I. L. HUMBERSTONE

HEMPEL MEETS WASON

ABSTRACT. The adverse reaction to Hempel's 'ravens paradox' embodied in giving it that description is compared with the usual reaction (universally regarded as incorrect) of experimental subjects to the Wason selection task.

1. HEMPEL

The most famous anomaly uncovered by the discussion in Hempel (1945) of (non-quantitative) confirmation was what is often called the 'Ravens Paradox', which arises in the following way. We first note the great plausibility of the following two conditions on any account of the concept of confirmation. First, the Nicod-derived Condition: that a hypothesis to the effect that every *F* is *G* is confirmed by the existence of any object which is both *F* and *G*. Secondly, the Equivalence Condition: that whatever confirms any hypothesis confirms any logically equivalent hypothesis. The first condition is derived from a proposed analysis by Jean Nicod which can be interpreted as deeming its satisfaction to be both necessary and sufficient for the confirmation of a hypothesis by an observation. It is a natural component of a tripartite proposal, according to which an object's being both *F* and *G* provides a confirming instance for the hypothesis that every *F* is *G*, an object's being *F* and not *G*, a disconfirming instance for (a counterexample to) that hypothesis, while an object which is not even *F* in the first place is confirmationally neutral with respect to the hypothesis. Whatever we may think of this proposal, the Equivalence Condition itself is reasonable because whether or not a hypothesis is confirmed by an observation should depend on the content of the hypothesis and not on the way it happens to be formulated.

Hempel found a prima facie unacceptable consequence of this plausible pair of conditions, noting that the hypotheses H_1 and H_2 are logically equivalent:

(H_1) All ravens are black
(H_2) All non-black things are non-ravens.

Erkenntnis **41**: 391–402, 1994.

Thus by the Nicod-derived Condition not only does the observation of a raven which is black confirm H_1 (well and good), but the observation of a non-black thing which is not a raven – for example a white swan, or a red pencil – also confirms H_2. Now by the Equivalence Condition, since H_1 and H_2 are equivalent, the latter observations must also count as confirming H_1. And here we get our anomaly: it seems grossly counterintuitive to suppose that the observation of a red pencil (say) should provide any confirmation for the hypothesis that all ravens are black. (Further anomalies, with which we shall not be concerned, were also uncovered in Hempel (1945); see also Horwich (1978).) Nor are we concerned here with Hempel's own positive theory of confirmation.) Another aspect of the anomaly arises over the tripartite aspect of the 'natural' view, mentioned above: any observation of a non-raven is supposedly confirmationally neutral with respect to H_1, whereas the reformulation in H_2 counts all such observations as either confirmatory or disconfirmatory. (It is this aspect of the account sketched in the preceding paragraph, rather than the Nicod-derived Condition or the Equivalence Condition, that Hempel rejects.)

The above summary is vague about the relata of the confirmation relation. The *confirmandum* is a hypothesis – in the cases of interest here, a hypothesis to the effect that one class is included in another – and a hypothesis we may take to be either a sentence or the proposition expressed by a sentence. The choice here comes to nothing if we identify the propositions expressed by logically equivalent sentences and endorse the Equivalence Condition. The *confirmans is* – what? Again a sentence ('*a* is *F* and *G*') or the proposition thereby expressed? We spoke of the observation of a black raven as confirming the hypothesis that all ravens are black. But, if this is the lead to follow, is what is meant the *act* of observation, or *what* is observed, that does the confirming? And if the latter, is this to be taken as the state of affairs observed (some raven's being black), or more concretely, as the black raven itself?

For present purposes, we take as primary the observation of, e.g., a black raven as what confirms the hypothesis, understanding by this the act of observation coupled with the recognition that it is indeed the observation of a black raven. (Thus even if all and only *D*s are *E*s, the observation of a *D* need not be, in the intended sense, the observation of an *E*.) Talk of a black raven as confirming or disconfirming a hypothesis is to be understood as elliptical for talk of the observation of a black raven. In Section 4 below, we will make use of an ad hoc notation for marking a more finely individuated *confirmans*, and distinguish between the observation of a black_1 raven_2 and the observation of a black_2 raven_1. (Roughly, this is because of contexts in which what matters is not: what knowledge is possessed after making an observation, but: how knowledge is increased by making it.)

Hempel's discussion of the material summarized above presents H_1 and H_2 in more regimented form, as (minor notational changes aside):

(H_1') $\forall x(\text{Raven}(x) \rightarrow \text{Black}(x))$
(H_2') $\forall x({\sim}\text{Black}(x) \rightarrow {\sim}\text{Raven}(x))$

and, for continuity with the discussion below, we should note also the following 'vernacular' presentations:

(H_1'') If something is a raven, it is black
(H_2'') If something is not black, it is not a raven.

Hempel's discussion makes a strong case for not fussing, in the present context, about such differences as there may be between, e.g., H_1, H_1', and H_1'', and various other representations, and we follow his example. (Likewise in respect of considering 'non-classical' interpretations of the conditional constructions in H_1', H_1'', etc.; compare note 3 below.)

2. WASON

One of the most extensively discussed experiments in cognitive psychology involves performance on the 'Wason selection task', originally reported by Wason (1966); the following quotation is from Johnson-Laird and Wason (1977):

> You are presented with four cards showing, respectively, 'A', 'D', '4', '7', and you know from previous experience that every card, of which these are a subset, has a letter on one side and a number on the other side. You are then given this rule about the four cards in front of you: 'If a card has a vowel on one side, then it has an even number on the other side'.
>
> Next you are told: 'Your task is to say which of the cards you need to turn over in order to find out whether the rule is true or false.'
>
> The most frequent answers are 'A and 4' and 'Only A'. They are both wrong. The right answer is 'A and 7', because if these two stimuli were to occur on the same card, then the rule would be false but otherwise it would be true. Very few highly intelligent S[ubject]s get the answer right spontaneously; some take a considerable time to grasp it;

a small minority even dispute its correctness, or at least remain puzzled by it . . . . (p. 143f)

Except for one point, this is a good summary of the data, and the discussion in the psychological literature takes up the question of what model of the cognitive processes involved best explains these data. (See e.g., Evans (1982, Chaps. 9, 11), Johnson-Laird and Wason (1977, pp. 75–81); the latter discussion contains extensive bibliographical references.) There have also been philosophical qualms about the use of such data to impute irrationality to the experimental subjects, which receive their best-known airing in Cohen (1981). The dubious point in the passage quoted above is the reason given for the correctness of the (indeed correct) answer 'A and 7', namely, 'because if these two stimuli were to occur on the same card, then the rule would be false but otherwise it would be true.' The claim in question – what the authors call the 'rule' – would of course be false even if no A and 7 appeared on the same card, as long as the A-uppermost card had *any* odd number on the back, or the 7-uppermost card had *any* vowel on the back. (The same mistake is made in the discussion of a variant form of the experiment by Johnson-Laird and Byrne (1991, p. 75).)

The main points to bear in mind are *what* the correct answer is – which cards in fact need to be selected for turning over – and *how* (and how frequently) subjects select incorrectly. In particular, the erroneous 'A only' response involves an error of omission (the need to turn over 7 being overlooked), while the other common response, 'A and 4', involves this as well as an error of commission (selecting 4 unnecessarily: recall the wording, '. . . which cards you need to turn over . . .').

3. CONNECTIONS

To make the connection between the Wason selection task and Hempel's 'Ravens Paradox', imagine that the experimenter's cards have been thoroughly inspected by the subjects, and found each to have the name of a bird on one side and of a (not necessarily chromatic) colour on the other. Four are drawn at random and placed on the table, showing *Raven*, *Swan*, *White* and *Black*. The hypothesis to be tested is then what we shall call H_3'' (by analogy with H_1'' and H_2'' above[1]):

(H_3'') If a card has 'Raven' on one side then it has 'Black' on the other and, as before, the subjects are asked which cards need to be turned over in order to test whether this hypothesis is correct, understood as restricted in application to the four cards on the table. The usual explanatory remarks are to be made, such as that 'one side' is not intended to pick out the side which has been dealt uppermost (i.e., read 'one' in H_3'' is to be read as 'either'), and that only cards which really need to be turned over are to be selected – not just any old cards from the turning over of all of which a verdict can be returned.

The correct selection is of course the selection of the card showing 'Raven' and the card showing 'White', and the responses corresponding to the frequent but incorrect selections 'A and 4' and 'Only A' in the A-D-4–7 draw from the letters-and-numbers pack are here '*Raven* and *Black*' and 'Only *Raven*'. We can think of the difficulty people have in seeing that the card showing '*White*' needs to be turned over as analogous to the counterintuitiveness of thinking that the observation of a white swan (or any other non-black non-raven) could count as confirming the hypothesis that all ravens are black. Without entering into detailed speculation, we may well suppose that the ability to make contraposition inferences is not readily activated in contemplating the Wason selection task (as Cohen (1981, p. 323f) and others have surmised) and is discounted in contemplation of the case of the ravens. (Here we take 'contraposition' to cover the relation not only between H_1'' and H_2'' but also H_1' and H_2', as well as between H_1 and H_2.) This analogy between the popular response that the Ravens Paradox is indeed paradoxical and the widespread poor performance on the Wason selection task will occupy us for the remainder of this note. More specifically, the point of analogy is with poor performance in respect of what we dubbed errors of omission in the selection task, since the worry about confirmation and the ravens has always been that the Nicod-derived condition and the Equivalence Condition are *overgenerous* in discerning cases of confirmation. (Cohen suggests that while the omissive errors in Wason's task are due to failures to contrapose, commissive errors are due to the independently attested proneness to 'illicit conversion'.) As will become evident in the following section, the Wason selection task is more precisely analogous to seeking confirmatory and disconfirmatory observations against a background of partial prior knowledge, though we can make a beginning here before explicitly distinguishing the between the two epistemic stages involved.

To make the Wason selection task with birds-and-colours cards closer in subject matter to the original question of assessing the hypothesis that all ravens are black, we may suppose that the cards in the experimenter's deck are the records of observations by ornithologists: the ornithologist on finding a bird of a given type and colour records the type one side of a card and the colour on the other. (We suppose that the colour terms chosen are mutually exclusive, and similarly for the terms for types of birds; we also set aside the possibility of erroneous observations or erroneous transcriptions of those observations.) Now what is being asked for in the birds-and-colours selection task, when subjects are asked which cards need to be turned over to decide on the correctness of H_3'' is equivalent to asking which cards need to be turned over to decide the correctness of H_1'' – alias H_1, H_1' – insofar as it applies to the four birds whose observation is recorded by the cards which have been dealt and whose exposed faces read *Raven*, *Swan*, *White* and *Black*.

This restriction to the birds whose records have been dealt distinguishes the task from the original problem of deciding what confirms the unrestrictedly universal hypothesis about all ravens being black, since a definitive verdict either way – the hypothesis is true/the hypothesis is false – is available on inspection of both sides of the cards, whereas in the unrestricted case the available observations afford at best a definitive negative verdict on the hypothesis (a consideration stressed especially in Popper's work). The analogue of this feature of testing a universal hypothesis in the original Wason selection task would be to have the subjects choose which of the four cards needs to be turned over when the claim to be tested concerns not just the four cards dealt – call this 'Test α' – but all the cards in the pack from which they were dealt – call this 'Test β'. (It is not necessary to make the pack infinite to bring out the point.) Thus the claim, hypothesis, or 'rule', to be tested by turning over a selection of the four cards dealt is: 'If any card in the deck has a vowel on one side, then it has an even number on the other side'. It would be misleading to continue as in Task α, by telling the subjects (in the style of the earlier-quoted instructions): 'Your task is to say which of the four cards you need to turn over in order to find out whether the rule is true or false', since this suggests that a suitable selection might reveal the claim to be true whereas the only thing conclusively establishable by even an optimal selection would be that the claim was false. For this new 'Popper–Wason' selection task, Test β, a better wording might run: 'Your task is to say which of the four cards you need to turn over in order to have any chance of discovering the hypothesis to be false'. Though presumably there is no experimental evidence on this, it is hard to believe intelligent subjects would not make the same mistakes as on the original Wason selection task.

4. AN EXPLICITLY TWO-STAGE ANALYSIS

Now that we have injected this Popperian note, we should also observe that the talk of confirmation is not essential to the Ravens Paradox, and those who have ideological objections to such talk (e.g., because of connotations of inductive support – not at all to the point here) can substitute their preferred idiom: to the extent that people are worried at the prospect of confirming H_1 by the observation of a white swan, they are equally worried at the suggestion that any such observation should have the power to *corroborate* H_1. The 'any' in this last sentence creates an ambiguity, as between, on the one hand, whether the apparent paradoxicality of the Ravens Paradox is taken to reside in the oddity of supposing

(1) that some observation of a white swan confirms or corroborates H_1,

and, on other hand, whether the perceived oddity is taken to reside in the oddity of supposing (as the Nicod-derived Condition dictates)

(2) that every observation of a white swan confirms or corroborates H_1.

This distinction is brought out in Watkins' theory of corroboration (Watkins 1984, p. 317), in exposition of which he contrasts his own theory with Hempel's positive theory (which agrees in this respect with the deliverances of the Nicod-derived condition) by noting that while on Hempel's account "anything that is F and G is a confirming instance" (of the hypothesis that every F is G), on his own account "something that is F and G may provide corroborating evidence". The idea behind this 'may' is that it depends on whether the observation of something both F and G comes up in the course of a genuine test of the hypothesis – as opposed to being disclosed in the course of an examination restricted to objects already known to be G. (See the discussion of Bacon's shipwreck example in Watkins (1984, p. 318); Watkins' own account involves various refinements and distinctions – strong *vs.* weak corroboration, etc. – which we can ignore for present purposes.) And this means we need to distinguish explicitly between two stages: a prior or 'pre-test' stage and a subsequent 'post-test' stage. Examination of objects known to be G at the prior stage does not provide an epistemic advance when it finds them to be F on passage to the second stage, in respect of the question as to whether all Fs are Gs.

The idea of these spuriously corroborative positive instances can be represented in the framework of Wason's experimental set-up in the following way. Returning to the selection task with the birds-and-colours cards, whether in the Test α or Test β version, we can describe each card by specifying the colour and kind of bird involved, in that order (since the corresponding terms are adjectives and nouns, respectively). Thus one card-type (of which there may be many tokens in the pack) is *White Swan*, for example, and another is *Brown Sparrow*. When certain cards have been dealt, a more refined description is possible – though not available to the experimental subjects. We will append a subscripted '1' to the term describing that side of the card facing up – a datum available at the first (prior) stage, and a '2' to the that on the underside, available as of the second, post-test stage. (It is this latter aspect of the more refined description which is not available to the subjects, of course.) The draw we earlier envisaged was *Raven*, *Swan*, *White* and *Black*, and let us suppose that, in terms of the fuller scheme of description, these cards are respectively:

$$Black_2\ Raven_1,\ White_2\ Swan_1,\ White_1\ Swan_2,\ Black_1\ Raven_2$$

(We could equally well have a more variegated draw, with, say, $White_1$ $Cockatoo_2$ and $Black_1$ $Sparrow_2$ as the last two cards; but the present example serves our expository purposes better.) An act of observation can be construed as the turning over a card. Recall that the pertinent cards to select for observation here are the first and third. So while the observation of – as we may put it – a $Black_2$ $Raven_1$ is pertinent, the observation of a $Black_1$ $Raven_2$ is not. Similarly, while the observation of a $White_1$ $Swan_2$ is very much to the point, there is nothing to be gained in the observation of a $White_2$ $Swan_1$. This is a way of modelling the distinction between positive instances which are corroborative (such as $Black_2$ $Raven_1$) and those which are not (such as $Black_1$ $Raven_2$): only the former had any chance of refuting the hypothesis being tested.[2] Observing a $Black_1$ $Raven_1$ amounts to discovering something (known to be) black to be a raven; observing a *Black*$_2$ *Raven*$_1$ amounts to discovering something which is (known to be) a raven, to be black. Only the latter discovery has – by ruling out some other colour for the raven concerned – any role to play in testing the hypothesis that all ravens are black, for the same reason that only (of the two cards involved) selecting the card which is in fact a *Black*$_2$ *Raven*$_1$ is correct in the birds-and-colours selection task (version α or version β).

For ornithology in the field, as opposed to the second-hand ornithology of the birds-and-colours observation-recording cards, it is perhaps hard to take very seriously the distinction between observing a white$_1$ swan$_2$ and observing a white$_2$ swan$_1$: all you get to see is white$_1$ swans. How could seeing one of those, and knowing that that's what you are seeing, help with testing the hypothesis that all ravens are black? The answer comes from drawing a wedge between seeing one and knowing that you are seeing one. If you see, from a distance, only a part of the surface area of what is clearly some bird or other, and you can see that it is white, then perhaps what you are seeing is indeed a white swan, though you don't know this without further investigation. In this case, such further investigation will issue in what we are calling the observation of a white$_1$ swan$_2$, an observation which is worth making to test the hypothesis about ravens, since for all you knew before making it what you had glimpsed was (say) an albino raven. On the other hand, suppose you see at twilight the silhouette of what is clearly a swan. Is it worth staying till dawn to check on the colour of this swan – which is in fact, as before, white? That would be observing a white$_2$ swan$_1$, and assuming your only interest is in the ravens hypothesis, it is not an observation you should bother to make. It would be making a gratuitous selection in the corresponding Wason task.

Hempel was well aware of the phenomenon we have been discussing here.[3] The following quotation is from Hempel (1945):

> Suppose that in support of the assertion 'All sodium salts burn yellow' somebody were to adduce an experiment in which a piece of pure ice was held in a colorless flame and did not turn the flame yellow. This result would confirm the assertion 'Whatever does not burn yellow is no sodium salt' and consequently, by virtue of the equivalence condition, it would confirm the original formulation. Why does this impress us as paradoxical? The reason becomes clear when we compare the previous situation with the case where an object whose chemical constitution is as yet unknown to us is held into a flame and fails to turn it yellow, and where subsequent analysis reveals it to contain no sodium salt. This outcome, we should no doubt agree, is what was to be expected on the basis of the hypothesis that all sodium salts burn yellow – no matter in which of its various equivalent

formulations it may be expressed; thus the data here constitute confirming evidence for the hypothesis. Now the only difference between the two situations here considered is that in the first case we are told beforehand the test substance is ice, and we happen to "know anyhow" that ice contains no sodium salt; this has the consequence that the outcome of the flame-color test becomes entirely irrelevant for the confirmation of the hypothesis and thus can yield no new evidence for us. (p. 19)

Hempel goes on to say that the relation of confirmation in which he is interested is that that between the observation and the given hypothesis, rather than one which is further relativized to additional prior knowledge – such as (in the case discussed) that the substance concerned is ice. So his question is:

Given some object α (it happens to be a piece of ice, but this fact is not included in the evidence), and given the fact that α does not turn the flame yellow and is no sodium salt: does α then constitute confirming evidence for the hypothesis? And now – no matter whether α is ice or some other substance – it is clear that the answer has to be in the affirmative; and the paradoxes vanish. (p. 20)

On the other hand, the situation facing the subject in the Wason selection task is one in which certain information is given (on the face-up sides of the cards) and the problem is which observations to make in the light of that information. Hence the (no doubt somewhat clumsy) subscripting notation above to mark the difference in epistemic stages.

Thus if the source of apparent paradoxicality in the Ravens Paradox is the idea that not even one observation of a white swan could possibly confirm or corroborate 'All ravens are black' ((1) as opposed to the stronger (2), above), the paradoxicality is indeed merely apparent, since this idea is misconceived. It is the product of the same tendency as we see manifest in experimental subjects on the Wason selection task – the tendency to overlook potential falsifying evidence whose salience is increased by reasoning contrapositively. The oversight which results in not forseeing that the card showing 7 in the (original) Wason selection task is a potential falsifier of the claim that if a card has a vowel on one side then it has an even number on the other, is the same oversight that results in not realizing that a non-black thing is a potential falsifier of the claim that all ravens are black.[4]

Notes

[1] It would be interesting to know what happens on the Wason selection task when explicitly conditional formulations such as H_3'' are replaced by formulations to the effect

that every card which has ___ on one side, has ... on the other (giving what we might call H_3 in the present instance). Experiment 3 of Wason and Green (1984) comes closest to this, but unfortunately also makes other changes from the original selection task. It would also be interesting, as Johnson-Laird and Byrne remark (1991, p. 81), to have experimental evidence on what happens when the 'if' formulation is replaced by an 'only if' formulation (interchanging the protasis and apodosis); these authors conjecture, on the basis of other research into reasoning with *only*, that such a reformulation would "enhance performance". If that conjecture is correct, one would expect similar results for quantificational *only* constructions, and if the parallel suggested in the present note is correct, one would accordingly also expect less resistance to the idea that something which is neither an F nor a G can confirm 'Only Gs are Fs' than to the idea that such an object could confirm 'All Fs are Gs'.

[2] *Warning*: in speaking of the positive instances of a hypothesis, as here, hypotheses must be understood as sentences rather than propositions, since the relation is not invariant under logical equivalence. (Hempel (1946, p. 80); Hanen (1967, pp. 275ff).)

[3] As have been numerous other writers; for examples (originally) published fifty years apart, see von Wright (1957, pp. 125ff.) and Schurz (1991, p. 62). (The discriminatory subscripting we have used is somewhat analogous to the 'asterisk' notation of Horwich (1982, p. 58).) The only novelty claimed for the preceding paragraph, above, lies in connecting such ideas with a consideration of the selection task. Schurz (1991) was replying to the suggestion by Sylvan and Nola (1991) that the Ravens Paradox is a genuine anomaly, to be eliminated by passage to a weak relevant logic in which the required contraposition inferences are outlawed. If the analogy we have been pursuing is correct, the advocates of this reaction might be inclined to deny that what are diagnosed as errors in performance on the selection task deserve that description. The fact that subjects are often readily convinced they have erred would presumably be seen as illustrating the power of brow-beating rather than enlightenment: the subjects have been bullied out of their initial naïve but logically correct responses.

[4] Referees for *Erkenntnis* expressed some doubt that the Wason/Hempel connection had not been made somewhere or other in the literature. The closest I have come – prompted by such suspicions – to finding anything in this vein is McDonald (1992), which discusses a methodological strategy urged by J. R. Platt. On page 270, McDonald makes a parenthetical reference to Wason, and then, on page 273, he does indeed make the point I have been elaborating on: "An assessment of the relative potential of positive and negative tests to produce disconfirmations under certain conditions even provides a simple explanation for the classic *raven paradox*".

References

Cohen, L. J.: 1981, 'Can Human Irrationality be Experimentally Demonstrated?', *Behavioral and Brain Sciences* **4**, 317–331 (peer commentary, ibid., pp. 331–370).

Evans, J. St. B. T.: 1982, *The Psychology of Deductive Reasoning*, Routledge and Kegan Paul, London.

Hanen, M.: 1967, 'Goodman, Wallace, and the Equivalence Condition', *Journal of Philosophy* **64**, 271–280.

Hempel, C. G.: 1945, 'Studies in the Logic of Confirmation', in Hempel (ed.), *Aspects of Scientific Explanation*, Macmillan, New York 1965, pp. 3–51.
Hempel, C. G.: 1946, 'A Note on the Paradoxes of Confirmation', *Mind* **55**, 79–82.
Horwich, P.: 1978, 'A Peculiar Consequence of Nicod's Criterion', *British Journal for the Philosophy of Science* **29**, 263–264.
Horwich, P.: 1982: *Probability and Evidence*, Cambridge University Press, Cambridge.
Johnson-Laird, P. N. and R. M. J. Byrne: 1991, *Deduction*, Lawrence Erlbaum, Hove.
Johnson-Laird, P. N. and P. C. Wason: 1977, 'A Theoretical Analysis of Insight into a Reasoning Task', in P. N. Johnson-Laird and P. C. Wason (eds.), *Thinking: Readings in Cognitive Science*, Cambridge University Press, Cambridge, pp. 143–157, (modified form of a paper originally published in 1970).
McDonald, J.: 1992, 'Is Strong Inference Really Superior to Simple Inference?', *Synthese* **92**, 261–282.
Schurz, G.: 1991, 'Relevant Deductive Inference: Criteria and Logics', in Schurz and Dorn, pp. 57–84.
Schurz, G. and G. J. W. Dorn (eds.): 1991, *Advances in Scientific Philosophy: Essays in Honour of Paul Weingartner*, Rodopi, Amsterdam.
Sylvan, R. and R. Nola: 1991, 'Confirmation Without Paradoxes', in Schurz and Dorn, pp. 5–44.
Wason, P. C. and D. W. Green: 1984, 'Reasoning and Mental Representation', *Quarterly Journal of Experimental Psychology* **36A**, 597–610.
Watkins, J. W. N.: 1984, *Science and Scepticism*, Hutchinson, London.
von Wright, G. H.: 1957, *The Logical Problem of Induction*, 2nd ed., Basil Blackwell, Oxford (1st ed., 1941).

Manuscript submitted November 24, 1993
Final version received September 19, 1994

Department of Philosophy
Monash University
Clayton, Melbourne
Victoria 3168
Australia