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RECONSTRUCTING HEMPELIAN MOTIVATIONAL EXPLANATIONS*

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ABSTRACT: When motivational explanations are cast in the Hempelian form, motivations and other mental states usually play the role of antecedent conditions. This leads to two objections: (1) that there is a question-begging connection between the explanandum and the antecedent conditions referring to mental states, and (2) that the intentional character of motivational explanations prevents them from being scientifically useful. These objections are mooted if claims about motivational states are construed as covering laws rather than as statements of antecedent conditions are as covering laws rather than as statements of antecedent conditions.

In their original and classic treatment of scientific explanation, Hempel and Oppenheim (1948) argue that adequate scientific explanations must have the form of valid arguments in which the state of affairs to be explained (the explanandum) can be logically inferred from the conjunction of two sets of premises. The first set of premises includes all the relevant antecedent conditions; the second set contains one or more covering laws, which must be of universal or statistical form. Taken together, the antecedent conditions and covering laws are called the "explanans." All of the statements in the explanans must be true and (at least in principle) empirically testable. Moreover, the explanandum must not be entailed by either set of premises taken alone; both the antecedent conditions and the covering laws must be necessary for the inference.

Thus, to explain why a particular metal rod increased in length, we might combine antecedent conditions (AC) with covering laws (CL) to reach the concluding explanandum statement (ES) as follows:

- (AC): The metal rod is composed of copper. The metal rod was heated.
- (CL): Copper expands when heated.
- (ES): The copper expanded.

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In the usual application of this Hempelian account to motivational explanations of human behavior, a motivation is treated as a particular mental state which is an antecedent condition to the behavior needing explanation. Thus, to explain the fact that Jones carried an umbrella today, one might (following Rosenberg, 1988) offer the following syllogism.

- (AC): Jones is a person who has access to an umbrella, believes that rain is likely today, and wants to stay dry.
- (CL): Other things being equal, people who have access to an umbrella, believe that rain is likely, and want to stay dry, carry umbrellas.
- (ES): Therefore Jones carried an umbrella today.

Note that the antecedent conditions in this case include two intentional states ("believes...., wants....") and that the covering law serves to relate these to the behavior, umbrella carrying.

I. TWO OBJECTIONS TO HEMPELIAN MOTIVATIONAL EXPLANATIONS

Motivational explanations which take this form are subject to at least two worrisome objections. The first is that there is too strong a connection between the antecedent conditions and the explanandum. This connection is clearer when one makes explicit all the antecedent conditions that are necessary for the explanation, including those that are assumed as well as those that are enumerated. In the example above, these tacit conditions would include that Jones has available no better means of keeping dry than an umbrella, that Jones does not believe that carrying the umbrella will prevent him from accomplishing other important goals, that Jones believes that carrying an umbrella will enable him to stay dry, that Jones is a reasonable person, (i.e., a person whose beliefs, desires, and behavior are related in instrumentally reasonable ways), etc., etc.

When the antecedent conditions assumed in the explanans are more fully enumerated in this way, they will be found to include at least one (and usually several) intentional states that take something very much like the explanandum as their object. So, among the antecedent conditions in the example above were Jones's beliefs about the consequences of 'Jones carried an umbrella today.' That these intentional states take Jones's carrying of an umbrella as their object does not exactly entail that Jones carry an umbrella, but it does make it impossible to identify these antecedent conditions except as conditions antecedent to the explanandum.

Furthermore, the implicit antecedent conditions must also contain the stipulation that Jones is a reasonable person, an assumption that is, on the one

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hand, absolutely necessary to the success of the explanation, but is, on the other hand, fatally subsumptive of the covering laws. Thus, a completely adequate articulation of this particular antecedent condition would render the covering laws superfluous. Given the other antecedent conditions in the example above, no "reasonable" person could fail to carry an umbrella. This result violates Hempel's requirement that the covering laws be necessary to inferring the explanandum.

In sum, according to this first objection, the connection between antecedent conditions and explanandum is either so tight that it violates Hempel's requirements, or, if not quite tight enough to entail the explanandum, at least so tight as to drain motivational explanations of any heuristic value, since there will be no way to identify or verify the antecedent conditions except as conditions antecedent to the explanandum (see Lipton and Thompson, 1988).

The second objection is that motivational explanations are not scientifically adequate because the intentional terms that they use to describe mental states suffer from a kind of referential opacity. In brief, the problem is that the truth value of statements using intentional terms is not reliably preserved when extensionally equivalent expressions are substituted for each other in the statements. Hence, motivational explanations are not susceptible to improvement, and so are not even worthy of scientific attention. To appreciate the force of this objection, compare two explanations, one containing only extensional terms, the other using intentional terms.

Explanation using extensional terms:

- (AC): Jones is a human being and carried a flattish, wide object over his head while it rained.
- (CL): Other things being equal, human beings who carry flattish, wide objects over their heads while it rains remain dry.
- (ES): Jones remained dry.

Explanation using intentional terms:

- (AC): Jones is a human being, believes that rain is likely today, wants to stay dry, and believes that carrying a flattish, wide object will enable him to stay dry.
- (CL): Other things being equal, human beings who believe that rain is likely, who want to stay dry, and who believe that flattish, wide objects will keep them dry, carry flattish wide objects.
- (ES): Therefore Jones carried a flattish, wide object today.

Now suppose that we discover that the flattish, wide object that Jones carried is an umbrella, rather than, say, a newspaper or a briefcase or a piece of cardboard. Without any further investigation or any additional knowledge about Jones's beliefs or desires, we can confidently substitute the term "umbrella" for the term "flattish, wide object" in the extensional explanation. And in so doing, we can be confident that we have both (i) preserved the truth of the statements in the explanans and (ii) increased their precision. Described in Hempel's terms, we have met the adequacy conditions of (i) truth and (ii) maximal specificity.

Unfortunately, the intentional explanation does not offer the same opportunities for improvement. We cannot confidently substitute the term "umbrella" for the term "flattish, wide object" in this explanation, because the proposition "Jones believes that carrying a flattish wide object will keep him dry" does not securely entail the proposition "Jones believes that carrying an umbrella will keep him dry." Indeed, if Jones has false beliefs about umbrellas, he might even believe that carrying an umbrella will not keep him dry -- despite the fact that he does believe that carrying a flattish, wide object would keep him dry. Thus, by substituting "umbrella" for "flattish, wide object" in the intentional explanation, we turn a previously true explanans statement into a false explanans statement, and so violate one of Hempel's conditions for an adequate explanation. Due to the special referential character of intentional terms, our attempt to increase explanatory precision has resulted not in progress, but in failure.

In sum, according to this second objection, scientific explanations must, at least in principle, be open to improvement by the substitution of ever more precise terms and concepts; but explanations using intentional terms are not open to such improvement, so scientific explanations cannot use intentional terms. And since motivational explanations cannot avoid using intentional terms, motivational explanations cannot qualify as scientific.

II. A RECONSTRUAL THAT MEETS THE TWO OBJECTIONS

These two objections to motivational explanations in Hempelian form take for granted that claims about mental states must be treated as antecedent conditions. But suppose instead that these claims can be construed as statements of extensionally explicable and empirically testable covering laws. In that case, a motivational explanation of Jones's behavior might take the following form:

- (AC): Jones heard the radio forecast rain this morning and saw an overcast sky when he looked out his window.
- (CL): Jones believes that radio weather forecasts are accurate, believes that an overcast sky presages rain, wants to remain dry, and believes that an umbrella will keep him dry.

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(ES): Therefore, Jones carried an umbrella today.

This explanation avoids the two objections to motivational explanation discussed above. The first objection (that the antecedent conditions alone, without the covering laws, suffice to entail the explanandum) is voided because the antecedent conditions clearly do not entail the explanandum. In fact, together with other covering laws, such as that Jones distrusts radio weather forecasts and believes that an overcast sky presages a heat wave, the same antecedent conditions will entail that Jones will not carry an umbrella.

The second objection -- that motivational explanations must use intentional terms which suffer a fatal kind of referential opacity -- is also voided. As we shall indicate in detail below, on our proposed reconstruction of claims about mental states as covering laws, such claims are extensionally explicable as referring to overt patterns of behavior and empirically testable by observing Jones's behavioral patterns.

One might object that the motivation statements and other claims here construed as covering laws are vulnerable to a new objection, namely, that because they refer to a particular entity (Jones) they cannot qualify as lawlike sentences. Indeed, Hempel and Oppenheim (1948) did require that covering laws have universal logical form, and since our motivational claims do refer to a spatio-temporally particular object, they might seem to be disqualified as Hempelian covering laws. But at least two replies can be made against this objection.

First, Hempel himself later pointed out that mention of spatio-temporally particular objects cannot be used to exclude otherwise lawlike sentences as potential scientific laws. (Hempel, 1965, p. 458, footnote 4). Second, the requirement of universal logical form has not stood the test of time -- and, in particular, the test of more sophisticated history of science -- as well as Hempel's other criteria. Many of the greatest scientific advances, including both Kepler's laws of planetary motion and Galileo's laws of terrestrial dynamics, refer to spatio-temporally particular objects (the sun in the former case; the earth in the latter).

Some would argue that Kepler's and Galileo's laws were genuinely scientific only because they are derivable from higher-order scientific laws (for example, Newton's laws of motion and gravity) which do not themselves refer to any spatio-temporally particular object. But this defense of Hempel's original view has its own problems. As applied to history, it would imply that before the publication of Newton's laws, neither Kepler's nor Galileo's laws could be used in valid scientific explanations -- an odd claim at best. And as applied to the contemporary problem of motivational explanation, it would constitute an objection to our proposed reinterpretation only if it is assumed that the covering laws describing Jones's behavior will themselves never be derivable from more general laws -- for example, from laws that relate histories of reinforcement or millennia of natural selection to the general forms of behavioral design and to the particular design of Jones's

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dry-keeping behaviors. Surely, it is no more difficult for contemporary social scientists to anticipate such general laws than it might have been for early Copernicans to anticipate Newtonian physics. For example, one might anticipate that the covering law, "Jones wants to remain dry" might eventually be derivable from a more refined version of one or both of the following schematic explanations:

- (AC): As a child, Jones was regularly punished for getting his clothes wet;
- (CL): Other things being equal, people whose personal histories have associated wet clothing with pain and embarrassment want to remain dry;
- (ES): Jones wants to stay dry.

or

- (AC): Jones is a descendant of a population of creatures that has been selected for remaining dry;
- (CL): Other things being equal, creatures who are descendants of populations that have had a history of selection for remaining dry, want remain to remain dry;
- (ES): Jones wants to stay dry.

Thus, our construal of motivational claims as scientific covering laws is at least as reasonable as the similar construal of Kepler's and Galileo's laws -- that is, it is reasonable enough for scientific purposes.

III. MENTAL TERMS AS COVERING LAWS

So far, we have argued that construing motivation statements as covering laws, rather than as causal antecedents, voids two classical objections to motivational explanation and improves the scientific status of motivational claims. But, as noted earlier, this reconstrual depends on interpreting mental terms as covering laws. How is such an interpretation plausible?

Thompson (1981, 1986a, 1986b, 1987a, 1987b, 1988, and in preparation) has already argued that mental and other organizational terms should be understood to refer not to *behavioral causes* (that is, to 'internal' conditions that must obtain before a behavior will occur) but to observable features of *behavioral design* (that is, to empirically testable generalizations linking particular causes to particular behaviors in an organism's behavioral repertoire). This argument grew out of the observation that certain concepts which were developed to explain natural design -- e.g., Darwin's concept of natural selection or Thorndike's concept of satisfiers -- are now often conflated with the same natural properties that they are supposed to

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explain. If theories of natural design are to be more than trivial truisms, there must be ways of describing or referring to these properties without invoking the very concepts that will later be used to explain them. Terms like "adaptation" (in biological theory) and "motivation" (in behavioral theory) have a vital use in describing and referring to design properties; and this initial descriptive use logically precludes their subsequent use to explain these same design properties (Thompson, 1987b).

This view of explanation is influenced both by neorealism and by philosophical behaviorism. Neorealism was a philosophical movement inaugurated with great fanfare in the early 20th century by R. B. Perry and E. B. Holt (Holt et. al., 1912; Holt, 1914) and developed with varying degrees of faithfulness and enthusiasm by the psychologists E. C. Tolman (1951), Albert Hofstadter (1941), and J. J. Gibson (1979). To the extent that they were faithful to the tenets of neorealism, these scholars took the position that "consciousness," "purpose," and other mental terms referred to things in a real world. Philosophical behaviorism is identified primarily with the philosophy of Gilbert Ryle (1949). Ryle took the position that hidden in our usage of such mental terms as "thinking" and "wanting" is confusion about levels of analysis. Although we often take such terms as referring to some mysterious and unknown something "inside" the organism, Ryle believed that we are actually referring to organizations of behavior. Although these two influences might seem to be divergent -- a form of realism and a form of ordinary language philosophy -- they share broadly the idea that terms such as "motive" and "belief" are best understood as referring to patterns of behavioral organization, not to hidden "inner" behavioral causes.

So, on the construal of motivational explanation here advanced, to say "Jones wanted to remain dry" is not to refer to a *cause* of Jones's behavior, but rather to a fact about the *organization* of Jones's behavior -- namely, that, when getting wet is a possibility, Jones does the sorts of things (things he normally avoids doing in fine weather) that will keep him dry. This dry-keeping property of Jones's behavior subsumes not only the fact that he carries an umbrella when rain threatens but also the fact that he crosses the street when he sees a sprinkler spraying the sidewalk and the fact that, on days that he has forgotten his umbrella, he delays his walk home or takes a taxi cab. Of course, there are obviously exceptions to this general rule about Jones's behavior -- as, for example, when he is wearing his bathing suit or about to take a shower; but each of these exceptions is itself subsumed under generalizations about the organization of Jones's behavior -- for example, generalizations about his fondness for swimming or his desire to be tidy. These too are part of the overall design of Jones's behavior.

We would use the same method to reconstrue references to "belief." In the version of motivational explanation suggested above, Jones's belief that an umbrella will keep him dry can be understood to refer to certain organizational (or design)

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features of his behavior, such as the fact that he carries an umbrella when rain threatens but does not carry an umbrella into the shower. Jones's belief that rain is likely can be understood to refer to such features of his behavior as the fact that he is carrying an umbrella today and also the fact that he turns off his automatic lawn sprinkler and puts away his lawn furniture before he sets off to work.

The possibility of construing statements about motivations and beliefs as covering laws, rather than as specifications of causal antecedents, may be obscured by the often elliptical way in which we deploy motivational explanations in ordinary discourse. Asked why Jones carried an umbrella today, we may supply only the antecedent, "because rain was forecast," while taking it for granted that our interlocutor knows that Jones wants to stay dry. Or we may supply only the covering law, "because Jones wanted to remain dry," while taking it for granted that our interlocutor knows that rain was forecast. But neither of these abbreviated explanations is complete. An adequate explanation of Jones's umbrella carrying provides both the antecedent conditions and the covering laws. When both of these are explicitly stated, it seems quite natural to view the statement regarding Jones's motivation as a generalization about the dry-keeping design implicit in his various behaviors with respect to water.

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