *A* and it is permissible that *B*.

But it would turn out to be disastrous to deontic logic to add the formula $P(A \vee B) \supset PA \,\&\, PB$ as an axiom, since in the standard deontic logics this implies $PA \supset PB$. An alternative approach for dealing with this situation would be to paraphrase (M) directly as $PA \,\&\, PB$. Similarly, one can deal with the intuitive validity of the inference from (K) to (L) by paraphrasing (K) directly as $(A > C) \,\&\, (B > C)$. Notice the similarity between the two situations. In both cases the surface form of an English sentence is 'Modal operator (*A* or *B*)', but its logical form seems to be 'Modal operator *A* and modal operator *B*'. This phenomenon is fairly common in English, although it is by no means universal. For example, '*a* believes that *A* or *B*' does not usually have the force of '*a* believes that *A* and *a* believes that *B*'.

My claim that (K) should be paraphrased by $(A > C) \,\&\, (B > C)$ would carry more conviction if an explanation could be provided for why this is so. The following model holds some promise of providing such an explanation. A semantic theory for some fragment of English maps the expressions of the fragment onto the expressions of an interpreted formal language in accordance with the structure of the English sentences. Call the interpretation thus provided for an English sentence its *semantic interpretation*. In a given context the actual interpretation of an English sentence may differ considerably from its semantic interpretation. For example, a doubly negated English sentence will have the same semantic interpretation as the unnegated sentence, but on a particular occasion it may express the same proposition as the singly negated sentence. Various "pragmatic pressures" [3] may act on the semantic interpretation of a sentence *A* to produce a different interpretation for a particular utterance of *A*. Call this the *pragmatic interpreta-*

[3] The term 'pragmatic pressures' is used by Jaakko Hintikka; see *Models for Modalities* (Dordrecht: Reidel, 1969), p. 5. The account of pragmatics sketched here was suggested by Hintikka's remarks.

tion of the utterance. As an example consider this conversation, cited by Grice: [4]

S. I am out of petrol.

T. There is a garage around the corner.

In this context it is natural to interpret *T*'s utterance as 'There is an open garage around the corner', although this is not the semantic interpretation of the sentence. The pragmatic pressure in this case is exerted by the assumption that *T* is attempting to assist *S* in finding petrol. So the pragmatic interpretation of *T*'s utterance is that there is an open garage around the corner. It may be that certain pragmatic pressures almost always operate on utterances of a particular kind. In such cases the pragmatic interpretation may become the standard interpretation. In order to express the semantic interpretation of such a sentence, one may have to indicate specifically that the usual pragmatic pressures are not at work. I will argue that this is precisely the situation with respect to counterfactuals.

We will make use of the following three "principles of pragmatics" in our account:

1. If someone makes an assertion it is normally expected that he is prepared to defend it.

2. One's utterances should be as informative as the occasion requires and one's knowledge allows. For example, one should not utter 'A or B' when one knows that A but does not know that B.

3. If someone utters a sentence which, in the particular context, seems to violate some pragmatic principles if it is given its semantic interpretation, it is natural to try to associate some other interpretation with the utterance.

These three "principles" are admittedly vague and in need of refinement. However, I think that they will serve to suggest an account of why (K) has the same interpretation as (L). I will suppose that the semantic interpretation of (K) is $(A \vee B) > C$ (interpreted in accord with Lewis) and show that pragmatic pressures will result in an utterance of (K) usually expressing $(A > C) \& (B > C)$.

Notice that in Lewis 'a world at which A is true is more similar to the actual world than is any world at which B is true' is expressed by $(A \vee B) > (A \& \sim B)$. We will abbreviate this formula by (A/B). The formula $\sim(A/B) \& \sim(B/A)$ holds just in case the "most sim-

[4] H. Paul Grice. "Logic and Conversation" in Peter Cole and Jerry L. Morgan, *Syntax and Semantics*, vol. 3 (New York: Academic Press, 1975). Grice suggests pragmatic principles which are similar to my 1, 2, and 3.

ilar" worlds at which A holds and the "most similar" worlds at which B holds are equally similar to the actual world. In order to show how pragmatic pressures applied to (K) result in its receiving the pragmatic interpretation $(A > C)$ & $(B > C)$, I will consider two cases. First, suppose that Smith asserts (K) but does not know which of (A/B), (B/A), and $\sim(A/B)$ & $\sim(B/A)$ holds. According to principle 1, Smith should be prepared to defend his assertion should he be told which one of these three cases obtains. Since (A/B) & $((A \vee B) > C)$ implies $A > C$, Smith will be able to defend his assertion (K) in light of the new information (A/B) only if he is prepared to defend $A > C$ in light of the new information. But typically he will be able to do this only if he is already prepared to defend $A > C$ before learning that (A/B). Consider, for example, my utterance of the counterfactual 'If Nixon had burned the tapes or paid off Dean he would not have been forced to resign'. I do not know which of the two conditions, Nixon's paying off Dean or Nixon's burning the tapes involves a greater departure from the actual course of events. So, if I am to defend my original counterfactual assertion, I should be able to defend both 'If Nixon had burned the tapes then he would not have been forced to resign' and 'if Nixon had paid off Dean he would not have been forced to resign'. It is, of course, possible for Smith to have good reason to believe $(A \vee B) > C$ without having good reason to believe both $A > C$ and $B > C$. He might, for example, believe $(A/B) \supset (A > C)$ and $(B/A) \supset (B > C)$ without believing either $A > C$ or $B > C$. But this kind of situation seems to be unusual. Typically, defending $(A \vee B) > C$ involves defending both $A > C$ and $B > C$. So, in the case in which Smith does not know which of (A/B), and $\sim(A/B)$ & $\sim(B/A)$ holds, pragmatic pressures result in interpreting (K) as $(A > C)$ & $(B > C)$.

Now suppose Smith utters (K) and it is known that (A/B). Nute provides just such an example with the following counterfactual: 'If we were to have good weather this summer or if the sun were to grow cold before the end of summer, we would have a bumper crop'. It is common knowledge that (there is good weather/the sun grows cold). Notice that (A/B) & $(A > C)$ implies $(A \vee B) > C$ but not vice versa. So, in this case, if we interpreted Smith's utterance of (K) as $(A \vee B) > C$, we would wonder why he disjoined B to A in the antecedent of the counterfactual, since interpretation of B is irrelevant to the truth value of the counterfactual. In fact, Smith would be flouting pragmatic principle 2, since his utterance would not be as informative as it could be. In accord with principle 3, we should look for a different interpretation of (K). A plausible explanation of why Smith disjoined B to A even though he knows (A/B) is that he believes $B > C$ as well as $A > C$. So, in this case, the pragmatic interpretation of (K) would seem to be $(A > C)$ & $(B > C)$. Finally, if Smith knows (or believes) $\sim(A/B)$ & $\sim(B/A)$, then he would have good reason to assert (K) only if he had good reason to assert both $A > C$ and $B > C$. So again, pragmatic pressures result in interpreting him as asserting the conjunction.

In view of these considerations it is not surprising that the standard interpretation of (K) is $(A > C)$ & $(B > C)$. But even so, this is not invariably the case. One can cancel the usual pragmatics, as is done in the following sentence: 'If A or B were the case, but I do not know which, then C would be the case'. Here the speaker is canceling the usual expectation that he can defend his assertion should he learn which of (A/B), (B/A), and $\sim(A/B)$ & $\sim(B/A)$ obtains. The pragmatic interpretation of an utterance of this sentence is its semantic interpretation, $(A \vee B) > C$.

I am aware that the preceding account will need to be modified and refined as the systematic theory of pragmatics is developed. But, if my explanation is approximately correct, then we have a way of accounting for the inference from (K) to (L) that certainly seems more attractive than Nute's alternative of adopting SDA as an axiom. But whatever the merits of my account, our discussion should show that the problem of representing counterfactuals or other natural-language constructions in a formal language is more subtle and complicated than it may at first appear.

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SEXUAL BEHAVIOR: ANOTHER POSITION *

WE can often distinguish behavior that is sexual from behavior that is not. Sexual intercourse may be one clear example of the former, but other sexual behaviors are not so clearly defined. Some kissing is sexual; some is not. Sometimes looking is sexual; sometimes *not* looking is sexual. Is it possible, then, to *characterize* sexual behavior?

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