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On the Nature of Conditionals and their Truthmakers¹

Standard propositional and predicate logic fails both as a model for natural language and, since it cannot handle causation, as a language for science. The failure to handle causation stems from a misconstrual of the causal conditional as a relation between the truth of two propositions (If p , then q). What the causal conditional in fact specifies is a 'relation' between the *possible* existence or non-existence of two situations made true by the existence of the dispositional properties of the concrete particulars involved.

1. The dispositional theory of meaning

Over the past ten years or so I have become increasingly convinced that the propositional and predicate logics, as they emerged from the work of Frege and Russell towards the end of the last century and the beginning of this, not only do not represent the underlying structure of natural language, they do not and can never hope to provide an adequate basis for a language of science either. The considerations that persuade of this are of two kinds. On the one hand there are general considerations arising from the nature of linguistic meaning as I construe it. On the other hand there are a number of specific issues of which the problem of conditionals which I shall be discussing here is one where an analysis in terms of the traditional logical calculi either fails or can only be sustained at the expense of invoking some metaphysical monstrosity such as the existence of the non-actual worlds of possible world semantics.

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The general considerations concerning the nature of meaning arise from the observation that an extensional logic, such as that embodied in the predicate calculus can only handle sets of actually existing objects. Such sets must be assumed to exist as discrete units of analysis before any symbol can be assigned to one of them. Such a view is inevitably committed to theory of meaning in which meaning is construed as a relation, a relation between a symbol and some actually existing particular or set of such particulars which it designates.

The problem with all semantic theories of this kind, as Brentano (1995, p. 272) points out, is that you cannot have a genuine relation between two things one of which, in this case the object, event or state of affairs referred to, does not exist. It follows that a relational theory of meaning must inevitably run into difficulties in attempting to account for what is arguably the distinctive feature of natural language considered as a system of communication, namely its ability to represent, not only objects, events and states of affairs that lie outside the context of utterance, but also future events and states of affairs which do not yet exist and may never do so, as well as past events and states of affairs which never existed but might have done so. Sentences which possess this property include all imperatives, all questions, all predictions, permissions, promises, threats, and all statements about the present and the past which are either false or relate to what might have been but never was. The same is true of any linguistic expression short of a complete sentence whose scope extends beyond actually existing cases to cases that might exist but do not actually do so. This arguably includes all such expressions with the exception of genuine proper names and expressions whose quantifiers specifically preclude any such extension.

To my way of thinking the only way to deal at all adequately with this feature of language is to abandon the relational theory of meaning altogether, except as an account of the special case where statements are true, imperatives are complied with and names and descriptions succeed in referring. In its place what we need is a dispositional theory in which the meaning of a linguistic expression is construed as a complex of dispositions defined in terms of the range of possible events and states of affairs which, if they existed, would constitute manifestations of the disposition in question.

The most important of the dispositions involved in the meaning of a linguistic expression on this view is the disposition to identify particulars of a particular kind as instances of some universal or kind.

Other important dispositions are the disposition to respond to what is taken to be things of the same kind in a manner appropriate to such an encounter, the disposition to apply the name or description conventionally ascribed to such things when it or an instance of it is encountered, the disposition to pick out and point to an instance when supplied with the name or description, and finally the disposition to construct and construe intelligible sentences containing those words and draw the appropriate inferences therefrom.

It seems to me that it is only in the light of a theory such as this that one can make sense of the claim, first made by the logicians of the Port Royal (Arnauld and Nicole, 1662), that what they call the "comprehension" of a general term (renamed "intension" by Sir William Hamilton, 1860-1) determines its extension. The same goes for Frege's (1892/1960) claim that what he calls the *Sinn* or 'sense' of a singular term determines its *Bedeutung* or 'reference', as it is usually translated.

The problem with such a dispositional theory of meaning is that from the standpoint of an extensional/relational theory the concept of a disposition is itself deeply problematic. Everyone would agree, I suppose, that the concept of a disposition has two components, a *categorical* component which asserts the existence of something here and now, and a *modal* component in the form of a subjunctive conditional which specifies what would or would very probably exist, *if at some time in the future* certain conditions were to be fulfilled. It is the analysis of this modal component which creates a problem for an extensional logic, and it is this problem, the problem of the nature of conditional sentences, that I want to discuss here.

2. Conditional sentences

A conditional sentence is a compound sentence consisting of two atomic sentences known as the *antecedent* and the *consequent*. In English the antecedent is typically introduced by the conjunctions *if* and *when*, while the consequent is optionally introduced by conjunctions such as *then* or *in that case*. Antecedent and consequent specify two semantically, if not ontologically, different situations (events or states of affairs) neither of which currently exists, but which either *may* exist in the future or *might have* existed in the past. The effect of the conditional is to link the existence of the situation specified in the antecedent to the existence of that specified in the consequent. The nature of the link between the two varies with the type of

conditional involved; but in all cases the consequent either *prescribes* or *describes* what will, may, would, might, can, could, should or must exist or have existed given the condition specified in the antecedent.

3. Varieties of conditional sentence

There are at least six varieties of conditional sentence:

(1) *Conditional imperatives* (prescriptive rules):

‘If situation *A* exists, cause situation *B* to exist.’

‘If situation *A* exists, prevent situation *B* from existing.’

(2) *Conditional permissions*:

‘If situation *A* exists, you may cause situation *B* to exist.’

‘If situation *A* exists, you may prevent situation *B* from existing.’

(3) *Conditional promises/threats*:

‘If situation *A* comes to exist, I (we) promise to cause situation *B* to exist.’

‘If situation *A* does not come to exist, I (we) promise to prevent situation *B* from existing.’

(4) *Causal conditionals - subjunctive* (causal laws, dispositional statements/descriptive rules), when fully spelled out, a compound conditional of the form:

‘(a) If at any time a situation of the *A* type were to exist, *ceteris paribus*, a situation of the *B* type would very probably exist; whereas

(b) if it were not to exist, *ceteris paribus*, a situation of the *B* type would not exist.’

(5) *Causal conditionals - counterfactual*:

‘If a situation of the *A* type had existed on a particular occasion, *ceteris paribus*, a situation of the *B* type would have existed.’ (deduced from 4a above)

‘If situation *A* had not existed as it did, *ceteris paribus*, situation *B* would not have existed.’ (deduced from 4b above)

(6) *Inference licences*:

‘If the statement "Situation *A* exists" is true, we can infer that the statement "Situation *B* exists" is also true.’

4. 'If p then q '

It is my contention that the formula 'If p then q ' applies only to inference licences (6) and not to any other variety of conditional. That it does not apply in the case of conditional imperatives is plain, since in this case the consequent is an imperative which has no truth value. But it also does not apply in the case of conditional permissions (2), conditional promises/threats (3) and causal conditionals, both subjunctive (4) and counterfactual (5), where both the consequent and the sentence as a whole have a truth value; but where the conditions specified in the antecedent determine the actual *existence* of the situation specified in the consequent, rather than what can or cannot be inferred when they are known to apply. This claim is particularly difficult to sustain in the case of the causal conditionals where for many true subjunctive conditionals there are two inference licences of the form 'If p then q ' which are thereby true, one licensing an inference from the truth of a statement asserting the existence of a situation of the cause type to the truth of a statement asserting the existence of a situation of the effect type, the other licensing an inference from the truth of a statement asserting the existence of a situation of the effect type back to the truth of a statement asserting the existence of a situation of the cause type.

5. Causal conditionals are unidirectional; inference licences can be bi-directional

It is a mistake to confuse

- (a) a causal conditional which asserts that the existence of a situation of type A, *whether or not anyone knows about it*, is a causal condition for the existence of a situation of type B, and
- (b) an inference licence which asserts that, if it is *known* that a situation of the A type exists, an inference to the existence of a situation of the B type is justified.

An example which brings out the difference between these two cases is

'If the car's starter makes a grinding noise, the battery is almost dead.'²

It should be obvious that this [is] an inference licence in the sense of (b) above rather than a causal conditional in the sense of (a). However, it is equally clear that the inference is justified by the existence of a

² I am indebted to David Sanford for this example.

causal relation going in the opposite direction from the inference, i.e., from the nearly dead battery to the starter making a grinding noise. This causal relation is a dispositional property of the nearly dead battery which is characterised by the subjunctive conditional

‘If at any time the battery were to become nearly dead, it would, *ceteris paribus*, cause the starter to make a grinding noise.’

Likewise, a manifestation of that disposition would be characterised by the causal counterfactual (which subsumes it under the law statement constituted by the subjunctive conditional)

‘If the battery had not been nearly dead, the starter motor would not have made a grinding noise.’

It is true that, in addition to entailing the inference licence

‘If the car's starter makes a grinding noise, the battery is nearly dead’,

the subjunctive conditional also entails the not particularly useful inference licence

‘If you find that the battery is nearly dead, you may expect the starter to make a grinding noise’

in which the inference proceeds from cause to effect rather than, as in the other case, from effect back to its cause. But because cause and effect act in one direction only there is no true subjunctive conditional or causal counterfactual running from effect back to cause or horizontally between one effect and another of the same cause.

It is the existence of these inference licences which run from effect back to cause which give some kind of sense to conditionals such as

‘If at any time the match or one similar to it were to ignite, it would be struck against the sandpaper.’

Construed as a causal conditional, this statement is plainly false. Construed as the inference licence, more aptly expressed by

‘If at any time the match or one similar to it ignites, it is likely that it has just been struck against the sandpaper’,

it is true.

It should be noted, however, that not all causal conditionals yield inference licences that are symmetrical, in the sense that we can infer both forward from cause to effect and backward from effect to cause. Take for example the inference licence

‘If the baby is crying, at least you know it's still breathing.’

In this case the inference goes only one way - from the crying to the breathing. That is because, whereas all cases of crying involve breathing, most cases of breathing don't involve crying.

6. Causal conditionals as motivators of behaviour

Another feature which distinguishes causal conditionals from inference licences of the form ‘If p then q ’ is their intimate connection with conditional imperatives. An example which illustrates this connection is Austin's (1956/1961)

‘There are biscuits on the sideboard, if you want them.’

It should be apparent this is a shortened version of a complex conditional sentence consisting of three conditionally connected atomic sentences of which one, the imperative ‘look on the sideboard’, is missing. If this missing imperative is supplied and the sentence is re-ordered so as to put the antecedent first, it comes out as:

‘If you want biscuits, look on the sideboard and you will find some’

which in turn resolves itself into two conditionals (a) the conditional imperative

‘If you want biscuits, look on the sideboard’

and (b) the conditional declarative

‘If you look on the sideboard, you will find some biscuits’

which supplies the reason or incentive for complying with the imperative. Sentences of this kind are of particular interest to me because, to use B. F. Skinner's (1969) terminology, they "specify" all three "terms" of a "contingency". Thus ‘If you want biscuits’ specifies an "antecedent" condition under which the "behaviour" ‘look on the sideboard’ is called for, while the final consequent ‘you will find some biscuits’ specifies the "consequence" to be expected from emitting that behaviour and thus provides the motivation for so doing. The example I have used (Place 1992) to illustrate this kind of complete specification of a contingency is:

‘If the baby cries, give it a bottle and it will go back to sleep.’

This decomposes in exactly the same way into the conditional imperative

‘If the baby cries, give it a bottle’

and the conditional declarative

‘If you give it a bottle, it will go back to sleep’

which provides the motivating consequence for complying with the imperative.

Another feature which connects causal conditionals to conditional imperatives is the fact that a causal (subjunctive) conditional **such as**

‘If you were to strike the match against the sandpaper, it would ignite’

entails the two conditional imperatives

- (a) ‘If you want the match to ignite, strike it against the sandpaper’, and
- (b) ‘If you don't want the match to ignite, don't strike it against the sandpaper.’

Given that imperatives have no truth value, there is no way that we can make sense of this inference in terms of the relation between the truth value of sentences. It makes sense only as the derivation of two opposite recommendations for action from a statement of the probable consequence of performing the action in question, where the choice between performing the action and refraining from so doing depends on whether its probable consequence is attractive or repulsive.

You may say that, since the consequent of a conditional imperative has no truth value, the sentence as a whole has no truth value. But compare

- (i) ‘If you want the match to ignite, strike it against the sandpaper.’ and
- (ii) ‘If you want the match to ignite, suck it.’

I want to say that (i) is true and (ii) is false. Don't you?

7. Deducing causal counterfactuals from subjunctive conditionals (causal law statements)

In *Fact, Fiction and Forecast* Nelson Goodman (1955/1965, pp. 17-25) draws attention to the difference between an accidental generalization such as

‘All coins in my pocket are silver’

and a causal law statement such as

‘All butter melts at 150° F’

whereby the latter "sustains" the *positive counterfactual conditional*

'If this butter had been heated to 150° F, it would have melted'

and the *negative counterfactual conditional*

'If this butter had not been heated to 150° F, it would not have melted';

whereas the former does not "sustain" the positive counterfactual conditional

'If this coin were in my pocket, it would be silver'

nor the negative counterfactual conditional

'If this coin were not in my pocket, it would not be silver.'

This tells us two things. Firstly, it tells us that the effect of the counterfactuals is to subsume what *actually* existed or did not exist on a particular occasion in the past under the law expressed by the subjunctive conditional which sustains it, thereby, in a case where two situations existed in juxtaposition, excluding the possibility that this juxtaposition was, as we say, purely coincidental. Secondly, it tells us that the relation between the subjunctive conditional and the causal counterfactual is a deductive relation which follows the accepted pattern for such relations in that the particular is deduced from the universal, but which in other respects is very peculiar. For, if in such cases the connective 'If . . . then' connects something other than statements or propositions, a whole can of worms opens up. This is because the only plausible alternative to saying that the connective 'If . . . then' connects statements or propositions, is to say that it connects possible situations (events or states of affairs). And the trouble with that is that standard quantification theory doesn't allow you to quantify over things that don't exist and may never do so, without committing you to asserting the existence of the non-existent, be it the intentional objects of Meinong's *Außersein* or the possible worlds of possible world semantics. What is needed, as I argued in Place (1987), is an intensional quantification theory which allows you to do, as we do in ordinary language, and quantify over the merely possible without having to assert its existence. But until someone invents one, we shall have to make do with ordinary language with its rich variety of intensional quantifiers.

8. Metaphysical implications of conditional sentences - ontology

The observation that standard quantification theory drives us to postulate the existence of the non-existent in order to explain the deduction of causal counterfactuals from causal laws raises the issue of the

metaphysical implications of the different varieties of conditional sentence we have distinguished. In *Dispositions: A Debate*, Armstrong, Martin and Place (1996) agree in taking Martin's Truthmaker Principle as the fundamental premise from which to decide all questions of ontology (questions concerning what does and does not exist) in so far as they fall within the competence of the philosopher. The Truthmaker Principle is stated in two different ways depending on whether or not the distinction between analytic and synthetic propositions is accepted as valid. If the distinction is accepted as valid, as it is by Place (1991), the principle holds that every synthetic proposition is true if and only if the situation (event or state of affairs) which it specifies (its truthmaker) exists. If the distinction is rejected, as it is by Quine (1951/1980), the principle holds that *every* true proposition has its truthmaker.

Conditional sentences present a problem for this principle because although the sentence as a whole has a truth value, even, as we have seen, in the case of some conditional imperatives, the antecedent and consequent of which it is composed either need not be true, as in the case of an inference licence, or, as in the case of conditionals of other kinds, specify situations that do not exist at the time to which the sentence refers and may never do so. But if the situations specified by the antecedent and consequent do not exist, what is this situation that must exist for the sentence as a whole to be true?

Perhaps the answer to this question is to be found in the observation that subjunctive conditionals *alias* causal law statements act as premises from which a variety of conditionals of other kinds can be deduced. For example if we start from the subjunctive conditional/causal law statement

(1) (a) If at any time the car's battery were to be nearly dead, *ceteris paribus*, the starter motor would very probably make a grinding noise; whereas

(b) if it were not nearly dead, *ceteris paribus*, the starter motor would not make a grinding noise,

and supply the additional premises

(2) On a particular occasion the car's battery being nearly dead was accompanied by the starter motor's making a grinding noise,

and

(3) This conjunction was no coincidence, i.e., it is an instance of (1) (a),

the negative causal counterfactual,

(4) If the battery had not been nearly dead, the starter motor *would not* have made a grinding noise, i.e., a counterfactual instance of (1) (b), can be deduced. Likewise, if we supply the additional premise

(2a) On a particular occasion the car's battery being in good shape was accompanied by the starter motor's not making a grinding noise,

the positive causal counterfactual

(4a) If on that occasion the battery had been nearly dead, the starter motor *would* have made a grinding noise,

i.e., a counterfactual instance of (1) (a), can be deduced.

We have seen, moreover, that there are a number of other conditionals which are directly entailed by the subjunctive conditional/causal law statement without the need for any additional premises. These include the two inference licences:

(5) If the car's starter makes a grinding noise, the battery is nearly dead,

and

(6) If you find that the battery is nearly dead, you may expect the starter to make a grinding noise,

and the two conditional imperatives:

(7) If you want the starter motor to make a grinding noise, ensure that the battery is nearly dead,

and

(8) If you don't want the starter motor to make a grinding noise, don't allow the battery to run down.

It would seem to follow from this that conditionals (1), (4), (5), (6), (7) and (8) all have the same truthmaker, the truthmaker for the subjunctive conditional/causal law statement (1) from which the others are deduced. That, I take it, is a conclusion which any subscriber to the Truthmaker Principle would accept. Where subscribers to the principle fall out is over the nature of the truthmaker whose existence makes statements of this kind true. According to Armstrong, the truthmakers for causal law statements are substantive universal laws woven into the texture of the universe. According to Place (Armstrong, Place and Martin, 1996) and Nancy Cartwright (1989), the truthmakers for such statements are the "dispositional properties" (Place) or "capacities" (Cartwright) of the individual entities involved in the causal interactions to which the causal law statement applies. The parallel between this view and Armstrong's is brought out if we

think of the dispositional property/capacity of an entity as a substantive law, not of nature in general, but of the nature of that particular entity.

9. Metaphysical implications of conditional sentences - cosmology

It will not have escaped the reader that the analysis of subjunctive conditional/causal law statements presented here differs in three respects from traditional philosophical analyses of such statements:

- (i) Whereas on the traditional analysis a causal law statement has the form 'If and only if a situation of the *A* type exists, a situation of the *B* type will exist,' the analysis employed here breaks the law down into two conditionals, one with the *existence* of the cause as antecedent, the other with its *non-existence* as antecedent.
- (ii) Whereas the use of the 'If and only if' formula in the traditional analysis makes the two halves of the law symmetrical, the analysis employed here makes the existence of the effect only "very probable" given that all the relevant causal factors are in place, while the non-existence of the effect in the absence of the cause is categorical.
- (iii) Whereas on the traditional analysis causal laws are assumed to hold universally and categorically, on the analysis presented here they are always subject to a *ceteris paribus* clause.

Of these differences, the first, the abandonment of the symmetrical 'If and only if' formula, is forced by the second and third. The second, the introduction of a probability qualification in the case of the existence of the effect, given the existence of the cause, is a response partly to the evidence for an ultimate indeterminacy at the level of quantum physics and partly to the idea scouted, e.g. by Gehrtz, Black and Solomon (1984), that Darwin's Principle of Variation and Natural Selection applies to any form of developmental process, physical as well as biological, which requires a basic element of random variation for the universe to have evolved in the variegated and yet orderly manner that it has done. The third, the introduction of an obligatory *ceteris paribus* clause, is a response to the observation that causes are invariably multiple and that, as a result, the constant conjunction between cause and effect which Hume speaks of occurs only under special conditions, such as those created by a controlled experiment or a mechanical device, in which all but one of the multiple causal variables are held artificially constant.

It follows from this that the *ceteris paribus* clause can always be replaced, at least in principle, by a complete list of all those factors which must be present and absent in order for a particular cause, when it is operative, to be among those jointly sufficient for the existence of the effect. It also follows that it is in principle possible to compile such a list by conducting a systematic programme of experimental research in which each relevant condition is systematically varied, while holding all other factors constant as prescribed by Mill's (1843) Principle of Concomitant Variation.

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