On the equivalence of Goodman's and Hempel's paradoxes

Kenneth Boyce

Department of Philosophy, University of Missouri–Columbia, United States

ARTICLE INFO

ABSTRACT

Historically, Nelson Goodman's paradox involving the predicates 'grue' and 'bleen' has been taken to furnish a serious blow to Carl Hempel's theory of confirmation in particular and to purely formal theories of confirmation in general. In this paper, I argue that Goodman's paradox is no more serious of a threat to Hempel's theory of confirmation than is Hempel's own paradox of the ravens. I proceed by developing a suggestion from R. D. Rosenkrantz into an argument for the conclusion that these paradoxes are, in fact, equivalent. My argument, if successful, is of both historical and philosophical interest. Goodman himself maintained that Hempel's theory of confirmation was capable of handling the paradox of the ravens. And Hempel eventually conceded that Goodman's paradox showed that there could be no adequate, purely syntactical theory of confirmation. The conclusion of my argument entails, by contrast, that Hempel's theory of confirmation is incapable of handling Goodman's paradox if and only if it is incapable of handling the paradox of the ravens. It also entails that for any adequate solution to one of these paradoxes, there is a corresponding and equally adequate solution to the other.

When citing this paper, please use the full journal title *Studies in History and Philosophy of Science*

Nevertheless, the difficulty is often slighted because on the surface there seem to be easy ways of dealing with it. Sometimes, for example, the problem is thought to be much like the paradox of the ravens (Nelson Goodman, *Fact, Fiction and Forecast,* p. 75).

Historically, Nelson Goodman's paradox involving the predicates 'grue' and 'bleen' has been taken to furnish a serious blow to Carl Hempel's theory of confirmation in particular and to purely formal theories of confirmation in general. In this paper, I argue that Goodman's paradox is no more serious of a threat to Hempel's theory of confirmation than is Hempel's own paradox of the ravens. I proceed by developing a suggestion from R. D. Rosenkrantz into an argument for the conclusion that these paradoxes are, in fact, equivalent.

If the conclusion of my argument is correct, it is of both historical and philosophical interest. Goodman himself maintained that Hempel's theory of confirmation was capable of handling the paradox of the ravens.[1] And Hempel eventually conceded that Goodman's paradox showed that there could be no adequate, purely syntactical theory of confirmation.[2] The conclusion of my argument entails, by contrast, that Hempel's theory of confirmation is incapable of handling Goodman's paradox if and only if it is incapable of handling the paradox of the ravens. It also entails that for any adequate solution to one of these paradoxes, there is a corresponding and equally adequate solution to the other. At the end of the paper, I test this latter entailment against three historically prominent proposed solutions to Hempel's paradox (one proposed by Quine, one proposed Israel Scheffler, and against Hempel's own proposed solution). I argue that, in each of these cases, the proposed solution to Hempel's paradox succeeds if and only if a corresponding solution to Goodman's paradox does.

1. Background

It will prove useful for what follows to bring into the foreground some of the historical details surrounding Hempel's theory of confirmation and the discussion of the paradoxes of confirmation that arose in connection with it. While much of this will involve

---

[1] See Goodman (1983, pp. 70–72, 75).
[2] Hempel (1965, pp. 50–51).

revisiting old ground, my hope is to highlight those aspects of the historical discussion that are most relevant to the central argument of this paper.

In his "Studies in the Logic of Confirmation," Hempel sets out to provide a formal theory of inductive confirmation, comparable to formal theories of valid deduction.[3] He begins his discussion by criticizing previous attempts to produce formal criteria of confirmation. In particular, he criticizes a condition of confirmation set forward by Jean Nicod. Nicod's condition can be intuitively stated as the condition that universal generalizations are confirmed by their positive instances and disconfirmed by their counterexamples.

A bit more formally, and in Hempel's own words, Nicod's condition states that a hypothesis of the form

$(x)(P(x) \supset Q(x))$...is confirmed by an object a if a is P and Q; and the hypothesis is disconfirmed by a if a is P, but not Q. In other words, an object confirms a universal conditional hypothesis if and only if it satisfies both the antecedent...and the consequent...of the conditional; and...it is neutral, or irrelevant, with respect to the hypothesis if it does not satisfy the antecedent.[4]

Hempel criticizes Nicod's condition on two grounds. First, Hempel notes that "the applicability of this criterion is restricted to hypotheses of universal conditional form," but what we want, according to Hempel, is "a criterion of confirmation which is applicable to hypotheses of any form."[5] Second, Hempel notes that if Nicod's condition is taken as a necessary and sufficient condition for confirmation, it conflicts with another highly intuitive condition of confirmation, one that Hempel refers to as "the equivalence condition." According to the equivalence condition, whatever confirms a hypothesis also confirms whatever statements are logically equivalent to that hypothesis.[6] Now, as Hempel points out, the statement *All ravens are black* is equivalent to the statement *Whatever is not black is not a raven*. But, as Hempel observes, Nicod's condition, taken as a necessary condition for confirmation, entails, for example, that an object that is black and a raven would confirm the former generalization but not the latter.[7]

Although Hempel eschews Nicod's condition as a *necessary* condition for confirmation, however, he does concede that Nicod's condition might plausibly be construed as a *sufficient* condition for confirmation.[8] But so taken, Hempel points out, Nicod's criterion, in combination with the equivalence condition, generates a paradox. As noted above, the statement *All ravens are black* is equivalent to the statement *Whatever is not black is not a raven*. Now, given Nicod's condition, the latter statement is confirmed by anything that is both non-black and a non-raven. And, by the equivalence condition, whatever confirms the latter of the above statements confirms the former of them. From this it follows, as Hempel put it, that "any red pencil, any green leaf, and yellow cow, etc., becomes confirming evidence for the hypothesis that all ravens are black."[9] But it seems wrong that we could learn about the color of ravens without ever observing

a single raven! As Goodman puts the matter, "the prospect of being able to investigate ornithological theories without going out in the rain is so attractive that we know there must be a catch in it."[10]

It is important for Hempel that he offer some solution to the paradox of the ravens, since the theory of confirmation that he himself ends up developing also generates that paradox.[11] The specific details of Hempel's own theory need not concern us, except in two respects (the relevance of which will become apparent later on).

First, Hempel takes the relata of confirmation to be statements (sentences that constitute "observation reports" and sentences that state hypotheses) rather than observed objects and hypotheses or observations and hypotheses.[12] (Sometimes, when discussing Hempel's views, I will speak as if either observations or observed objects serve as one of the terms of Hempel's confirmation relation, but when I do, it should be kept in mind that this is merely a loose manner of speaking). Hempel states that "confirmation as here conceived is a logical relationship between sentences, just as logical consequence is." He goes on to explain that, on this conception of confirmation, just as "whether a sentence S_2 is a consequence of a sentence S_1 does not depend on whether S_1 is true (or known to be true)...analogously, the criteria of whether a given statement...confirms a certain hypothesis cannot depend on whether the statements in the report are true, or based on actual experience, or the like."[13]

Second, Hempel's theory accommodates a condition on confirmation that he refers to as "the special consequence condition." According to the special consequence condition, "if an observation report confirms a hypothesis H, then it also confirms every consequence of H."[14]

Hempel attempts to dissolve the paradox of the ravens, not by denying the paradoxical conclusion, but by trying "to show that the impression of the paradoxical character...is due to misunderstanding and can be dispelled."[15] According to Hempel, the reason that it seems paradoxical to us that observations of non-black, non-ravens confirm the generalization that all ravens are black is because "we are often not actually judging the relation of the given evidence, E alone to the hypothesis H (we fail to observe the 'methodological fiction', characteristic of every case of confirmation, that we have no relevant evidence for H other than that included in E)."[16] Hempel argues, for example, that if we are testing the hypothesis that sodium salt burns yellow, and we happen to have at our disposal the prior information that the particular substance we are about to burn is ice and that ice contains no sodium salt, then "of course, the outcome of the experiment can add no strength to the hypothesis under consideration." But, Hempel also argues, in the absence of such background information, discovering that a particular substance that did not turn the flame yellow is not sodium salt does confirm that hypothesis.[17] Although Hempel does not spell it out explicitly, presumably we are to accept a parallel solution to the raven paradox: If we already know beforehand that an object is a non-raven, then discovering that it is not black adds no support to

---

[3] Hempel (1945a, pp. 2–3).
[4] Hempel (1945a, p. 10).
[5] Hempel (1945a, pp. 10–11).
[6] Hempel (1945a, p. 12).
[7] Hempel (1945a, p. 11).
[8] See Hempel (1945a, p. 13). Although Hempel insists, for certain technical reasons, that Nicod's condition can only be taken as providing a sufficient condition for confirmation "if we restrict ourselves to universal conditional hypotheses in one variable". See his note 1 on the same page for why he regards this restriction as essential.
[9] Hempel (1945a, p. 14).
[10] Goodman (1983, p. 70).
[11] Hempel (1945b, pp. 108–110).
[12] See Hempel (1945a, pp. 22–26). In this article, Hempel appears to use the term 'sentence' and the term 'statement' interchangeably. I will do the same.
[13] Hempel (1945a, p. 25).
[14] Hempel (1945b, p. 103).
[15] Hempel (1945a, p. 15).
[16] Hempel (1945a, p. 20).
[17] Hempel (1945a, pp. 19–20).