THE LOGIC OF INTENTIONAL ACTION

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Abstract

Five purposive relations are investigated: endeavoring, endeavoring for a certain purpose, bringing something about in a certain endeavor, bringing something about for a certain purpose, and bringing something about intentionally. No satisfactory analysis of these terms has yet been proposed, either in mentalistic—belief, desire, intending—or in action terms. While bringing something about for a certain purpose may seem too obscure to be taken as a primitive, there are at least two arguments in favor of it. First, no analyses in terms of other primitives has worked; second, the rather natural definitions of the other notions which it makes possible take us some way toward understanding the structure of intentional action.
Among the relations which an agent may bear to states of affairs are those which involve intention or purpose. In this paper I will be concerned with these five intentional relations:

(A) Up: He undertook (tried, endeavored) to bring it about that p.

(B) Pp,q: He endeavored to bring it about that p, and did so in order to bring it about that q.

(C) Mp,q: He brought it about that p in his endeavor to bring it about that q.

(D) Ip,q: He brought it about that p for the purpose of bringing it about that q.

(E) Dp: He intentionally brought it about that p.¹

The notation I have indicated ignores distinctions of subject and time because they will play no role in what follows. Strictly speaking, the relation in, for example, locution (C) relates four things and might better be put this way: "Mₖp,q: s brought it about at t that p in his endeavor to bring it about that q." Where two or more of these locutions occur in a single context the subject and time will be assumed to be fixed throughout. I will say something about the more interesting features of these relations, and then I will suggest principles that will characterize them rather more fully. In parts II and III I will discuss attempts to analyze the relations in this set, and in part IV I will propose a systematic treatment of them.

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¹I would like to thank Paul Firgens for his comments on an earlier version.

I am indebted to the work of Henry Leonard and Roderick Chisholm for the kind of notation used in this paper, and for the direction my thought has taken regarding the solution of these problems. The precise meaning of the locutions (A) through (E) has been discussed by Leonard in [15], and Chisholm in all of the cited works.
One reason why the theory of action has not been the subject of much formal scrutiny, it is said, is that the semantics of action locutions have remained obscure. It seems to me a mistake, however, to suppose that we can learn much about the semantics of an area of language without knowing what its logic is. The systematic treatment offered in Part IV is meant to be a step toward filling this gap in our knowledge.

I

The five relations should be understood in this way: (A) does not entail that the agent failed to bring it about that p; one may undertake to do something and fail, but one may also succeed. (B) is true when and only when the agent undertook to bring it about that p as a means to bringing it about that q; it may be that he brings about neither that q nor that p. (C) will be true if, in his endeavor to bring it about that q, he brought it about that p, whether intentionally or not. (D), on the other hand, is only true if he brought it about that p as a means of bringing it about that q. Neither (C) nor (D) entails that he has brought it about that q. As I am using (E), it entails that the agent acted for a purpose, even if the purpose is only to bring it about that p.

Using the notation suggested we may investigate a number of principles involving these relations. I will use Lukasiewicz's reverse turnstile, \( \neg \vdash \), as he did, to indicate that something is not a thesis (but not, notice, to indicate that its denial is a thesis.) \(^2\) \( \neg \neg p, q \vdash p \) will abbreviate "its being the case that p contributed causally to its being the case that q." Propositions being asserted will appear on the right (\( \vdash ' \)), while those being rejected will appear on the left (\( ' \neg ' \)).

P1. \( \vdash ' \neg ' U_p \rightarrow p \) P2. \( ' \vdash D_p \rightarrow p \)

From the fact that something was undertaken it doesn't follow that that thing occurs; hence P1 is the rejection of the proposition that what is undertaken must occur. On the other hand, what is brought about intentionally does occur, and that is what is asserted in P2.

P3. \( ' \vdash p, q \rightarrow p \)

\(^2\) Lukasiewicz, of course, provided a formal rejection procedure. See [16], p. 353.
P4. $\neg (Pp, q \rightarrow q)$

From the fact that he undertook to bring it about that $p$ in order to bring it about that $q$, it doesn't follow that $p$ and it doesn't follow that $q$.

P5. $\neg (Mp, q \rightarrow q)$

P6. $\neg (Mp, q \rightarrow p)$

If he brought it about that $p$ in the endeavor to bring it about that $q$, it must happen that $p$; it need not happen that $q$. (Notice that we might introduce a new, non-intentional relation here, 'Bp' to abbreviate "He brought it about that $p"", which could be defined to mean that for some $q$, $Mp, q$. What an agent brings about in this sense he may, but need not, bring about intentionally; he need not intend to bring it about; he need not even be aware that he is bringing it about, or believe that he is bringing it about, or desire that it be brought about.)

P7. $\neg (I p, q \rightarrow q)$

P8. $\neg (I p, q \rightarrow p)$

The locution 'Ip,q' is intentional with respect to $q$, and it need not come about that $q$ in order for it to be true. On the other hand, it must be true that $p$.

P9. $\vdash (\exists q)Pp, q \rightarrow Up$

P10. $\vdash (\exists q)Pq, p \rightarrow Up$

P11. $\vdash Up \rightarrow (\exists q)Pp, q$

P12. $\vdash Up \rightarrow (\exists q)Pq, p$

If an agent endeavors to bring it about that $p$ for the purpose of bringing it about that $q$, then he undertakes to bring about $p$ and he undertakes to bring about $q$ (P9, P10). (The converse of that is not also true; if the agent both undertakes to bring it about that $p$ and undertakes to bring it about that $q$, it does not follow that he undertakes either for the sake of the other.) P11 and P12 are more controversial. If an agent undertakes to bring it about that $p$ must there be something for the sake of which he tries to bring it about? And must there be something which he undertakes to bring about for the purpose of bringing it about that $p$? I will assume that everything that we undertake to bring about is such that, in addition to the other things for the sake of which we may seek to bring it about, we undertake to bring it about for its own sake. But then

3 Perhaps this is not the best way to put what I have in mind, since it suggests that everything we undertake is an ultimate end. "Done for its own sake" is, I suppose,
P11 and P12 follow by existential generalization.

\[ P13. \vdash (\exists q)Mq,p \rightarrow Up \]
\[ P14. \vdash Up \rightarrow (\exists q)Mq,p \]
\[ P15. \vdash (\exists q)Iq,p \rightarrow Up \]
\[ P16. \vdash (\exists q)Ip,q \rightarrow Up \]
\[ P17. \vdash Up \rightarrow (\exists q)Iq,p \]

I will also assume that one has not undertaken something if one has not brought about anything in the undertaking of it, and that one has undertaken something if one has brought about something in the undertaking of it (P13, P14). What one brings about for the purpose of bringing a second thing about is itself something that one undertakes to bring about, and of course the second thing is also undertaken (P15, P16). We may also assume, I think, that in undertaking something we bring about at least one thing intentionally (P17).

\[ P18. \vdash Up \rightarrow Dp \]
\[ P19. \vdash Dp \rightarrow Up \]

If an agent brings it about intentionally that \( p \), then that agent has undertaken to bring it about that \( p \); but from the undertaking of it it doesn't follow that the agent brought it about intentionally.

\[ P20. \vdash Dp \rightarrow (\exists q)Pp,q \]
\[ P21. \vdash Dp \rightarrow (\exists q)Pq,p \]

If I bring it about intentionally that \( p \), then there is something that I undertake for the sake of bringing it about that \( p \) (if only \( p \) itself), and I undertake to bring it about that \( p \) for the purpose of bringing something about (if only \( p \) itself).

\[ P22. \vdash (\exists q)Mq,p \rightarrow Dp \]
\[ P23. \vdash Dp \rightarrow (\exists q)Mq,p \]

usually reserved for such goals. I mean something much more trivial, and if that is understood, then perhaps what I say here will not seem too implausible. When I undertake to bring it about that \( p \), one of the things I intend, or purpose, is that \( p \). How could it be otherwise? This is the only sense in which I would maintain that whenever I undertake to bring it about that \( p \), I do so for its own sake. I do not mean to imply that among the things that I find desirable for their own sake there is the bringing about of \( p \). When a man undertakes to cut off his leg to prevent gangrene, one of the things he intends to bring about is the cutting off of the leg: he is undertaking it in order to do it!
One may make something happen in the endeavor to make a second thing happen without making the first thing happen intentionally and without making the second thing happen at all (P22, P24). On the other hand, if one brings it about intentionally that \( p \), then one makes it happen that \( p \) in some endeavor or other (P25). Does one also make something happen in the endeavor to bring it about that \( p \)? On the assumption made in connection with P11 and P12 that everything we undertake we undertake for its own sake as well as in order to bring other things about, we must accept P27; and from P27, P23 follows. Merely bringing something about in the endeavor to bring it about is not sufficient for bringing it about intentionally: in trying to make it happen we may do something unwittingly that causes it to happen (P26).

What I bring about for some purpose I bring about intentionally, and what I bring about intentionally I bring about for some purpose; what I undertake to bring about I need not bring about intentionally (I may not bring it about at all), but what I bring about intentionally I undertake to bring about (P28, P29, P30, P31). What I bring about for its own sake I bring about intentionally, and what I bring about intentionally I have undertaken for its own sake, as well as for any other purpose I have for undertaking it; hence if I bring it about intentionally I bring it about for its own sake, even if also for some other purpose (P32, P33).

These principles concern the relationships among (B), (C) and (D). If I bring it about that \( p \) for the purpose of bringing it about that \( q \), I bring it about that \( p \) in the endeavor to bring it about that \( q \); but the converse is not true. Many of the things I bring about in the endeavor to bring it about that \( q \) are things of which I am not aware, and which it was not my intention to bring about (P34, P35). What I bring about for a purpose I undertake to bring about...
for that purpose (P37); but what I undertake I may not bring about at all, let alone for a purpose (P36). From the fact that I make it happen that \( p \) it does not follow that I undertook to make it happen that \( p \); and from the fact that I undertook to make it happen that \( p \) it does not follow that I make it happen that \( p \) (P38, P39).

\[
P40. \neg M_pq \rightarrow (\exists q)I_{r,q}
P41. \neg P_pq \rightarrow (\exists r)I_{r,q}
P42. \neg M_pq \rightarrow (\exists r)I_{r,p,q}
P43. \neg P_pq \rightarrow (\exists r)I_{r,p,q}
P44. \neg P_pq \rightarrow (\exists r)I(I_{r,p}, q)
P45. \neg (\exists r)I(I_{r,p}, q) \rightarrow P_pq
\]

If an agent makes something happen in the endeavor to bring it about that \( q \), or if that agent undertakes something for the purpose of making it happen that \( q \), then there is something that the agent brings about for the purpose of making it happen that \( q \) (P40, P41). If the agent makes it happen that \( p \) in the endeavor to make it happen that \( q \), then there is something that he undertakes for the purpose of bringing it about that \( q \); and if he undertakes to make it happen that \( p \) for the purpose of bringing it about that \( q \), then there is something he brings about in the endeavor to bring it about that \( q \) (P42, P43). P44 and P45 say something similar to what is said by P13 and P15; if I undertake something for a purpose, then that requires that there be something I bring about for a purpose.

\[
P46. \neg \neg (P_pq \& M_pq) \rightarrow D_p
\]

Finally, I may endeavor to bring it about that \( p \) for the purpose of bringing it about that \( q \), and I may make it happen that \( p \) in the endeavor to bring it about that \( q \), without bringing it about that \( p \) intentionally. Suppose that I undertake to make my wife laugh for the purpose of cheering her up. I dress up in silly clothes, planning to surprise her and make her laugh. Although I don't know it, she has been watching my silly preparations, and begins to laugh. As much as I would like to take credit for it, it seems to me that I did not make her laugh intentionally. Of course, neither was it against my will; but then not everything I make happen is either intentional or against my will.

The clause which is the consequent of P44 and the antecedent of P45, involving as it does the iteration of 'Ip,q', is to be read in this way: "he brings it about that he brings about something for the purpose of bringing it about that \( p \), and does so in order to bring it about that \( q \)."
These principles delineate what we may call the structure of purposive action, or at least a part of it. It is natural to ask whether any of the intentional relations involved in these principles can be defined, whether from outside the set or from within it, and in such a way that all the relationships expressed in these principles can be preserved.

II

Attempts to analyze talk about purpose fall into two groups: those which include among their undefined terms involving purpose, and those which do not. Among attempts of the first sort I include that of Henry Leonard in [15], in which he took the relation in our locution (B) as primitive, and those of Roderick Chisholm in [3], [4], [5], [6], [7], [8], and [9], in which he took first (C) and later (A) as undefined. In the second group I include the analyses of purpose in terms of belief and desire--Ducasse ([12]), Davidson ([10]), and Goldman ([13]) among others have made attempts which fall into this group--and those in terms of intending--the work of Aune ([1]) and Harman ([14] can be put into this group.4

The attempts which fall into the second group involve causation by mental events. Ducasse's view is the simplest of this sort, and is therefore a common starting point for discussions of this subject. According to Ducasse, to say that an agent brought it about that p intentionally is to say this: that he desired that q, that he believed that if he brought it about that p then it would happen that q (or that it would happen that q only if he brought it about that p), and that that belief and that desire caused him to bring it about that p ([12], p. 543). An equally simple analysis in terms of intending--though I know of no one who has suggested it--would be this: one does something intentionally if the action was caused by one's intention to do it.

The objections normally raised against Ducasse's analysis, or at least some of them, can be raised against the intending analysis as well. Just as a belief and a desire might cause the action which is believed to lead to the desired consequence while the action is nevertheless unintentional, so intending to do something might cause one's doing it, but unintentionally. The best known example of this sort is from Chisholm [3]: I desire to inherit my

4 For still another approach to these matters, see [19] and [20]. See also the reply by Taylor, [17] and [18].
uncle's money, and believe that if I kill him I will inherit the money; the belief and the desire so agitate me that I lose control of the car I am driving, swerve and hit a bystander, who turns out to be my uncle. I have killed him unintentionally; yet according to Ducasse's definition my action should be intentional. Similarly an equally nervous person might become agitated by the intention to kill, so that the intention causes him to kill accidentally. Whatever the mental event, simple causation by that event is not enough for intentional or purposive action.\(^5\)

Recent analyses have made use of the notion of a plan of action and, in at least one case, of the notion of a normal or characteristic causal sequence. In Goldman's [13] a plan is a set of beliefs about how one's actions will generate the desired consequence. If the basic action in the plan is caused (in the appropriate way) by the plan (and presumably by the desire for the consequence), then any of the actions in the plan which happen according to plan are intentional. My plan may be to convince someone that I am a good driver by signalling for a left turn, and I may plan to signal by extending my arm out the window. If I desire to convince that person that I am a good driver, and the plan and the desire cause me to extend my arm, then I have extended my arm intentionally. If extending my arm brings about (generates) my signalling, then my signalling is intentional; and so on down the list of actions in the plan. My killing my uncle in my agitated state does not count as intentional on this account (Goldman [13], pp. 49-63).

But the suspicion persists that even with this sort of amendment the analysis will be open to the same objections. How completely must the plan be conceived, for example? Is it enough for the plan to contain the two lower-level actions, extending my arm and signalling for a turn? Or must all the other things I do at the same time be in the plan? Among other things, I extend my arm either rapidly or slowly, gracefully or not, and perhaps in a southerly direction; I put my sleeve into a position to reflect a certain light; I catch the eye of a passerby. Many of the things I am doing I will be unaware of; we can hardly require that they be in the plan. It may be that I have been told only that

\(^5\)Notice that the other important objection that Chisholm raises against the belief-desire-causation analysis does not hold against the intending-causation sort of analysis. Chisholm maintains in [3] that we may strive for what we do not desire, and for what we do not even believe will lead to what we desire.
if I extend my arm out the window I will have signalled, and it may remain a great mystery to me how that occurs; whether I activate some device in thus moving my arm, or whether something else, equally far-fetched, occurs. Consequently there is a certain limit to how detailed we can require the plan to be without excluding certain obviously intentional acts.

If we can't be any more precise that that, however, then it seems to me that the analysis is open all over again to the same sorts of objections. Consider a man in the situation I have described, whose plan has two steps, to extend his arm and by extending his arm to signal, and who does not know how the first brings the second into being. Imagine one of those lucky accidents: although he is mistaken in thinking that in this state one can signal by extending his arm, it happens that in extending his arm he has caught a wire and pressed it against the metallic door, causing a short and causing the left turn signal to come on. The signalling is quite fortuitous and should not be called intentional, I think; yet on this analysis it must be. The action of extending his arm has been caused in the appropriate way (let us suppose), and all of the elements of the plan up to his signalling have happened according to plan: his extending his arm generated his signalling. Nevertheless the action is unintentional. Precisely the same sorts of problems arise if we consider the action to be caused by intending.

The answer is not to require that the plan be more detailed, to exclude such deviant causal chains; as we have seen, the plan depends upon the agent's knowledge, and we cannot legislate what that knowledge must be without ruling some intentional actions unintentional. This sort of problem comes to seem insurmountable for this sort of approach. And it is not merely that there is a certain vagueness about how completely the plan of action should be specified, a vagueness matched by the vagueness of our intuitions about borderline cases of intentional action. A plan, however detailed, may be fulfilled without the action being intentional, since there will always be some gap due to ignorance of the causal chain (or of the generational chain)--a gap that will allow deviant causal sequences. On the other side of it, an intentional action may involve a plan of little detail, some of the details of which are not fulfilled. If I plan to shoot my neighbor by holding my gun steady and firing at him, I shoot him intentionally even if I fail to hold my gun steady.

The objections I have considered are sufficient to con-
vince me that there is not now a satisfactory analysis of this sort; other objections are raised by Davidson in [11]. Let us move on, therefore, to those analyses which take members of our set of intentional relations as primitive.

III

In 1959, in "Authorship and Purpose," Henry Leonard attempted an analysis of certain of the intentional relations. He took as undefined our (B) and another related locution not in our list, "He brings it about that p (Bp)." He proposed the following definitions:

\[
I_{p,q} = \text{df. } P_{p,q} \land B_p \\
U_p = \text{df. } (\exists q)P_{q,p}
\]

He does not attempt a definition of 'M_{p,q}', however his primitive 'B_p' is related to our 'M_{p,q}' in this way:

\[B_p = (\exists q)M_{p,q}\]

Furthermore, although he does not define 'D_p' we may suppose that, in line with his definition of 'I_{p,q}', he would have defined it in this way:

\[D_p = \text{df. } (\exists q)P_{p,q} \land B_p\]

The definition of "U_p" seems to me acceptable. The definition of 'I_{p,q}', however (and the definition of 'D_p', which Leonard may or may not have accepted) though it may have been sufficient for Leonard's purposes is clearly not adequate to the important philosophical uses of these words.

To show that the definition of 'I_{p,q}' is inadequate we need only imagine a state of affairs in which an action undertaken for the sake of a second thing is brought about by the agent, but is brought about quite unintentionally. Suppose that I undertake to signal for the purpose of impress-

\[\text{Leonard's notation was as follows: } W^t(a,p,q) \text{ (undefined) abbreviates 'a works at time } t \text{ at bringing it about that } p \text{ in order to bring it about that } q', (p. 278) \text{ and } B^t(a,p) \text{ (also undefined) abbreviates 'a brings it about at time } t \text{ that } p' (p. 279). 'D^t(a,p,q)' ('a brings it about at time } t \text{ that } p \text{ in order to bring it about that } q') \text{ he defines this way: } [W^t(a,p,q).B^t(a,p)]; \text{ and 'pt(a,p)' ('a purposes at time } t \text{ that } p') \text{ he defines in this way: } (\exists q)W^t(a,q,p)' (pp. 280-281).\]
ing my driving instructor; and suppose that in undertaking to signal I bring it about that I signal and that I do so unintentionally; imagine that in trying to extend my arm out the window I again accidentally set off the left turn signal. In such a case it would be true that I had undertaken to signal for the purpose of impressing my instructor, and it would also be true that I signalled; but it would not be true that I had signalled for the purpose of impressing my instructor, since, as things turned out, I did not signal on purpose at all. Exactly the same considerations would hold against the definition of 'Dp'. The action involved, though undertaken for a purpose, and though it came about, was not brought about intentionally. These are the considerations that keep P46 from being a thesis.

Roderick Chisholm has proposed to take first (C) and now more recently (A) as undefined. We may confine ourselves, in spite of the change of primitives, to the recent definitions of Person and Object; the definitions in that work are in the line of development indicated in the previous work. In fact, the change in primitives may have come about because of the realization that the two relations are rather obviously interdefinable: to undertake something is just to make something happen in the undertaking of it; and to make one thing happen in the undertaking of another is just to undertake the second thing and have that undertaking cause the first. With one exception, therefore, we can confine ourselves to the definitions of Person and Object. The exception is 'Ip,q' which is not defined in that book, and for which we must look to the most recent of the earlier definitions.

The first of the definitions to be considered is this:

7 The notation of [4] may serve as an example of the sort of notation Chisholm has used. In that paper, 'Mt(a,b)' symbolizes 'at time t, he makes A happen in the endeavor to make B happen.' The 'A' and 'B' of the English sentence and the 'a' and 'b' of the notation take as substituends terms referring to states of affairs ([4], p. 285). (In earlier versions of the present paper I had attempted to use variables in a similar way; however, the problems that arose in connection with iteration of operators, truth-functional connectives within the scope of the operators, and quantifiers were so great that I have made use of substitutional quantification instead. I believe, nevertheless, that in talking about these things I must assume the existence of states of affairs.) The definitions are these:
Pp,q = df. U(p & C(Up),q). \hfill ([9], p. 76)

That is, to say that he undertook to bring it about that p and did so for the purpose of bringing about that q is to say that he undertook to bring it about that p and that his undertaking to bring it about that p should cause it to be the case that q. Chisholm had earlier proposed (in [7], for example, p. 638) a shorter definition in which it was required only that among the things undertaken was that the fact that p (and not the mere undertaking of p) should cause it to be the case that q:

Pp,q = df. U(p & Cp,q).

He adopted the more complicated version because of the sort of objection raised by Annette Baier in [2].

The definition of Leonard's 'Bp' is this:

Bp = df. (\exists q)C(Uq),p, \hfill ([9], p. 70)

that is, there is some state of affairs such that his undertaking that state of affairs contributed causally to its being the case that p. (This definition is related to the definition which I proposed to show that 'Mp,q' could be defined in terms of 'Up'.)

I propose to treat the following as the definition of 'Dp' in spite of the fact that it appears in Person and Object as a definition of a completely successful action and not as a definition of an intentional action:

Dp = df. Up \& (q)(Pa,p \to Cq,p) \hfill ([9], p. 83)

\hfill 8There is an additional complication in Chisholm's definition which need not worry us here: Chisholm requires not only that the agent undertake to bring it about that p, but that he make an attempt at bringing it about that p, which is to say that he does not merely undertake that someone (possibly other than him) should bring it about.
This definition is in a line of definitions which began as definitions of intentional action; in spite of the fact that he has in more recent work ceased to refer to this as the definition of intentional action, Chisholm referred to actions fitting the definition as actions "which could be said, without reservation, to be intentional" in [4], p. 289, and called the definition the definition of "successful intentional action." Moreover, there is no other definition of intentional action in Person and Object, and there is no reason to think that he has abandoned his earlier characterization of such actions as these as intentional.

There is no definition of 'Ip,q' in Person and Object; we must look to the earlier work to gain some notion of how Chisholm thinks that locution is to be defined:

\[ Ip,q = \text{df. } M(p \land C(Bp),q) \]  

that is, to say that he brought it about that p for the purpose of bringing it about that q is to say that he brought it about that p in the endeavor to bring it about that (i) p, and (ii) that his bringing it about that p should cause it to be the case that q. This definition would receive roughly the following rendering in the language of Person and Object:

\[ Ip,q = \text{df. } C(U(p \land C(Bp),q),p) \]

that is, his endeavor to bring it about that (i) p and (ii) his bringing it about that p should contribute causally to its being the case that q, contributed causally to p.

The definitions of both 'Pp,q' and 'Bp' are adequate, I think, while the definitions of 'Dp' and 'Ip,q' seem inadequate. Against the definition of 'Dp', it may happen that everything that I undertake for the purpose of making it happen that p, happens but happens unintentionally, and therefore while it comes about that p, that also comes about unintentionally. Suppose that I undertake two things for the purpose of signalling, and that I undertake nothing further for the sake of those two things; and suppose that in endeavoring to bring each of them about I bring them about by accident. Suppose too that it happens that each of those things contributes causally to my signalling; then, though I have signalled, I have signalled unintentionally. Consequently the definition of 'Dp' seems too weak. It is also very strong, since nothing will turn out to be a successful intentional action unless everything undertaken for the sake of bringing it about also occurs. The charge of weakness is more serious, however, since whether or not Chisholm means this to be a definition of merely intentional action,
he does mean it to be a definition of action that is, among other things, intentional.

The objections that can be raised against the earlier definition of 'Ip,q' are similar. The fact that one undertakes the conjunctive state of affairs which is expressed by "(p & C(Bp),q)", together with the fact that undertaking it contributed causally to one's bringing it about that p, is not sufficient to warrant the conclusion that one has brought it about that p for the purpose of bringing it about that q, for it does not even entail that one has brought it about that p on purpose. Setting out to bring about that complicated state of affairs, the agent brought it about that p by accident. Why not? I undertake to make it happen that I kill an ant, and that my doing so contribute causally to my being admitted to a certain club of ant-killers; I take up my spade for the purpose, and in moving the spade I unwittingly crush an ant. Later, looking for an ant-victim, I find none and put the spade away disappointed. Can I be said to have killed an ant for the purpose of gaining entrance to that weird club? I don't think so.

Is any analysis of (D) and (E) possible in terms of (A) or (B) or (C)? It appears unlikely. In the first place, though endeavoring or undertaking is not simply a mental event, a causal analysis which makes use of endeavoring will be beset with most of the same difficulties that attended the analysis in terms of mental events and causation. Something similar is true if we take (B) as undefined, since again a causal relationship will be required to bring about the intended behavior. In (C), finally, the relationship between the behavior undertaken and the behavior that comes about may be entirely accidental; and that will be true no matter how complicated we make the state of affairs to be undertaken. It seems to me that any systematic treatment will have to take either (D) or (E) as primitive. In the next section I propose a theory of intentional action based upon the undefined (D).

IV.

The axioms and definitions that follow will allow the derivation of all the theses from P2 through P45. If we give up the last axiom we lose only the two principles P27 and P33; our attitude toward that axiom and those principles will depend upon our attitude to the claim that what is brought about for any purpose is also brought about for its own sake.
Axioms for intentional action:

A1. \( Ip,q \rightarrow p \)
A2. \( Ip,q \rightarrow (\exists r)C(Ir,q),p \)
A3. \( Ip,q \rightarrow (\exists r)I(Ir,p),q \)
A4. \( Ip,q \rightarrow (\exists r)I(Ip,q),r \)
A5. \( Ip,q \rightarrow Ip,p \).

An additional principle governing the causal relation:

C. \( Cp,q \rightarrow (p \& q) \).

Definitions:

D1. \( Dp = df. (\exists q)Ip,q \)
D2. \( Up = df. (\exists q)Iq,p \)
D3. \( Pp,q = df. (\exists r)I(Ir,p),q \)
D4. \( Mp,q = df. (\exists r)(Ir,q \& C(Ir,q),p) \).

We may also introduce here Leonard's "He brought it about that p" which entails neither that he brought it about intentionally that p, nor that he endeavored to bring it about that p.

D5. \( Bp = df. (\exists q)(\exists r)(Iq,r \& C(Iq,r),p) \).

I will indicate how each of the theses is to be derived, in some cases giving the complete proof.

P2. \( Dp \rightarrow p \): by definition D1 and axiom A1
P6. \( Mp,q \rightarrow p \): D4 and C
P8. \( Ip,q \rightarrow p \): A1
P9. \( (\exists q)Pp,q \rightarrow Up \): I will give the proof in the case of this and the three that follow.9

1. \( (\exists q)Pp,q \)  
   assumption
2. \( Pp,q \)  
   assumption (for E.I.)
3. \( (\exists r)I(Ir,p),q \)  
   2, D3
4. \( I(Ir,p),q \)  
   assumption (for E.I.)
5. \( Ir,p \)  
   4, A1
6. \( (\exists q)Ip,q \)  
   5, E.G.
7. \( Up \)  
   6, D2

In these derivations I make use of the following version of Existential Instantiation: if, from the assumption of A, we can derive B, then B follows from \((\exists x)C\), where C is the result of substituting x for free occurrences of y in A.

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P10. \((\exists q)Pq,p \rightarrow Up\):

1. \((\exists q)Pq,p\) assumption

2. \(Pq,p\) assumption

3. \((\exists r)I(Ir,q),p\) assumption

4. \(I(Ir,q),p\) assumption

5. \((\exists q)Iq,p\) \(3, 4-6, \text{E.I.}\)

6. \(Up\) \(3, 4-6, \text{E.I.}\)

7. \(Up\) \(1, 2-7, \text{E.I.}\)

8. \((\exists q)Pq,p \rightarrow Up\) \(1-8, \text{C.P.}\)

P11. \(Up \rightarrow (\exists q)Pp,q\):

1. \(Up\) assumption

2. \((\exists q)Iq,p\) assumption

3. \(Iq,p\) assumption

4. \((\exists r)I(Iq,p),r\) assumption

5. \(I(Iq,p),r\) assumption

6. \((\exists q)Iq,p\) \(3, 4-8, \text{E.I.}\)

7. \(Up\) \(4, 5-8, \text{E.I.}\)

8. \((\exists q)Pp,q\) \(2, 3-9, \text{E.I.}\)

9. \((\exists q)Pp,q \rightarrow Up\) \(1-10, \text{C.P.}\)

P12. \(Up \rightarrow (\exists q)Pq,p\):

1. \(Up\) assumption

2. \((\exists q)Iq,p\) assumption

3. \(Iq,p\) assumption

4. \((\exists r)I(Iq,p),p\) assumption

5. \(I(Iq,p),p\) assumption

6. \((\exists q)Pq,p\) \(2, 3-9, \text{E.I.}\)

7. \(Up \rightarrow (\exists q)Pq,p\) \(1-7, \text{C.P.}\)

P13. \((\exists q)Mq,p \rightarrow Up\) \(D4, \text{simplification}, D2\)

P14. \(Up \rightarrow (\exists q)Mq,p\) \(D2, A2, A1, D4, E.G.\)

P15. \((\exists q)Iq,p \rightarrow Up\) \(D2\)

P16. \((\exists q)Ip,q \rightarrow Up\) \(A3, \text{E.G.}, D2\)

P17. \(Up \rightarrow (\exists q)Ip,q\) \(D2\)

P18. \(Dp \rightarrow Up\) \(D1, A3, A1, \text{E.G.}, D2\)

P19. \(Dp \rightarrow (\exists q)Pq,p\) \(D1, A3, A1, A3, D3, E.G.\)

P20. \(Dp \rightarrow (\exists q)Pq,p\) \(D1, A3, A1, A3, D3, E.G.\)

P21. \(Dp \rightarrow (\exists q)Pq,p\) \(D1, A3, A1, A3, D3, E.G.\)

P22. \(Dp \rightarrow (\exists q)Pq,p\) \(D1, A3, A1, A2, A1, D4, E.G.\)
We can also see that some, at least, of those which are not theses do not follow from the axioms. Let the following matrices assign truth values to assertions involving our undefined relation \('Ip,q'\) and to the causal relation:

<table>
<thead>
<tr>
<th>p</th>
<th>q</th>
<th>Ip,q</th>
<th>Cp,q</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>T</td>
<td>T</td>
<td>T</td>
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<tr>
<td>F</td>
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</tr>
</tbody>
</table>

Then each of the axioms turns out to be true under every interpretation of the sentence letters:

A1. It is true that Ip,q only if it is true that p.
A2. It follows from the antecedent that it is true that p; hence it only needs to be shown that there is something that will make it true that Ir,q. But any true proposition will do for that, since if it is true that r then it is true that Ir,q, whether or not it is true that q.
A3. Similarly, the existence of any true proposition is sufficient to make the consequent true, and thus make A3 true.
A4. The truth of the consequent follows from the truth of the first of the two relata, which follows from the truth of the antecedent.
A5. It is true that Ip,q only if it is true that p; but then it must also be true that Ip,p.

The following non-theses turn out to be falsifiable:

P1. Up \(\rightarrow\) p: it can be true that Up whether it is true or false that p (see D2). Hence we can make the
conditional false by making it true that Up and false that p.
P3. Pp,q \rightarrow p: Again, by definition D3, it can be true that Pp,q whether or not it is true that p.
P4. Pp,q \rightarrow q: Similarly, by the definition.
P5. Mp,q \rightarrow q: It can be true that Mp,q whether or not q is true (D4).
P7. Ip,q \rightarrow q: The truth of the antecedent depends only on its being true that p.
P18. Up \rightarrow Dp: Let it be false that p; then it will be true that Up since there is some q (let it be axiom A1) such that Ip,p. But it will be false that Dp by D1.

P22 can be made false in the same way, as can P29, P36, and P39. Those which cannot be made false, P24, P25, P34, P38, and P46, all involve the locution 'Mp,q'.

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REFERENCES


