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Conditionals in English and FOPL

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If and *suppose* – two small words, but
nobody has ever been able to explain them.
– Jack Johnson

In the 1960's, both Montague (e.g. 1970, 222) and Grice (1975, 24) famously declared that natural languages were not so different from the formal languages of logic as people had thought. Montague sought to comprehend the grammars of both within a single theory, and Grice sought to explain away apparent divergences as due to the fact that the former, but not the latter, were used for conversation. But, if we confine our concept of logic to first order predicate logic (or FOPL) with identity (that is, omitting everything which is not required for the pursuit of mathematical truth), then there are of course many other aspects, in addition to its use in conversation, which distinguish natural language from logic. Conventional implicature, information structure (including presupposition), tense and time reference, and the expression of causation and inference are several of these, which combine as well with syntactic complexities which are unnecessary in first order predicate logic. In this paper I will argue that such distinguishing aspects should be more fully exploited to explain the differences between the material conditional of logic and the indicative conditional of one natural language (English).

In the first section of the paper we will review the main contending analyses of the English indicative conditional. In section 2 I will try to argue there that, as far as truth conditions go, there is some support for the much maligned material conditional view. (Much of this material is taken from Abbott 2004.) Following that we will look in more detail at some of the traditionally cited problems for the material conditional analysis. Here I will try to draw on the differences between natural language and logic mentioned above in order to argue that these problems are not as crushing as they are sometimes taken to be. The last section of the paper contains concluding remarks.[1]

[1] There are a number of kinds of *if* sentences whose semantics and pragmatics will not be addressed in this paper. Subjunctive conditionals will be touched on only briefly, to be distinguished from ordinary indicative conditionals. I will have even less, if anything, to say about 'generic' conditionals, e.g.
(i) If a student wants to succeed, s/he should study hard.
or *if*-clauses which serve as quantificational restrictors, e.g.
(ii) Often if it is raining my roof leaks [= Lewis1975, ex. 32].
See von Fintel & Iatridou 2002 for discussion of the former, and Lewis 1975 for discussion of the latter.

1. Competing analyses of English indicative conditional sentences.

1.1. The material conditional analysis. According to the material conditional analysis, indicative conditionals have the truth conditions of the material conditional truth function of logic, hereinafter sometimes symbolized with the 'hook' ( ). These are given in (1) below.

(1)

A	*C*	*A* *C*
T	T	T
T	F	F
F	T	T
F	F	T

Thus on this account, indicative English sentences of the form *If A (then) C* are true unless *A* is true and *C* is false, and they are equivalent to *Either not-A or C*. A number of factors support this analysis. For one thing, it would give a corresponding natural language expression (to go with *and* (for) *or* (for), and *not* (for ¬)). More importantly, *if A then C* often does seem to be equivalent to *Either not-A or C*. As Stalnaker notes: '"Either the butler or the gardener did it. Therefore, if the butler didn't do it, the gardener did." This piece of reasoning…may seem tedious, but it is surely compelling' (1975, 137). And if it is valid then the English indicative conditional is in fact equivalent to the material conditional of FOPL. (Stalnaker did not come to this conclusion; however Hanson 1991 and Barker 1997 also give proof-like arguments in favor of the material conditional analysis.)

The problems for this analysis are well-known. For the most part they stem from the failure of those truth conditions by themselves to predict either assertability of indicative conditionals or their use in reasoning, in a number of cases. Some of these cases, so-called 'fallacies of the material conditional', are given in (2)-(4). In each case I give first a logically valid deduction, and then an English example which does not seem to be valid. (These examples are modified from ones found frequently in the literature; (2) is based on an example from Jackson (1979), (3) is based on examples from Gibbard (1980), and (4) comes from Goodman (1947).)

(2) Contraposition.
   a. A C, ¬C ¬A
   b. If Bush wins, it won't be by a large margin. Therefore, if Bush wins by a large margin, he won't win.

(3) Negated Antecedent (a.k.a. Vacuous Truth).
   a. ¬A, A C
   b. Andrew Jackson was President in 1836. Therefore, if Jackson died in 1835, he was president in 1836.

(4) Antecedent Strengthening.
   a. A C, (A B) C
   b. If I strike this match it will light. Therefore, if I pour water on this match and strike it, it will light.

The other major problem area for the material conditional analysis is the fact that denying *If A then C* rarely seems equivalent to asserting *A and not-C*, as it should on the material conditional analysis. Indeed, if we accept this analysis we seem forced to accept the

existence of God, given proofs like the following (from Michael Jubien, personal communication; a similar proof was attributed to W.D. Hart by Edgington (1986, 37, n. 6)).

(5) i. If God doesn't exist, then it's not the case that if I'm evil, I'll be punished after I die.
ii. I'm not evil!
God exists.

(Fortunately for the atheistically inclined, with a little ingenuity we can probably also come up with a proof that God doesn't exist.)

1.2. Intensional analyses. The vulnerable part of the material conditional analysis is the bottom half of the truth table given in (1), and the remaining analyses find a way to avoid that area altogether. Many of them acknowledge a foundation in what has come to be called 'the Ramsey test':

(6) If two people are arguing 'If *p*, will *q*?' and both are in doubt as to *p*, they are adding *p* hypothetically to their stock of knowledge and arguing on that basis about *q*…. We can say they are fixing their degrees of belief in *q* given *p*. (Ramsey 1931, 247; cited in Gibbard 1980, 227.)

The idea behind Stalnaker's intensional analysis is the following: 'a conditional statement, *if A, then B*, is an assertion that the consequent is true, not necessarily in the world as it is, but in the world as it would be if the antecedent were true' (1975, 143). 'The world as it would be' is that world which is closest in similarity to the actual world but in which the antecedent is true. (The approaches of Kratzer (1986) and Lycan (2001) are similar, except that the consequent must be true in **all** worlds (within the context set, or within some subset thereof) in which the antecedent is true.) This raises the question of what the difference is between indicative conditionals (like those in (7)) and the corresponding subjunctive conditionals in (8).

(7) a. If Lynn was there she got the message.
b. If it rains tomorrow, we can't have our picnic.

(8) a. If Lynn had been there, she would have got the message.
b. If it were to rain tomorrow, we couldn't have our picnic.

Indeed, both Stalnaker (1968) and Lewis (1973) assign truth conditions to subjunctive conditionals[2] which are very like the Stalnaker truth conditions for indicatives. The difference, for Stalnaker, is whether or not, in going to nearby possible worlds, we abandon propositions which are in the common ground of the conversation. For indicatives we don't, for subjunctives we may.

On this kind of theory, the patterns of inference illustrated in (2)-(4) are not valid, matching our intuitions about them. Furthermore the negation of a conditional *If A then C* is equivalent to *If A then not-C*. This also seems to accord well with our intuitions, at least in some cases.

Problems have been noted for intentional analyses. As Edgington points out (2003, and elsewhere), the kind of inference mentioned above about the butler and the gardener, which was described as 'compelling' by Stalnaker, does not hold on this account. The examples are repeated here as (9).

[2] Actually Lewis 1973 is specifically concerned with the truth conditions for counterfactual conditionals, that subset of subjunctive conditionals for which the antecedent is assumed to be false.

(9) a. Either the butler or the gardener did it.
b. If the butler didn't do it, the gardener did.

On the possible worlds analysis (9a) could be true while (9b) is false. This would be the case if the butler did it, but in the closest world in which he didn't, the gardener didn't do it either. (Stalnaker gives an extended account of why this inference should be reliable, even if not valid (Stalnaker 1975, 187ff). However the complexity of reasoning involved makes it unconvincing.) I believe there are even worse problems than this for the intensional account, but will postpone going into those until we look at the third sort of approach to conditionals.

1.3 Probabilistic analyses. The Ramsey test also naturally gives rise to a probabilistic approach to conditionals. This approach focuses on the assertability of a conditional, which requires that the probability of the consequent given the antecedent (*P* (C/A)) is relatively high (and thus the probability of the negation of the consequent (*P* (¬ C/A)) relatively low). Adams 1975 is the *locus classicus* of this kind of approach, which has been more recently supported and developed by Stefan Kaufmann (2001, 2005). Interestingly, Lewis (1976, 1986) proved that there is no proposition X (i.e. no set of truth conditions) such that for a single probability measure, the probability of X is equal to a conditional probability. This means that acceptance of the probabilistic approach has the consequence that conditionals can not be viewed as having truth conditions at all. Supporters of this approach speak instead simply of the assertability of a conditional sentence, or the degree to which it is supported, or its probability, but this cannot be its probability of truth.

On the account of Kaufmann (2005), which treats only subjunctive and future (predictive) conditionals, such conditionals can be true – they will be if their antecedents are true and their consequents are as well. And they are false if their antecedents are true and their consequents are false. However if their antecedents are false, they are assigned 'expectations' – something like a probability of truth, were the antecedent to have been true. This is quite similar to the intensional type of approach, but instead of simply quantifying over possible worlds Kaufmann's probabilistic approach evaluates an indicative conditional *If A then C* by comparing the proportion of worlds where *A* and *C* are both true to those where *A* is true and *C* is false. (In addition, Kaufmann imposes a causal structure on the worlds under consideration, in order to avoid certain difficulties with prior accounts of this type, and there are other complexities which I am skipping over.)

2. Objections to the intensional and probabilistic analyses.

My main objection to both the intensional type of approach to conditionals, and to Kaufmann's probabilistic type of approach, is that they do not adequately distinguish indicative conditionals from subjunctive conditionals.

2.1. The 'Snodgrass' example.[3] In Abbott (2004) I presented the following 'Snodgrass' example: We have received a number of letters about the water shortage. Almost all of them were 5 pages or less, and all of those received an answer. One letter (from Byram

[3] My 'Snodgrass' example is similar to the type of situation described in Barker 1997.

Snodgrass) was 5 pages plus a few words, and the last letter was 8 pages. We did not reply to the last two letters. The 8-page one was just too long to consider, and Byram Snodgrass is a crank who has been writing incoherent letters to us about everything under the sun ever since we took on the post of Water Commissioner. We never answer his letters. Actually this letter of Byram's only went onto the sixth page because he added a PS: 'If you answer this letter I'll stop writing to you.' That made us stop and think, but in the end we threw his letter in the trash like all his other letters.

Byram called our office to find out whether his letter had been sent a reply. Based on the truth in (10),

(10) Every letter no longer than 5 pages was answered.

we said (11):

(11) If your letter was no longer than 5 pages, it was answered.

Our reply was truthful.

There is a sharp contrast between the true indicative conditional in (11) and the corresponding subjunctive conditional in (12), which is not true:

(12) If your letter had been no longer than 5 pages, it would have been answered.

As noted, we never answer letters from Byram Snodgrass. Analyses of subjunctive conditionals like that of Stalnaker 1968 and Lewis 1973 seem to give the right truth conditions for (12). In those analyses, we look at the closest world or worlds where the antecedent of a subjunctive conditional is true, and see whether the consequent is true or not. In any of those nearby possible worlds where Byram's letter was not quite 5 pages long, it still did not receive an answer, so the subjunctive (12) is correctly classified as false.

Analyses of indicative conditionals which assign them truth conditions similar to those assigned to subjunctive conditionals, and so only consider situations in which the antecedent is true even if this involves considering nonactual possibilities, cannot distinguish between (11) and (12) and hence cannot be correct. **The problem with such analyses is that they do not capture the fact stated in (F)**

(F) Indicative conditionals are always about the actual world, whether their antecedents are true or false.

Subjunctive conditionals, on the other hand, involve consideration of hypothetical situations, which may or may not be actual.

2.2. Snodgrass vs. Oswald. I should take a moment to explain why my 'Snodgrass' examples are different from the well-known 'Oswald' examples in (13) and (14) (adapted by Lewis (1973, 3) from examples given by Adams (1970, 90)), which are frequently given to illustrate the difference between indicative conditionals and subjunctive conditionals.

(13) If Oswald did not kill Kennedy, then someone else did.

(14) If Oswald had not killed Kennedy, then someone else would have.

It is quite easy to see that one could hold (13) to be true and (14) to be false. Nevertheless these examples do not make the case I wanted to make. Several factors combine to make them unsuitable. One is that there are two different ways to conceive of the antecedent being true, that is, to conceive of it being the case that Oswald did not kill Kennedy. One is to imagine that the crime was committed, but that Oswald did not do it. The other is to imagine that the crime never took place. When we are considering (13),

we are considering the first sort of situation and when we consider (14) we are considering the second. Also, when we consider (13) we consider the actual world (I would say we are forced to consider only the actual world, because this is an indicative conditional), and we can do that because there must always be some small doubt about whether Oswald was the murderer (and for some people, of course, there is a lot of doubt). However there can be no doubt that the crime was committed, so for (14) we consider a quite different possible world in which the crime never took place.

In short, for the Oswald examples there are two different ways to imagine the antecedent being true, one of which could hold in the actual world, and the other of which could not. So analyses like those of Stalnaker, Lycan, and Kratzer can account for the difference between them while still only considering situations in which the antecedent is true – an actual situation for (13) and a hypothetical, nonactual one for (14). For the Snodgrass examples, on the other hand, the antecedent is not ambivalent in this way. Instead, the antecedent of the indicative conditional is false at the actual world, but we still judge the whole conditional to be true. For the subjunctive version, on the other hand, we must consider alternative possible worlds in which the antecedent is true, and there the sentence as a whole is false because the consequent is false.

2.3. Future situations. As noted above, Kaufmann's probabilistic account does not treat past indicative conditionals, but only future and subjunctive ones. Indeed, it has often been suggested (most notably by Dudman (1991 and elsewhere)) that future conditionals bear more similarity to subjunctive conditionals than they do to other indicatives. I do not agree. Instead, I want to claim that future indicative conditionals no less than past or present ones are about the actual world and not alternative possibilities, and that in that they differ from subjunctives.

Let us return to our situation with Mr. Snodgrass. Suppose he were to call prior to writing his letter, to ask about whether or not his letter to the water commissioner would be answered. Suppose too that we know who he is and his history with the Water Commission, but we do not know how long the letter he will write is. Presumably, if we wanted to be truthful, we would not reply with (15), or (16).

(15) Every letter that is no more than 5 pages long will be answered.

(16) If your letter is at most 5 pages, it will be answered.

That is because we know that if Snodgrass's letter turned out to be shorter than 5 pages there is still no way it would get an answer. And clearly if Snodgrass were to learn about the customary (for everybody but him) 5 page limit and make sure to write a letter shorter than 5 pages, (15) and (16) would be false if we didn't answer it. But I want to claim that (15) is true if and only if every letter shorter than 5 pages gets an answer. And if Snodgrass's letter turns out to be longer than 5 pages (and all the short letters get answers), the predictive (16) is true, regardless of what would have happened had his letter been shorter than that. And so if we had answered with (15) or (16), intending to lie, we would have failed under those circumstances, since we would have said something true.

What gives these future cases the subjunctive feel to them is probably the fact that they are about as yet undetermined (or at least unknowable) events, and so in that sense they represent hypotheses about what will be the case. But regardless of that, it would be a mistake to give their truth conditions on the basis of how well- or ill-founded they are

as hypotheses, just as we would not want to evaluate future non-conditionals, like those in (17), on that basis.

(17) a. It will rain tomorrow.

b. The Bush administration will recognize the full threat of global warming and act vigorously to avert it.

Certainly we may argue about the truth or falsity of examples like (17) based on our view of their probability, but just as certainly we cannot be sure of their truth or falsity until after their respective event times have passed. Similarly examples like (15) and (16) should not be evaluated on the basis of probabilities, but rather than on the basis of how the facts unfold, since when we are in full knowledge of how the facts do unfold, we clearly evaluate them relative to those facts and not to some alternative possible course of events. This claim is pretty directly opposed to the following assertion of Kaufmann (2005, 186): 'It is appropriate to say that [18] is true or false depending on whether the match is dry or wet….'

(18) If the match is struck, it will light. [= Kaufmann 2005, ex. 7a]

On the contrary, we cannot say whether (18) is true or false until either the match is struck or it can no longer be struck.

2.4. Conclusion. My main claim in the foregoing has been that indicative conditionals are about the actual world, rather than about alternative possible worlds. This claim is supported by the morphological evidence; indicative conditionals are indicative – there is no morphological marking of irrealis like that we find with, say, subjunctive conditionals. There has been a fair amount of discussion in the literature as to how similar or different indicative conditionals are from subjunctives. The comments of Strawson (1986) are frequently cited, as in the following quote from Edgington (1995, 245) (cf. also Kaufmann 2005, 184f):

> He [i.e. Strawson] gives the examples;
>
> > Remark made in the summer of 1964: 'If Goldwater is elected, then the liberals will be dismayed'.
> >
> > Remark made in the winter of 1964: 'If Goldwater had been elected, then the liberals would have been dismayed''
>
> And comments that 'the least attractive thing that one could say about the *difference* between these two remarks is that… "if…then…" has a different meaning in one remark from the meaning which it has in the other' (p. 230).

However it is not necessary to invoke a difference in the meaning of *if…then…* in order to claim a difference between indicative and subjunctive conditionals, since there is another factor which distinguishes them – their mood. Furthermore the difference between indicative and subjunctive mood corresponds exactly to the distinction I claim exists between indicative and subjunctive conditionals – i.e. that indicatives are about the actual world whereas subjunctives are about hypothetical possibilities. (Cf. also Iatridou 2000.)

3. Support for the material conditional.

3.1. A conventional implicature for if. Since the material conditional analysis of indicatives is the only extant proposal which treats them as being unambiguously about the actual world, it seems worthwhile to keep looking for ways to deal with the apparently crushing problems for this analysis. Edgington (1995, 245) summarizes the problem as follows: 'We need to be able to discriminate believable from unbelievable conditionals whose antecedent we think is false. The truth-functional account does not allow us to do this.'

Grice, of course, has been one of the most vigorous defenders of the truth functional analysis, supplementing it with the idea that assertion of a conditional conveys conversationally that the speaker has grounds independent of either falsity of the antecedent or truth of the consequent for believing that the conditional is true. (Cf. Grice 1989a; these grounds would typically be some causal or inferential relation between the two propositions.) However Edgington argues that this will not do: '…the difficulties with the truth-functional conditional cannot be explained away in terms of what is an inappropriate conversational remark. They arise at the level of belief' (1995, 245).

Jackson (1979) also argues against Grice's version of the material conditional analysis. Instead, he proposes that conditionals convey a **conventional** implicature (in the sense of Grice 1975) to the effect that the conditional is ROBUST with respect to the truth of the antecedent. This enables him to distinguish plausible from implausible conditionals with false antecedents. Failure of this robustness (e.g. in the case of the bad conditionals in (2)-(4) above) leads to unassertability of a conditional, though not necessarily to its falsehood. Since Jackson's implicature is conventional, it would also be a part of conditional beliefs, thus skirting Edgington's objections to Grice. Nevertheless there are some problems with Jackson's theory. One is that it does not allow for 'Easter bunny' conditionals such as (19).

(19) If that's a real diamond then I'm the Easter bunny.

Easter bunny conditionals depend crucially on modus tollens; the consequent is intended to strike the addressee as obviously false, thus conveying the falsity of the antecedent. Jackson does acknowledge the existence of such conditionals, but argues that they are 'not standard', and thus that his theory does not need to account for them. This response is weak, though it might slip by if there were no other problem with Jackson's proposal. However there is at least one other problem: Jackson's proposed conventional implicature is unlike other such implicatures in not being available to intuition. In the case of *even* or *therefore* we know the meanings of the words and know what the conventional implicatures are. This is not so in the case of *if*. (These problems were pointed out in Abbott 2004; see also Edgington 1995, 301ff4 for further arguments against Jackson's analysis.)

I would like to amend Jackson's proposal in the following way. First of all, like Jackson, I believe that *if* does convey a conventional implicature, but I suggest that the implicature is something that I will call CONDITIONALITY, by which I mean that the *if* clause conveys a condition under which the content of the consequent holds. This is something that we have direct intuitive access to in connection with *if*, thus solving the second problem associated with Jackson's proposal. Also, it does not impede modus tollens, thus solving the problem with Easter bunny conditionals.

Secondly, I want to claim that the conditionality conventionally associated with *if* gives rise to a number of conversational implicatures. These are the ones proposed by

Grice (1989a) to do with there being some grounds independent of truth values for supposing that the conditional is true – grounds such as that the circumstances referred to in the antecedent are causally sufficient for those in the consequent, or that the consequent would be inferable from the antecedent for some other reason.

One conversational implicature which is less obvious is what von Fintel & Iatridou (2002) call 'iffiness' – the idea that the proposition expressed by the *if* clause may not be true. The mechanism for this implicature is the standard Gricean one: if one could simply assert the consequent clause, one would. By making that assertion conditional on the *if* clause, one conveys that one is not in a position to make that assertion *tout court*. It follows (again, from the conditionality) that the antecedent clause is also not one known by the speaker to be true (because if the speaker did know it was true, then they would also be sure of the truth of the consequent clause). Notably, this implicature is cancelable in the case of 'premise-conditionals' (the term is Haegeman's (2003)) such as (20)

(20) If [as you say] it is going to rain this afternoon, why don't we just stay at home and watch a video? [= Haegeman 2003, ex. 1b]

Here information from context shows the antecedent clause is being assumed to be true, canceling the implicature that it may not be.

Finally, I would like to supplement the Jacksonian approach by observing the many other features of the English indicative conditional which are not shared with their logical counterpart. (Some of these are also stressed in Lycan, 2001.) First of all, the semantic asymmetricality of the material conditional is more than matched in English with grammatical asymmetry: *if*-clauses are adverbial modifiers of their consequents, not coordinated clauses (and in this they are conjunction and disjunction). Like other adverbial modifiers, their syntactic position shows a lot of flexibility, as shown in (21) and (22).

(21) a. If Sue raises, Bill will call.
b. Bill will call, if Sue raises.
c. Bill, if Sue raises, will call.
d. Bill will, if Sue raises, call.

(22) a. Fortunately, Bill will call.
b. Bill will call, fortunately.
c. Bill, fortunately, will call.
d. Bill will, fortunately, call.

Often, adverbial modifiers will constitute the main assertion in an utterance, the remainder being grammatically presupposed. This is true of the temporal and manner adverbials in (23), for example.

(23) a. Mary sliced/didn't slice the carrots <u>carefully</u>.
b. Did you visit your mother <u>on Tuesday</u>?

However, because of the conditional meaning of *if*, this is not so with antecedents of conditionals. Rather, in the typical case of temporally located propositions, they express circumstances that are prior to, and hence often backgrounded relative to, those of the main clause. Note that there is a certain tension between the background idea and the conversational implicature of iffiness noted above. This is part of what makes conditionals so complex and interesting.

3.2. Explaining the apparently invalid inferences. With these facts in mind, let us return to the seemingly invalid inference patterns displayed above in (2)-(4), repeated here as (24)-(26).

(24) Contraposition.
  a. A C, ¬C ¬A
  b. If Bush wins, it won't be by a large margin. Therefore, if Bush wins by a large margin, he won't win.

(25) Negated Antecedent (a.k.a. Vacuous Truth).
  a. ¬A, A C
  b. Andrew Jackson was President in 1836. Therefore, if Jackson died in 1835, he was president in 1836.

(26) Antecedent Strengthening
  a. A C, (A B) C
  b. If I strike this match it will light. Therefore, if I pour water on this match and strike it, it will light.

Note first that from the grammatical considerations just noted, it is not at all surprising that Contraposition gives us strange results. Due to the asymmetricality of the antecedent and consequent clauses, and the fact that the antecedent clause (as the name implies) typically expresses either temporally or logically antecedent conditions, we do not expect to be able to reverse these roles.

Turning now to truth conditions, it follows from the material conditional analysis that each of these **is** a valid inference pattern. And that is correct – i.e. these **are** valid – in the sense that any situation of which the premise would be true is also one of which the conclusion would be true. Consider (24b), for example. If the premise (*If Bush wins it won't be by a large margin*) is true, then either Bush will lose or he will win by a narrow margin. But either of those situations would also be one in which the conclusion (*If Bush wins by a large margin, he won't win*) is also true.

What gives these arguments their air of invalidity is that the premise in each case **seems** more probable than the conclusion. That in turn is because we are judging the probability of the conclusion on the basis of the conditional probability of the consequent clause, given the antecedent. In the case of (24b), for example, the conclusion *If Bush wins by a large margin, he won't win* seems unlikely because, given that Bush has won by a large margin, the sentence *he won't win* is not only unlikely to be true, it is definitely going to be false. However, on the material conditional account, the correct way to evaluate the probability of the sentence in question is as the probability of the antecedent's being false (i.e. Bush's not winning by a large margin) plus the probability of the consequent's being true (i.e., Bush's not winning at all), and this probability is just the same as that of the premise of the argument.

This much is well known (at least in the philosophical literature). However, I want to draw attention to another factor which may be at work here. Kaplan (2005) has pointed out that our sense of argument validity depends on more than the simple truth conditions of an utterance. Kaplan's examples involve the semantic content of epithets like *damn* and *bastard*; note that that (27) does not seem like a valid inference (Kaplan 2005, 8).

(27) Kaplan was promoted. Therefore, that damn Kaplan was promoted.

The problem, as Kaplan describes it, is this: 'Although nothing is *said* in the conclusion that is not said in the premises, there is an intrusion of information *displayed* in the conclusion that is not available from the premises' (10, italics in original). (The sense of *said* here seems to be Grice's (1975) sense – which includes just truth conditions for the main assertion of a sentence. See Bach 1999 for a different view.)

This idea of Kaplan's extends naturally to (other?) conventional implicatures like the one I have proposed for *if*. Thus each of the conclusions in (24) – (26) conveys thoughts which would not be inferable from their respective premises, namely, those conveyed by the conditionality implicature of *if*. In the case of (24b), the implicature is that Bush's winning by a large margin is a condition for his not winning, which is obviously false. In the case of (25b) the implicature is that Jackson's death in 1835 is a condition for his being president in 1836, again something that is obviously not the case. And in the case of (26b) the implicature is that pouring water on this match and striking it is a condition for its lighting, which strikes us as at least dubious. It should be stressed, though, that in each case these propositions are implicatures, and not a part of the main asserted or 'at issue' content of the utterance.

3.3. Even if conditionals. I want to take a brief look at *even if* conditionals, of which a simple example is given in (28).

(28) Even if it rains tomorrow, the match will still be played.

There have been a number of proposals for such conditionals (e.g. Bennett 1982, 2003; Barker 1991, 1994; Lycan 1991, 2001); and they all agree that the goal is to give an analysis of *even* and an analysis of *if* that will, when combined, automatically account for *even if*. I believe that that is possible with the approach taken here. *Even* is, of course, a focus sensitive particle; it adds a conventional implicature to the effect that there are other items besides the one in its focus for which the rest of the sentence holds true, and that the sentence holding true is in some sense less expected for the focussed item than for the others. When the antecedent of a conditional is under focus by *even*, the implicature is that the consequent is even more likely in other antecedent conditions.

There has been a fair amount of attention paid to what has been called the 'Consequent Entailment' problem. The assumption has been that, for at least some *even if* conditionals (like that in (28)), the consequent clause is in fact entailed by the conditional as a whole. However, as Frank Jackson has argued (Jackson 1979, 125), this is not actually the case; it is always possible to consistently add another condition under which that consequent would **not** hold, as in (29).

(29) Even if it rains tomorrow, the match will still be played. However, if it snows it will definitely be cancelled.

Furthermore this implication of speaker confidence in the consequent (all other things being equal – i.e., without an added condition as in (29)) is easily accounted for as a consequence of the meaning of *even if* conditionals. Given that they require an assumption that the consequent is even more likely in other conditions, they are bound to convey that the consequent is more likely than would be conveyed by the same conditional without the *even*.

The reason for bringing up *even if* conditionals is that it may be significant that all of the conclusions of the apparently invalid arguments have this flavor (as well as the premise of the Contraposition example). These are repeated in (30).

(30) a. (Even) if Bush wins, it won't be by a large margin. Therefore, (even) if Bush wins by a large margin, he won't win.
b. Andrew Jackson was President in 1836. Therefore, (even) if Jackson died in 1835, he was president in 1836.
c. If I strike this match it will light. Therefore, (even) if I pour water on this match and strike it, it will light.

I have to say I'm not sure at this point exactly what that significance is, but it seemed worth at least mentioning.

3.4. Negating conditional utterances. We turn finally to the problems involved in negating conditionals. The first thing to note is that it is grammatically awkward to negate a conditional. This is a consequence of the fact that the *if* clause is a root modifier (a sentence adverbial), and as with other sentence adverbials, does not fall within the scope of a main clause negation. This is shown in (31).

(31) a. Fortunately, Bill won't call.
b. If Sue raises, Bill won't call.

In both sentences in (31), the negation applies only to the main clause. Thus the only option in the case of conditionals is something like the cumbersome *It is not the case that* construction, which is rarely used in everyday speech and about which we consequently do not have the strongest of intuitions.

Grice (1989a) notes that there are three ways that denial of a conditional may be understood. One way is to understand it simply truth functionally – i.e. denial of *If A then C* means *A and not-C*. A situation Grice imagines in which this would be the case is the somewhat artificial one in which bridge partners have a convention that a bid of *five no trump* means 'If I have a red king, I have a black king', and one partner takes the other to task after the hand for having bid incorrectly. It should not be surprising that this kind of interpretation requires a somewhat artificial setting, given the additional elements conveyed in less marked uses of conditionals. But it is still important that negated conditionals can have this interpretation.

Another possibility is that denial of a conditional will be understood to deny whatever connection is conversationally implicated to hold between antecedent and consequent. These are readily accountable for as instances of metalinguistic negation (Horn 1985). On the material conditional account, the negation of a conditional *If A then C* is equivalent to assertion of *A and not-C*, which is much easier to say than *It is not the case that if A then C*. It follows that, on general Gricean grounds, we would expect the utterer of *It is not the case that if A then C* to have some other point to their utterance, and a natural possibility would be the conditionality of *if*, and more specifically any of the conversational implicatures arising from that conditionality. One example might be that in (32).

(32) It's not the case that Harry will leave **if** Sue leaves – he'll leave anyway!

The natural construal of (32) is to deny the implied causal relationship between Harry's leaving and Sue's leaving.

For Grice the most problematic type of construal of a negated conditional is the third possibility, where the negation seems to skip over the antecedent clause and land on the consequent. This may well be the most common case. (Indeed, as noted above, Stalnaker's version of the intensional analysis makes falsity of *If A then C* equivalent to

truth of *If A then not-C*.) Thus denying any of the conditionals in (33) would most likely have this interpretation.

(33) a. If I strike this match it will light.
b. If you ask for permission, they'll give it to you.
c. If it rains, they'll cancel the match.

The negated conditional in the first premise of Michael Jubien's proof of the existence of God given above in (5), repeated here as (34), would be another example.

(34) If God doesn't exist, then it's not the case that if I'm evil, I'll be punished after I die.

The most natural construal of the underlined negated conditional is that the speaker will not be punished after he or she dies, even if he or she is evil.

Grice proposed a kind of quasi-logical 'bracketing' device for this problematic construal, whereby *if* clauses would automatically receive wide scope with respect to other operators. However he did not seem to be completely happy with this line of attack (cf. Grice 1989a, 81ff). Here I think we can bring in some of the more articulated ideas sketched above, which might add some semantic and pragmatic flesh to the bracket hypothesis. First, given their conditional meaning, as noted above, *if* clauses will typically convey prior or background circumstances relative to those of the main, consequent clause. Although they are not presupposed in the sense of being assumed to be true in context (quite the contrary, due to the iffiness implicature), nevertheless they share the backgroundedness of presuppositions, and thus might be expected not to fall within the scope of a negation. It is also worth noting that the negations under consideration are most often taken to be denials of prior assertions of conditionals. (This is not unusual for negative assertions in general; the carefully contrived Jubien example is an exception to that.) Under those circumstances it would be very difficult indeed to have a denial count as anything other than a denial of the consequent, given the antecedent conditions.

4. Conclusion.

The main purpose of this paper has been to try to support the material conditional analysis of English indicative conditionals. One reason for doing so is that this analysis is the only one available which is consistent with the fact that indicative conditionals (unlike their subjunctive counterparts) are about the actual world, not alternative possibilities. Past defenses of this analysis have not drawn sufficiently on the many differences between natural language and the formal languages of logic that exist in addition to the difference stressed by Grice 1975, 1989b (that natural languages but not formal ones are used in conversation). The line taken here follows Jackson 1979 in postulating a conventional implicature for *if*, as part of the mechanism to derive the conversational implicatures postulated by Grice, although the implicature put forward here is one of conditionality rather than Jackson's robustness. In addition to that we have called upon other aspects of conditional antecedents which exist in natural language but not in formal languages, in order to try to explain (a) the role of conditionals in seemingly invalid (but actually valid) argument patterns, and (b) the fact that a negated conditional is typically not construed as equivalent to assertion of the antecedent conjoined with denial of the consequent. Needless to say, these will not be the last words on this topic.

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