



Philosophy of Science Association

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Source: *Philosophy of Science*, Vol. 47, No. 1 (Mar., 1980), pp. 142-145

Published by: The University of Chicago Press on behalf of the Philosophy of Science Association

Stable URL: <http://www.jstor.org/stable/187152>

Accessed: 16/03/2010 18:45

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DISCUSSION:
FIELD AND JEFFREY CONDITIONALIZATION*

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In a recent note (1978) Hartry Field has proposed what he calls a reparameterization of Richard Jeffrey's scheme for changing one's degrees of belief in circumstances in which one learns no new certainty from experience (see Jeffrey 1965 and 1968). I shall argue that Field's proposed revision of Jeffrey's formula is neither correct nor necessary.

Simple conditionalization is generally accepted in situations in which we acquire a certain belief in some observation sentence (say, "this ball is blue") on the basis of some experience (say, observing the ball in good light). If P_0 represents S 's pre-experiential degrees of belief, P_1 the post-experiential degrees of belief, and E is the observation sentence, then according to simple conditionalization:

$$(1) P_1(A) = P_0(A/E).$$

Jeffrey conditionalization is intended to be a generalization of (1) to the case in which our experience is not sufficient to make us certain of E (say, we observe the ball in poor light), but, nevertheless, the experience has a "direct effect" on our degree of belief in E , either raising it or lowering it. In this circumstance, Jeffrey proposes that P_1 is related to P_0 as follows:

$$(2) P_1(A) = qP_0(A/E) + (1 - q)P_0(A/\sim E)$$

where $q = P_1(E)$, S 's post-experiential degree of belief in the observation sentence E .

Field argues that it would be desirable to express P_1 entirely in terms of S 's pre-experiential degrees of belief and what he calls an input parameter, "a number that represents the degree to which stimulation affects" S 's degree of belief in E , "for the new probability function should be determined by the old one together with a list of which observation sentences have been directly affected and how much each one has been affected; and how much each one has been

*Received August 1979; revised October 1979.

Philosophy of Science, 47 (1980), pp. 142-145.
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affected is measured by the input parameter'' (Field 1978, p. 362). What prevents (2) from satisfying this requirement, Field claims, is the fact that q is actually a complex parameter, depending both on S 's prior degree of belief in E and on the degree to which the stimulation affects his beliefs, that is, on the genuine input parameter (see Field 1978, p. 363). Field's strategy is to posit an input parameter, α , a constant associated with each (sort of) stimulation, define $P_1(E)$ in terms of α and $P_0(E)$, and then substitute the "purified" version of $P_1(E)$ for q in (2) above. The end result is a reparameterized version of Jeffrey conditionalization, giving the post-experiential degrees of belief P_1 explicitly in terms of the prior P_0 and the input parameter α .

I would like first to look closely at the account of stimulation and its effects that Field actually proposes. The input parameter is supposed to be a constant which, together with S 's priors, determines what the posterior degrees of belief are to be for S 's observation sentences. The relation that Field proposes is the following, where q is as before and $p = P_0(E)$:

$$(3) \quad q = (pe^\alpha)/(pe^\alpha + (1-p)e^{-\alpha}).$$

Since the input parameter is a constant for any given sort of stimulation, α can be measured by observing in some particular case the actual change in S 's observational degrees of belief as a consequence of the experience in question, and solving equation (3) for α :

$$(4) \quad \alpha = \frac{1}{2} \log ((q/p)/((1-q)/(1-p)))$$

((4) is actually Field's definition of α ; see Field, 1978, p. 364). Once α has been so determined, we can then use (3) to calculate the effect that the stimulation in question will have on S 's degree of belief in E for any prior we choose. Let us do some actual calculations. Suppose S sees a ball in such dim light that it raises his degree of belief in the observation sentence E , "this ball is blue," only very slightly, say from .3 to .4. Using (4) we can calculate that the stimulation in question has an α value of .2209 (to four places). Suppose, now, that S returns to check again on the color of the ball, and has an exactly similar experience (with the same associated value of α , of course). Since we know the value of α , we can use (3) to calculate that his new degree of belief in E will be .5019 (to four places). Repeating the observation will give S the following succession of degrees of belief (where $P_1(E)$ is the degree of belief after one look, $P_2(E)$ after two looks, etc.):

$P_0(E) = .3$	$P_5(E) = .7961$
$P_1(E) = .4$	$P_6(E) = .8586$
$P_2(E) = .5091$	$P_7(E) = .9043$
$P_3(E) = .6173$	$P_8(E) = .9363$
$P_4(E) = .7150$	$P_9(E) = .9581$

That is, after *nine* repetitions of the *same* rather uninformative experience, *S* will become *virtually certain* that the ball is blue. If the experience had been only slightly richer, say sufficient to raise *S*'s initial degree of belief in *E* from .3 to .5, then it would have taken only *five* repetitions of the experience to raise *S*'s degree of belief in *E* above .95.

This, I think, shows quite conclusively that there is something very wrong with the reparameterization that Field proposes. If stimulation behaves in the way he supposes in (3), then practical certainty in *E* is much too easily obtained. There might be a way of patching up Field's proposal. However, there also seem serious reasons for questioning the whole enterprise.

Simple conditionalization and Jeffrey's extension of simple conditionalization are based on a certain idealized picture of the evolution of belief. On that picture, stimulation or experience impinges directly on some of my beliefs, which in turn cause changes in all of the others. The points of impingement are the observation sentences, and the mechanism by which the direct effects of experience are transmitted to the other beliefs is conditionalization, either in its simple form or in Jeffrey's more complex variant. This picture of belief change may be wrong, at least for situations as they happen in the real world, but it is in the context of this view of the evolution of belief that conditionalization seems to have its clearest applicability and strongest intuitive pull. If in a given episode of belief change there are some observation sentences whose new degrees of belief are totally independent of prior belief, then the picture seems to hold: such sentences are plausibly identifiable as the points of impingement and conditionalization seems appropriate. But if as a result of experience, there are no beliefs directly caused by experience alone, independently of any prior belief, then the picture looks like less of a good fit. If the new degrees of belief are dependent on prior degrees of belief, then in what sense are they the *direct* effects of experience? In what sense are these supposed points of impingement different from any other degrees of belief changed by the experience in supposedly less direct ways? Conditionalizing on these supposed observation sentences no longer seems so clearly appropriate; such conditionalization would not diffuse and distribute the *direct* effects

of experience (in the sense in which Field attempted to capture this notion in his input parameter α), but those direct effects intermingled with prior beliefs. This suggests the following sort of difficulty for Field's reparameterization program. If $P_1(E)$ is independent of $P_0(E)$, then rules (1) and (2) are clearly applicable. But in this case, $P_1(E)$ meets Field's requirements for being an input parameter, and no reparameterization is needed. But if $P_1(E)$ is *not* independent of $P_0(E)$, then there is reason to believe that we are dealing with a situation in which conditionalization of any sort is just not appropriate. And in this case, again, reparameterization seems not to be necessary. Field might well be correct in thinking that what we usually *take* to be observational degrees of belief are *not* independent of their priors; indeed, they are probably not independent of the priors of other *non-observational* sentences as well. But if this is true, then my intuition is that the correct response is not the reparameterization that Field attempts, but the far more interesting (and far more difficult) task of finding an alternative way of characterizing rational belief change.¹ Such an alternative might, as Field suggests, show how P_1 is derived from P_0 and an appropriate input parameter, but *without* the intermediation of conditionalization.

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¹This, of course, is not the first time that the universal applicability of conditionalization has been challenged. But it is only comparatively recently that people have attempted to specify the circumstances under which conditionalization is appropriate, or have seen the need to work out systematic alternatives to conditionalization. On the former, see, e.g., de Finetti (1974) and Teller (1976), and on the latter, see, e.g., May and Harper (1976) as well as Henry Kyburg's remarks on Teller (1976), given in Harper and Hooker (1976, p. 257).