HOW TO BELIEVE A CONDITIONAL*

Conditional statements concern us because we use them to say and do things, e.g., draw inferences and make decisions, that need analyzing, and also to analyze concepts such as causation, as in "an object followed by another . . . where, if the first object had not been, the second never had existed."[1] Both uses call for an understanding of conditionals on which agreement has proved difficult. One recent obstacle to agreement is a result of David Lewis's argument, which seems to make a popular thesis of Ernest Adams's deprive the conditionals to which it applies of truth conditions.[2] I shall argue for an account of conditionals which shows that the Lewis result does no such thing, but which also shows the Adams thesis to be false on other grounds.

I. ADAMS

The Adams thesis ('Adams' for short) is that my *degree of acceptance* of a conditional 'If P, Q' is equal to my *conditional credence* in Q given P. I mean these terms to be taken as follows.

My *credence* $c(X)$ in a proposition X is the probability measure of the strength or degree of my partial or full belief in X, i.e., in the truth-conditional content of that belief.[3] To believe X in the everyday sense, which I call full belief and write 'BX', means having a $c(X)$ at least close to 1. (How close does not matter for present purposes.) To disbelieve X, i.e., to believe $\sim X$, $B(\sim X)$, is thus to have $c(\sim X) \approx 1$ and hence $c(X) \approx 0$. So to have what I shall call a *serious credence* in X is to have a $c(X)$ greater than this.[4]

By *conditional credence* in Q given P, I mean $c(P\&Q)/c(P)$, i.e., my

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[1] David Hume, *An Enquiry Concerning Human Understanding,* §VII.

[2] Lewis, "Probabilities of Conditionals and Conditional Probabilities," in his *Philosophical Papers,* Vol. II (New York: Oxford, 1986); Adams, *The Logic of Conditionals* (Boston: Reidel, 1975), p. 7.

[3] I take it for granted that belief comes by degrees that are so measurable, albeit not precisely. See F. P. Ramsey, "Truth and Probability," in his *Philosophical Papers* (New York: Cambridge, 1990); my *The Matter of Chance* (New York: Cambridge, 1971), ch. 2; Isaac Levi, "On Indeterminate Probabilities," this JOURNAL, LXXI, 13 (July 18, 1974): 391–418.

[4] See Levi, *The Enterprise of Knowledge* (Cambridge: MIT, 1980), §1.2.

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credence in $P\&Q$ divided by my credence in P, provided that is not zero.[5] This I write '$cc(Q|P)$' rather than '$c(Q|P)$' because, although conditional credences are probabilities—they satisfy the standard axioms—they are not credences: $c(P\&Q)/c(P)$ is a mere function of $c(P)$ and $c(P\&Q)$, not a credence in its own right.

By *acceptance* of a conditional 'If P, Q', I mean not its public assertion but the mental state we use such assertions to induce.[6] This is the state that I shall say 'If P, Q' *expresses*, in the sense in which an unconditional assertion expresses belief. Whether this state *is* belief is a serious question, as we shall see, so to avoid begging it I write its measure '$a(P, Q)$'. But this measure, too, even if not a credence, is a probability; so that as with belief, accepting 'If P, Q' in the everyday sense, which I write '$A(P, Q)$', means having $a(P, Q) \approx 1$.

Then Adams says that, for all P, Q, credences in $P\&Q$ and nonzero credences in P, $a(P, Q) = cc(Q|P)$, and hence in particular that $A(P, Q)$ if and only if $cc(Q|P) \approx 1$.

Note that this alleged identity is not an identity of mental states. Adams does not say that my acceptance of 'If P, Q' is really a combination of my two beliefs in P and in $P\&Q$. That would be nonsense, like taking the law $T = kPV$ to say that the temperature T of an ideal gas is really a combination of its pressure P and volume V. All the gas law says is that a measure of T equals the value of a function of measures of P and V. Similarly, all Adams says is that a measure of my degree of acceptance of 'If P, Q' equals the value of a function of my credences in P and in $P\&Q$. This no more tells us what accep-

[5] Adams, *op. cit.*, p. 3. See also Lewis, "A Subjectivist's Guide to Objective Chance," in his *Philosophical Papers*, Vol. II; R. C. Jeffrey, *The Logic of Decision* (Chicago: University Press, 1983); et alia. This fits the standard mathematical definition of conditional probability, e.g., by J. F. C. Kingman and S. J. Taylor, *Introduction to Measure and Probability* (New York: Cambridge, 1966). Some philosophers define it differently, by "the odds at which [I] would now bet on [Q], the bet only to be valid if [P] is true." (Ramsey, "Truth and Probability," p. 76). See also B. de Finetti, "Foresight: Its Logical Laws, Its Subjective Sources," in H. E. Kyburg Jr. and H. E. Smokler, eds, *Studies in Subjective Probability* (New York: Wiley, 1964), p. 108. My choice of odds for such a conditional bet I take to measure the degree of belief I now believe I am disposed to have in Q if I fully believe P, a disposition whose probability measure I write '$d(P, Q)$' (see sect. III). It does not, of course, matter which concept we call 'conditional credence', provided we do not confuse them. What does matter is that, as we shall see in sect. X, the Ramsey-de Finetti concept makes Adams's thesis vacuous, which is why I follow his orthodox definition.

[6] I am thus not concerned with Gricean and other properties of assertibility that occupy much of the literature. See, e.g., H. P. Grice, "Logic and Conversation," and F. Jackson, "On Assertion and Indicative Conditionals," both in Jackson, ed., *Conditionals* (New York: Oxford, 1991).

tance *is* than the ideal gas law tells us what temperature is. It is thermodynamics, not the gas law, that tells us what temperature is. And it is the obvious answer to the question 'What is acceptance?' that poses the problem I want to discuss.

II. TWO BELIEF THEORIES

1. Simple belief. The obvious answer to 'What is it to accept a conditional?' is: to believe it. This, which I shall call the *simple-belief theory*, is very appealing. It tells us what acceptance of conditionals is and hence how to measure its strength, namely, by a serious credence. But credence in what? What is the truth-conditional content of 'If P, Q' ? It must obviously be some nontrivial function—not necessarily a truth function—of P and Q, which I write '$P \rightarrow Q$'. Then the simple-belief theory says that for all P, Q and n, to accept 'If P, Q' to degree n is to have credence n in $P \rightarrow Q$.

The problem this poses is not that it credits conditionals with truth conditions, which many philosophers deny that some or all conditionals have.[7] What concerns me here is not that denial but one apparent reason for it, namely, Lewis's proof that nontrivial credences cannot satisfy both Adams and the simple-belief theory, in short, that some values of $c(P \rightarrow Q)$ must differ from $cc(Q|P)$.[8] I shall not discuss this result ('Lewis' for short) nor the conditions in which it holds, which are not in question. All that matters here is that Lewis shows the simple-belief theory to be false of what I shall call *Adams conditionals*, i.e., of conditionals, if any, that satisfy Adams. The probability measures of degrees of acceptance of an Adams conditional and of degrees of belief in it must differ. But states whose probability measures differ cannot be identical: so accepting an Adams conditional cannot be believing it.

2. Belief-in-Adams. What then is it to accept 'If P, Q', if not to believe $P \rightarrow Q$? Perhaps it is to believe that I have a high $cc(Q|P)$, i.e., $A(P, Q) = B(cc(Q|P) \approx 1)$. Lewis does not rule this out, even for Adams conditionals: for since, as I have noted, $cc(Q|P)$ is not itself a credence, it is in particular not $c(P \rightarrow Q)$. So accepting 'If P, Q' to any degree n could still be believing that my $cc(Q|P)$ is n, i.e., $a(P, Q) = n$ could be $B(cc(Q|P) = n)$ for all n. This I shall call the *belief-in-Adams theory*.

But this is false, too, as our use of future-referring conditionals in

[7] E.g., J. L. Mackie, "Counterfactuals and Causal Laws," in R. J. Butler, ed., *Analytical Philosophy: First Series* (Cambridge: Blackwell, 1962); Adams; A. Appiah, *Assertion and Conditionals* (New York: Cambridge, 1985); D. Edgington, "Do Conditionals Have Truth-conditions?," in Jackson, *Conditionals.*

[8] Lewis, "Probabilities of Conditionals and Conditional Probabilities."

decision making shows. Imagine Kennedy's supposed assassin, Oswald, considering the conditional

(1) If Oswald doesn't kill Kennedy, someone else will.

while deciding whether to make true the proposition P that he does not kill Kennedy. P's truth depends on his decision, which he has not yet made and which we may consistently suppose him quite unable to predict. That is, he has and believes he has *no* $c(P)$, high or low, not even an indeterminate one.[9] But then, since $cc(Q|P) = c(P\&Q)/c(P)$, he can have no conditional credence in Q (the proposition that someone else will kill Kennedy) given P. Yet obviously he can still accept (1) to some degree, a degree that may well determine his decision and hence his subsequent $c(P)$. And as for Oswald, so for anyone using a future-referring 'If P, Q' to help them decide whether to make P true.[10]

In short, we can and often do accept conditionals without believing ourselves to have the corresponding conditional credences. So acceptance of a conditional can no more be identical with this belief than with belief in the conditional itself. But what then does 'If P, Q' express, if not the belief that it is true, or that I have a high conditional credence in Q given P?

III. THE DISPOSITION THEORY

The basic answer is that conditionals express inferential dispositions.[11] This *disposition theory* says that a *simple* 'If P, Q' (i.e., one in which neither 'P' nor 'Q' contain conditionals) expresses a disposition to infer Q from P. In other words, fully to accept a simple 'If P, Q' is to be disposed fully to believe Q if I fully believe P, a disposition I write '$D(P, Q)$'.

The disposition theory must, of course, say more than this to cover complex and embedded conditionals, and also to meet objections that have been made to it. But first we must see how it solves our problem for simple conditionals. To do this, the inferential dispositions it postulates must come by degrees: how? Obviously, by the degrees of belief in Q that my fully believing P will, unless it alters my disposition, cause me to have. So to accept a simple 'If P, Q' to degree n is to be disposed to have credence n in Q if I fully believe P, a disposition I write '$d(P, Q) = n$'. In short, the disposition theory says that for all simple P and Q and for all n, $a(P, Q) = n$ is $d(P, Q) = n$, and hence in particular that $A(P, Q)$ is $D(P, Q)$, i.e., $d(P, Q) \approx 1$.

[9] See Levi, "On Indeterminate Probabilities."
[10] Cf. Edgington, pp. 188–9.
[11] See R. C. Stalnaker, *Inquiry* (Cambridge: MIT, 1984), ch. 4.

This solves the problem. For now my degree of acceptance of 'If P, Q' is measured by the $c(Q)$ it disposes me to have if I fully believe P. So now all Lewis tells us is that the truth-conditional content of an Adams 'If P, Q' is not Q. But no one ever thought Q was the content of any 'If P, Q': Q is not a nontrivial function of P and Q. Lewis now tells us nothing we did not already know. And what entails the falsity of the belief theory is not Adams but the fact that 'If P, Q' expresses a distinct kind of mental state, with a different measure, from the states of belief in P and Q between which it provides a causal link.

This distinction between beliefs and inferential dispositions is not new. It is what Frank Ramsey meant by saying that a general statement like 'all men are mortal' "expresses an inference we are at any time prepared to make, not a belief of the primary sort."[12] It is what made J. L. Mackie call some singular conditionals "condensed arguments" (*op. cit.*). But this does not mean, as Mackie thought, that they lack truth values and hence truth conditions, merely that to accept them is not to believe them as one believes an argument's premises and conclusion.

The distinction between inferential dispositions and the beliefs they link is consistent with beliefs also entailing dispositions, namely, dispositions to act in various ways, depending on what one wants. For as R. L. Stalnaker remarks, even if "ordinary beliefs are conditional dispositions to act," we can still distinguish acceptance of conditionals as "conditional dispositions to acquire conditional dispositions to act" (*op. cit.*, p. 101). And even if these are, as Stalnaker says, "always grounded in . . . factual beliefs," it does not follow, as he thinks, that they do not differ in kind from such beliefs (*op. cit.*, p. 102).

IV. DISPOSITIONS AND TRUTH CONDITIONS

So far so good. But how does the disposition theory give simple conditionals their truth conditions? I have shown how it stops the Lewis result from depriving Adams conditionals of truth conditions. But this does not show that the disposition theory itself lets conditionals have truth conditions, nor how it fixes them.

To show this, I note first that beliefs are not the only mental states whose contents have truth conditions.[13] Desires, fears, and other propositional attitudes have them, too: any proposition X that can

[12] Ramsey, "General Propositions and Causality," in his *Philosophical Papers*, p. 146.

[13] Whether the propositional content X of a mental state *has* or *is* a truth condition is a moot point, but makes no odds to what follows: only for brevity do I write as if contents have rather than are truth conditions.

be believed can also be desired or feared. We do not call these desires or fears 'true' or 'false', but not because their content X has no truth condition. The reason is that in these states X is not just meant to be true, as it is in the full belief that X. (In the fear that X, for example, X is if anything meant to be false.) What distinguishes belief from other propositional attitudes is that full beliefs aim only at truth, in a sense which is indeed easier to recognize than to spell out, but which for that very reason I feel free to take for granted.[14]

But since my inferential state $D(P, Q)$ disposes me by definition to BQ if BP, it too aims at truth in whatever sense full belief does, namely, at the truth of the BQ which it makes BP cause. It may, of course, miss its aim if P is false, but that is not its fault: nothing can ensure the success of inferences from false premises. All $D(P, Q)$ can do to make BQ true is to pass on BP's truth when P *is* true, i.e., not to make a true BP cause a false BQ. This is the condition in which $D(P, Q)$ will always achieve its truth-generating aim.

But this is the truth condition of the material conditional '$P \supset Q$'. So fully to accept a simple 'If P, Q' is to have an inferential disposition which, although not itself a belief, aims at truth just as full belief does, and succeeds just when $B(P \supset Q)$ succeeds. This is why it is so natural to call $D(P, Q)$ a belief and to give the conditional that expresses it the truth condition of $P \supset Q$. Admittedly, $D(P, Q)$ cannot itself have the content $P \supset Q$, simply because it has not one content but two, namely, P and Q. But as we see, it can still give this truth-conditional content to the 'If P, Q' that expresses it. All Lewis shows is that an Adams 'If P, Q' cannot express a *belief* in this content. But on the disposition theory, no conditional does that. So nothing stops the theory crediting all simple conditionals with the truth conditions of their material counterparts.

V. SIMPLE CONDITIONALS

1. Factual conditionals. But not all simple conditionals have those truth conditions, though some do.[15] In particular, past-referring instances of so-called "indicative" conditionals do, such as

(2) If Oswald didn't kill Kennedy, someone else did.

(2) fits the disposition theory perfectly. If it has a truth value at all, it must be true; for since someone did kill Kennedy, then, if Oswald

[14] For the spelling out, see J. T. Whyte, "Success Semantics," *Analysis*, L, 3 (June 1990): 149–57.

[15] Pace Edgington, and others (see fn. 7): see Jackson, *Conditionals* (New York: Blackwell, 1987).

did not, someone else must have. That is, what makes (2) true is that either Oswald killed Kennedy or someone else did, in short, that someone killed Kennedy. But this is the truth condition of the material conditional 'Oswald didn't kill Kennedy ⊃ someone else did'.

The disposition theory not only fits (2), it explains it. For (2) clearly expresses a disposition to infer Q, that someone else killed Kennedy, from P, that Oswald did not. But this disposition is one I have only because I believe someone did kill Kennedy. In other words, this inferential disposition is caused by my belief in the material conditional. This is what makes (2) truth-functional, by restricting the inference it expresses to the actual world, complete with the actual killing of Kennedy, thus making the conditional and the disposition it expresses what, for a reason that will emerge shortly, I shall call *factual.*

2. *Hypothetical conditionals.* Other past-referring conditionals are less tractable, notably so-called "counterfactual" or "subjunctive" conditionals like

(3) If Oswald hadn't killed Kennedy, someone else would have.

For if no one else had it in for Kennedy, (3) will be false even if Oswald's killing of Kennedy makes its antecedent false and hence the corresponding material conditional true. So (3)'s truth-conditional content cannot be that of its material counterpart, as the disposition theory seems to require. What then is it, and how can we account for it?

To see how, consider that (3) differs from (2) by not being restricted to the actual world: (3) and the disposition it expresses are what I shall call *hypothetical.* That is, they are about a world where, by hypothesis, Oswald does not kill Kennedy; a world of which, since it may not be actual, (3) cannot presuppose but must assert that, in it, someone kills Kennedy. My acceptance of (3), unlike (2), is *not* caused by my belief that someone actually killed Kennedy. A hypothetical inferential disposition is one that does *not* depend causally on my believing the material conditional.

This does not, of course, mean that I will have $D(P, Q)$ without $B(P \supset Q)$. For since $\sim P$ entails $P \supset Q$, I shall naturally be disposed to believe $P \supset Q$ if I *dis*believe P; and if I believe P, my $D(P, Q)$ will make me believe $P \supset Q$ by making me believe Q. So my $D(P, Q)$ and $B(P \supset Q)$ are still causally linked: only now my $D(P, Q)$ is not caused by my $B(P \supset Q)$ but causes it—when I believe P. And this means that what makes my hypothetical $D(P, Q)$ truth-generating is not that $P \supset Q$ is *actually* true, but that it would be true if P were. This is why

(3)'s truth-conditional content is not $P \supset Q$ but (for those who buy the possible-world semantics of Stalnaker and Lewis) that of the "Stalnaker conditional," namely, that Q is true in the possible world or worlds most like ours in which P is true.[16]

3. Future-referring conditionals. The disposition theory thus explains both why and how (3)'s truth condition differs from that of (2). What about our future-referring (1) 'If Oswald doesn't kill Kennedy, someone else will'? Conditionals like (1) are traditionally called "indicative" and analyzed like (2). But, as V. H. Dudman[17] has shown, this classification has no basis in English grammar and is wrong. (1)'s truth value goes not with (2) but with (3): for obviously, if (3) is false after Kennedy's killing, (1) was false before it.[18] And this misclassification matters because it makes conditionals like (1) look like counterexamples to analyses of conditionals like (2), which they are not.[19]

This is why we need the new labels 'factual' and 'hypothetical'. To classify (1) with (2) by calling it "indicative" gives it the wrong truth condition, and for a reason that is both wrong and of the wrong kind, namely, grammatical. For as Ramsey said of the subject-predicate distinction, "the task on which we are engaged is not merely one of English grammar; we are not school children analysing sentences . . . but are interested not so much in sentences themselves as in what they mean."[20] So what matters here is not the grammar of English 'If'-sentences but what we use those sentences to express. And on the disposition theory that depends on whether the inferential disposition we use 'If P, Q' to express is caused by belief in the material conditional. If it is, that 'If'-sentence is a truth-functional factual conditional about this world. Otherwise, it is a non-truth-functional hypothetical conditional about a world in which, by hypothesis, its antecedent is true.

What then makes (1) hypothetical? Consider again Oswald's thinking in advance that (1) is true, i.e., that if he does not kill Kennedy someone else will. He cannot infer this from the fact that someone

[16] "A Theory Of Conditionals," in E. Sosa ed., *Causation and Conditionals* (New York: Oxford, 1975); Lewis, *Counterfactuals* (Cambridge: Blackwell, 1973).

[17] "Indicative and Subjunctive," *Analysis,* XLVIII, 3 (June 1988): 113–22.

[18] See Dudman; T. J. Smiley, "Hunter on Conditionals," *Proceedings of the Aristotelian Society,* LXXXIV (1983–4): 241–9. For other examples, see Adams, p. 103; B. Ellis, *Rational Belief Systems* (Cambridge: Blackwell, 1979), p. 50.

[19] See J. Bennett, "Farewell to the Phlogiston Theory of Conditionals," *Mind,* XCVII, 388 (October 1988): 509–27.

[20] "Universals," in his *Philosophical Papers,* p. 13.

kills Kennedy, as we infer (2): he must do what we do with (3), namely, take (1) to be true of the hypothetical world, actual or not, in which he does not kill Kennedy. So what makes Oswald use (1) as a hypothetical like (3) is that he believes someone will kill Kennedy *because* he accepts (1), not vice versa. And as for Oswald's use of (1), so for most if not all uses of future-referring conditionals. No one could infer (1) from the belief that someone will kill Kennedy, since no one can perceive the future. We can only get beliefs about the future by inference from our perceptions of the past. So future-referring $D(P, Q)$s cannot generally be caused by the corresponding $B(P \supset Q)$s, which is why most if not all future-referring conditionals are hypothetical.[21]

VI. DISPOSITIONS AND BELIEFS

The disposition theory thus explains the most salient features of simple conditionals. But only, as we have seen, by crediting the dispositions they express with causes and effects. The theory must therefore incorporate a realist view of these and other mental dispositions, including beliefs.[22] In other words, the theory must take these dispositions either to be, or to be instantiated by, real states of people, with real causes and effects.[23]

Thus, on my realist reading of the disposition theory, to believe $P \supset Q$ is to have some intrinsic property F such that (e.g.) wanting an otherwise unattainable Q strongly enough *while I am F* will cause me if I can to make P true. Similarly, to be disposed to infer Q from P is to have an intrinsic property G such that believing *P while I am G* will cause me to believe Q. (This means, incidentally, that my being disposed to infer Q from P does *not* entail that I shall believe Q if I believe P, but only that I will believe Q if I believe *P while I have this disposition:* a fact that, as we shall see, disposes of several apparent counterexamples to the theory.[24])

The intrinsic properties F and G that respectively realize $B(P \supset Q)$

[21] See Jackson, "On Assertion and Indicative Conditionals," pp. 129–30.

[22] Contra G. Ryle, *The Concept of Mind* (London: Hutchinson, 1949), ch. 5.

[23] I argue for the first alternative in "In Defence of Dispositions," in my *Matters of Metaphysics* (New York: Cambridge, 1991); Armstrong argues for the second in *A Materialist Theory of the Mind* (New York: Routledge and Kegan Paul, 1968), ch. 6, sect. VI.

[24] It also meets Ramsey's objection to my taking (in fn. 5) my choice of odds for a bet on Q conditional on P to measure "the degree [n] to which [I now believe I] would believe [Q] if [I] believed [P] for certain," namely, that "knowledge of [P] might profoundly alter [my] whole system of beliefs." (Ramsey, "Truth and Probability," p. 76.) So it might, but only by causing a change in my disposition $d(P, Q) = n$.

and $D(P, Q)$ for a given P and Q need not, of course, be the same properties in everyone, nor need they be the same in me at different times. These mental states may be as "variably realized" as most other mental (and physical) dispositions are.[25] But since they are, as we have seen, causally linked to each other, the particular F and G that realize them in me at any one time must also be so linked.

And not only to each other. As we have seen, a hypothetical $D(P, Q)$ will not cause $B(P \supset Q)$ on its own. It takes BP to make it cause BQ and hence $B(Q \supset P)$. Nor does every $B(P \supset Q)$ cause a factual $D(P, Q)$. Take Adams's visibly blue bird, of which I accept the hypothetical 'If that were a canary it would be yellow' but not the factual

(4) If that's a canary, it's yellow.

despite believing $P \supset Q$ (since I believe $\sim P$, that it is not a canary).[26] Yet I do accept (4)'s contrapositive, 'If that's not yellow, it's not a canary', which has the same truth condition as that of $\sim Q \supset \sim P = P \supset Q$. What stops this $B(P \supset Q)$ causing $B(P, Q)$ when $B(\sim Q \supset \sim P)$ causes $D(\sim Q, \sim P)$? Obviously my eyesight: nothing will dispose me to believe Q (it is yellow) while my eyes cause me to believe $\sim Q$. That is what makes me resist this contraposition despite its evident validity: thus proving again, were more proof needed, that accepting 'If P, Q' is not the same as believing that it is true.

Hypotheticals pose the opposite problem. Here contraposition is generally invalid, since $P \supset Q$ and $\sim Q \supset \sim P$ might both be true if P was but not if $\sim Q$ was.[27] Thus, (1) does not entail its contrapositive, 'If no one else kills Kennedy, Oswald will', since Oswald might only kill Kennedy to stop his backup doing so. Yet I may still infer it: why? Because inferences need not be valid to be reliable, and contraposition may actually preserve truth often enough for most hypothetical $D(P, Q)$s to dispose us also to infer $\sim P$ from $\sim Q$.

$D(P, Q)$'s causal links similarly defuse the so-called paradoxes of material implication, e.g., the tautological content of every factual 'If $\sim P$, then if P, Q', which seems to suggest that any belief P I lack would, if I had it, make me believe any proposition Q. But of course it would not, and the disposition theory shows why. $B(\sim P)$ may perhaps cause me to believe $P \supset Q$ for any Q. But $B(P \supset Q)$ need not

[25] See T. Crane, "Mental Causation and Mental Reality," *Proceedings of the Aristotelian Society*, LXXXXII, 9 (February 24, 1991–2): 185–202.
[26] Adams, p. 104.
[27] See Lewis, *Counterfactuals*, pp. 34–5.

give me $D(P, Q)$, and not every such belief will do so. Certainly $B(P \supset Q)$ and $B(P \supset {\sim}Q)$ will not both do so: I cannot be simultaneously disposed both to believe Q and to believe ${\sim}Q$ if I believe P. In particular, as (4) shows, $B(P \supset Q)$ will not give me $D(P, Q)$ if I find Q sufficiently incredible on other grounds. And even if I do have $D(P, Q)$, coming to believe P may still not cause me to believe Q. For as we shall see below, it may cause me instead to lose my $D(P, Q)$ and hence to reject the conditional 'If P, Q'—as indeed it must do if I cannot then believe Q. So even if we did accept every 'If ${\sim}P$, then if P, Q', which I doubt we do, our doing so would have no untoward consequences.

$D(P, Q)$'s causal links also explain why an 'If P, Q' with a clearly false Q, like

(5) If Oswald didn't kill Kennedy, I'm the Pope.

expresses disbelief in P. On my disposition theory, accepting (5) does not entail that believing Oswald did not kill Kennedy would give me delusions of Papal grandeur. It would not: it would simply make me give up (5). This is what makes (5) express my belief that Oswald did kill Kennedy: the fact that my acceptance of (5) depends causally on that belief.

Herein also lies the answer to a well-known counterexample to nonrealist versions of the disposition theory.[28] A man—call him 'Jim'—accepts the hypothetical

(6) If my wife were deceiving me, I wouldn't believe it.

yet of course if Jim did believe his wife was deceiving him, he would believe it. In short, Jim accepts 'If P, Q' even though, if he believed P, he would believe ${\sim}Q$. But this does not refute my disposition theory. Jim is indeed disposed to infer Q from P, but only because he does not believe P: precisely because Q is the proposition that he does not believe P. For believing P can obviously not cause Jim *not* to believe P, nor therefore, failing self-deception, to *believe* that he does not believe P, i.e., to believe Q. But, as before, Jim's BP can only fail to cause BQ if it makes him lose his disposition to infer Q from P, thus making him reject 'If P, Q'. So what my disposition theory says is that Jim's believing his wife was deceiving him would make him reject (6); which of course it would.

[28] Credited to Richmond Thomason in B. C. van Fraassen's review of B. Ellis, *Rational Belief Systems*, in *Canadian Journal of Philosophy*, x, 3 (September 1980): 497–511, p. 503.

VI. COMPLEX CONDITIONALS

Realism about dispositions enables us also to account for complex conditionals. These are conditionals containing other conditionals, like

(7) If there's a conspiracy, then if Oswald doesn't kill Kennedy, someone else will.

of the form 'If *R*, then if *P*, *Q*', or 'If someone else will kill Kennedy if Oswald doesn't, then there's a conspiracy' of the form 'If *Q* if *P*, then *R*'. This nesting of conditionals can be repeated indefinitely; but since it will be obvious how to iterate the account of the simplest case, that is all we need consider.

The only reason we need a separate account of conditionals like (7) is that inferential dispositions are not beliefs. This is why 'If *R*, then if *P*, *Q*' cannot express a disposition to *believe* 'If *P*, *Q*' if I believe *R*. But it can express a disposition to *accept* 'If *P*, *Q*' if I believe *R*. For dispositions, realistically conceived, can not only embody causal relations, they can be linked by them. Thus, the *D*(*P*, *Q*) that embodies the causal link between *BP* and *BQ* can itself be caused by the belief that *R*—a causal link embodied in the disposition that 'If *R*, then if *P*, *Q*' expresses; and similarly for other kinds of complex conditionals.

This account of complex conditionals enables the disposition theory to explain Vann McGee's[29] recent counterexamples to modus ponens. Take my accepting, of a sea creature that looks like a fish, the conditional

(8) If that's a fish, then if it has lungs it's a lung fish (*ibid.*).

As McGee says, it does not follow that if I believed the creature was a fish I would accept the embedded conditional 'If it has lungs, it's a lung fish', and I would not. The conditional I would accept is 'If it has lungs, it's a dolphin', since I believe dolphins, which are not fish, are the commonest sea creatures that have lungs and look like fish. But whatever problems this poses for modus ponens, it poses none for my disposition theory, which treats (8) just like (5) and (6). On it, I *am* disposed to accept 'If it has lungs, it's a lung fish' if I believe it is a fish; but only because I actually believe it is not a fish. In short,

[29] "A Counterexample to Modus Ponens," this JOURNAL, LXXXII, 9 (September 1985): 462–71.

the inferential disposition that (8) expresses depends causally on my disbelieving its antecedent, just as those expressed by (5) and (6) do.

VIII. TRUTH FUNCTIONS OF CONDITIONALS

So much for complex conditionals. But we can also accept conjoined, negated, and disjoined conditionals. How does the disposition theory account for this? Conjunction is easy. To accept '*R* and if *P*, *Q*' for an unconditional *R* is to have both *BR* and *D*(*P*, *Q*); to accept 'If *P*, *Q*, and if *R*, *S*' is to have both *D*(*P*, *Q*) and *D*(*R*, *S*); and so on.[30]

Negation is trickier. On the disposition theory, acceptance of 'If *P*, *Q*' comes by degrees ranging from $d(P, Q) \approx 1$ when *D*(*P*, *Q*) to $d(P, Q) \approx 0$, which is $d(P, \sim Q) \approx 1$, i.e., $D(P, \sim Q)$, or full acceptance of 'If *P*, ~*Q*'. Now this *internal* negation is often all we mean by rejecting 'If *P*, *Q*'. Thus, in VI, I rejected the factual (4) 'If that's a canary, it's yellow' only because I could see the bird was blue and so accepted (4′) 'If that's a canary, it's not yellow'. But if (4) and (4′) have the truth conditions of their material counterparts, they are not contradictories, or even contraries: for since the bird is not a canary, both are true.

How then do I accept the *external* negation, '~(if *P*, *Q*)', of 'If *P*, *Q*'? I do it by being in a state that deprives me of any disposition to have a serious credence in *Q* if I believe *P*.[31] $D(P, \sim Q)$ is one such state, but not the only one. Another one is $B(P\&\sim Q)$: for I can have no serious *c*(*Q*) while believing *P* and ~*Q*. Acceptance of '~(if *P*, *Q*)', which I write '$A \sim (P, Q)$', may be caused by either of these states, depending on whether 'If *P*, *Q*' is factual or hypothetical (see section V).

If 'If *P*, *Q*' is a factual conditional, about the actual world, its rejection $A \sim (P, Q)$ will depend causally on $B(P\&\sim Q)$. This gives '~(if *P*, *Q*)' the truth condition, that of $P\&\sim Q$, which it requires: since the factual *D*(*P*, *Q*) which $B(P\&\sim Q)$ prevents will make a true belief cause a false one if and only if $P\&\sim Q$ is true. If, on the other hand, $A \sim (P, Q)$ depends on $D(P, \sim Q)$ but not on $B(P\&\sim Q)$, it is the rejection of a hypothetical 'If *P*, *Q*' about a world, actual or not, in which by hypothesis *P* is true. For now $A \sim (P, Q)$ requires

[30] Acceptance of these conjunctions does not, however, come by degrees independent of degrees of belief or acceptance of their conjuncts. '*P* and *Q*' expresses a belief in *P*&*Q* whose degree can be measured, independently of my degrees of belief in *P* and in *Q*, e.g., by the odds I would choose for a bet on *P*&*Q*'s truth. '*R* and if *P*, *Q*' and 'If *P*, *Q* and if *R*, *S*' express no such single state of acceptance with independently measurable degrees.

[31] I.e., one that is not ≈0: see sect. I.

neither BP nor $B(\sim P)$. The $D(P, Q)$ it prevents is thus a hypothetical one, which will fail to preserve truth if and only if it is not the case that Q would be true if P were. This therefore, again as required, is the truth condition that an $A \sim (P, Q)$ caused by $D(P, \sim Q)$ gives the '$\sim$(if P, Q)' that expresses it.[32]

So much for the negation of conditionals. Their disjunction is tricky, too. For if accepting 'R or if P, Q' were having BR or $D(P, Q)$, I could not accept it without either believing R or accepting 'If P, Q', yet obviously I can. To see how, consider first what accepting a simple disjunction 'P or Q' is. It, too, cannot be having BP or BQ, for the same reason. It is in fact having a pair of inferential dispositions, namely, to believe Q if I believe $\sim P$ and vice versa, i.e., $D(\sim P, Q)$ and $D(\sim Q, P)$. And I can easily have these dispositions while neither believing P nor believing Q, e.g., while having $c(P) = c(Q) = 0.5$.

Similarly for disjunctions of conditionals. To accept 'R or if P, Q' is to be disposed to accept $D(P, Q)$ if I believe $\sim R$ and to believe R if I accept '$\sim$(if P, $\sim Q$)'. Similarly, to accept 'If R, S, or if P, Q' is to be disposed to accept 'If P, Q' if I accept '$\sim$(if R, S)' and vice versa. And I can have all these dispositions, too, while neither believing R nor accepting 'If R, S' or 'If P, Q', e.g., by having $c(R) = d(R, S) = d(P, Q) = 0.5$.

IX. A METHODOLOGICAL OBJECTION

My version of the disposition theory copes easily with all these uses of conditionals.[33] But there is another kind of objection to it that I should meet. This is that it uses conditionals to define the very dispositions that it says conditionals express: conditionals like the one in '$D(P, Q)$ is a state such that, if I believe P while I am in it, I will believe Q'. Does this not make the theory viciously circular?

No. It is just like using 'and' in its own definition, namely, 'P and Q' is true if and only if P is true and Q is true. There is nothing

[32] On Lewis's semantics (*Counterfactuals*, pp. 16–8), this truth condition may differ from Q's being false if P were true, since Q may be true in some but not all the closest P-worlds, and this falsifies both the hypotheticals 'If P, Q' and 'If P, $\sim Q$'. So I should be able to reject both, i.e., to reject 'If P, Q' without accepting 'If P, $\sim Q$'. I cannot when $A \sim (P, Q)$ is caused by $D(P, \sim Q)$: then the two go together. But they need not, since I may have *no* disposition to have any serious $c(Q)$ or $c(\sim Q)$ when I believe P, i.e., no value at all of $d(P, Q)$, nor therefore of $d(P, \sim Q)$. That is how I can reject both 'If P, Q' and 'If P, $\sim Q$'.

[33] And with such other uses as 'I fear that if P, Q', which expresses a disposition to fear Q if I believe P, and hence to fear Q more the more strongly I believe P. I am indebted to colleagues of Sheffield University for drawing my attention to this example.

wrong with using a term in a metalanguage to define the same term for its object language. The definition is, of course, no use for teaching the term to people who cannot already use it. But that is not its job. Its job is to state, and maybe to regiment, an existing use of the term it defines. In such a definition, it is not circular, merely sensible, to use the term it defines in its defined sense.

And as for 'and', so for conditionals. Of course, the disposition theory must be true of the conditionals used to state it, or it would be false. But this does not make the theory either circular or irrefutable. On the contrary, those conditionals could refute it as easily as any others. The reason they do not, I believe, is that it is true.

X. ADAMS REVISITED

Where, finally, does this leave Adams? We have seen how the disposition theory lets Adams conditionals have truth conditions. But does it let them exist? What the disposition theory makes Adams say is that I have a $d(P, Q) = n$ if and only if I have $cc(Q|P) = c(P\&Q)/c(P) = n$. Is this generally true?

No. For, as we saw in II.1, when deciding whether to make a future-tense P true, we often accept 'If P, Q' with no $c(P)$, high or low, and so no $cc(Q|P)$. And we can do this with past- and present-referring conditionals, too. Thus, I can accept (2) 'If Oswald didn't kill Kennedy, someone else did' or (3) 'If Oswald hadn't killed Kennedy, someone else would have' to any degree n with no idea whether Oswald killed Kennedy, i.e., with no $c(P)$, high or low. I may, of course, be *disposed* to have a $cc(Q|P) = n$ if I have any credence m in P; but that will not help Adams. For first, I shall obviously only have all these other dispositions (one for every m) because I have the original $d(P, Q) = n$ for which Adams cannot account; and, secondly, Adams needs conditional credences for these dispositions, too. But they will not exist either: for if I have no idea whether Oswald killed Kennedy, I shall either be sure that I do *not* believe to any particular degree m that he did, or I shall have no idea about that either.

So Adams must be false of most if not all conditionals. But perhaps it is half true: perhaps $cc(Q|P) = n$ is, if not necessary for $d(P, Q) = n$, at least sufficient? No. For if it were, I would accept the factual 'If P, Q' for all P and Q I fully believe, since $c(P) \approx 1$ and $c(P\&Q) \approx 1$ entail $cc(Q|P) \approx 1$. But I do not, since most of my beliefs are causally independent of each other. Thus, my beliefs that France is big and Egypt hot are not causally linked; unlike my beliefs that Oswald killed Kennedy and that no one else did, which are linked via my belief that someone did. I am not at all disposed to infer Egypt's heat from France's size or vice versa. My belief in the material conditional 'France is big ⊃ Egypt is hot' will not therefore make me accept the factual 'If France is big, Egypt is hot' as I accept 'If no one else killed Kennedy, Oswald did'. Only if acceptance were belief would it make me do that; but as we have seen, it is not.

So Adams is not even half true for credences close to 1. What about lesser values of $c(P)$? Then Adams says that I am disposed, if my $c(P)$ changes to 1, to get a credence in Q equal to my present $cc(Q|P)$. This way of changing credences is called "conditionalizing" by the Bayesian philosophers who advocate it.[34] But what they say is not that we *do* conditionalize but that we *should.* But often we should not, since "ought implies can" and, as we have seen, we often have no $cc(Q|P)$ to which to equate our $d(P, Q)$. And even when we do, whether we should then conditionalize, or change our credences in some other way, e.g., by "imaging,"[35] is a contentious matter. But not one we need consider. For all that matters here is that, on the disposition theory, the Adams thesis is something generally false, which even Bayesians advocate only as a prescription. And even if they are right to prescribe it, which I doubt, that is no reason to believe a demonstrable falsehood: wishful thinking is no more rational in psychology and semantics than it is anywhere else.

In short, on Adams's own definition of $cc(Q|P)$, as $c(P\&Q)/c(P)$, his thesis is false. And on the alternative definition of it as $d(P, Q)$, given in footnote 5, his thesis is vacuous. For as we have seen, to accept 'If P, Q' to degree n just is to have $d(P, Q) = n$. Adams's thesis could thus be reinterpreted as a statement of the theory for which I have argued. But, first, that is not what Adams himself argues for. Secondly, as I note in section I, Adams does not claim to say what degrees of acceptance *are,* only what fixes the numerical values of their probability measures. And if a degree of acceptance just *is* what $d(P, Q)$ measures, then to say that $d(P, Q)$ fixes the value of this measure is vacuous. That is why I agree with Adams's orthodox definition of conditional credence: for as Karl Popper has taught us, we learn more by refuting falsehoods than by confirming tautologies.

D. H. MELLOR

Cambridge University

[34] E.g., Jeffrey, *The Logic of Decision,* ch. 11.
[35] Lewis, "Probabilities of Conditionals and Conditional Probabilities," p. 147.