# On Hetherington's Solution of the Goodman Paradox

NATHAN STEMMER

The Goodman paradox, which arises in the context of inductive reasoning, presents us with the problem of describing the hypotheses that are 'confirmed by their positive instances'.[1] That this is not an easy task can be shown by the predicate 'grue' which applies to things examined before *t* just in case they are green or to other things just in case they are blue. Although both 'green' and 'grue' can be used for describing positive instances of hypotheses, they differ with respect to confirmation. Thus, as Goodman observes, all emeralds examined before time *t* are green, and this 'confirms the prediction that the next one will be green. But also, all those examined are grue, and this … does not confirm the prediction that the next one will be grue'.[2]

## 1. Hetherington's Solution

In a recent paper, Stephen Hetherington[3] deals with Goodman's problem by concentrating on the psychological nature of the evidence on which inductive reasoning is based. To this effect, Hetherington turns to Hume's views on this reasoning according to which inductive arguments are arguments from observed instances—the evidence—to unobserved instances of empirical predicates. More specifically, they are 'predictive arguments from evidence reporting an epistemic subject *S's experiences,* her *observations'*.[4] Hetherington then distinguishes between experience-*of* and experience-*as,* and this distinction implies that a subject's experience could be *of* an emerald *e*'s being green 'without her experiencing *e as* being green' … and, *a fortiori*… 'without her

[1] N. Goodman, *Fact, Fiction, and Forecas*t (Indianapolis: Bobbs-Merril, 1965), 81.

[2] Op. cit., 82.

[3] S. Hetherington, 'Why there need not be any Grue Problem about Inductive Inference as such', *Philosophy* 76 (2001), 127–36.

[4] Op. cit., 128, original italics.

doi:10.1017/S0031819104000488 ©2004 The Royal Institute of Philosophy



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

experiencing *e as* being grue'.[5] In particular, whether the subject will infer from the observation of emerald *e* the hypothesis 'All emeralds are green' or rather 'All emeralds are grue' will depend on whether the subject experiences *e as* green or rather *as* grue. And this will depend on the psychological nature of the subject. Thus, 'if some particular *S* has a constant consciousness of the passage of time, then experiencing *e* as grue may be more natural for her than experiencing it as green would be'.[6] Since the hypothesis that a subject infers from a particular evidence depends on how she experiences the evidence, Hetherington thus avoids the paradox of having to conclude that, for a particular subject, a green emerald may be evidence for both: 'All emeralds are green' and 'All emeralds are grue'. And the underlying idea is that normal people experience a green emerald as green rather than grue. This then accounts for the fact that, for normal people, the observation of a green emerald 'confirms the prediction that the next one will be green [while it] does not confirm the prediction that the next one will be grue'.[7]

## 2. The Reliability Phenomenon

Hetherington thus gives a correct solution to Goodman's problem. But there is a further phenomenon in connection with inductive reasoning that should receive our attention, and although it is an important phenomenon, neither Goodman nor Hetherington have examined it. This phenomenon is the remarkable reliability of the inductive inferences that conform to Hetherington's criterion (as applied to normal people). For example, as far as we know, the inference of the hypothesis 'All emeralds are green' from the observation of a number of green emeralds has indeed been highly reliable, as has been the inference of 'All candle flames are hot' from the observation of a hot candle flame, to mention one of Hume's examples. This reliability is even more remarkable if we consider that the inferences that agree with the criterion were often made by young children, i.e., by people who did not consult background knowledge for inferring the hypotheses, and were often based on the observation of very few positive instances.

In the following, I will complement Hetherington's account by dealing with this reliability phenomenon. And what will probably come as a surprise to many, we will see that David Hume gave

[5] Op. cit., 130.
[6] Op. cit., 133.
[7] N. Goodman, *Fact, Fiction, and Forecas*t, 82.



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

already a plausible explanation of this reliability. Moreover, we will also see that a very similar explanation of the reliability has lately been given by a number of naturalistic philosophers who, however, did not realize that Hume had preceded them with his explanation.

## 3. Psychological Similarities

In order to present Hume's explanation, it will be useful to describe in somewhat more detail Hume's views on inductive inferences. Hume treats these inferences as the acquisition of expectations upon the observation of contiguous events. He states, for example: 'When I found that such an object has always been attended with such an effect' then 'I foresee that other objects which are in appearance similar will be attended with similar effects',[8] or: 'From causes which appear similar, we expect similar effects'.[9] Hume also gives an example that illustrates this psychological process: 'When a child has felt the sensation of pain from touching the flame of a candle, he will be careful not to put his hand near any candle; but will expect a similar effect from a cause which is similar in its sensible qualities and appearance'.[10]

We notice that Hume uses the notion of similarity for describing the expectations that derive from the observation of contiguous events. Thus he speaks of an expectation about objects that are in appearance *similar* to the original object, and he describes the expected effects as *similar* effects. It follows that according to Hume the extrapolations from the observed instances are not arbitrary; rather, they concern entities that are *similar* to the original instances. But which is the similarity notion that Hume has in mind? Clearly, it is not an unrestricted notion such as the notion described later by Charles Peirce: 'When we take all the characters into account, any pair of objects resemble one another in just as many particulars as any other pair'.[11] Rather, the similarity to which Hume is referring is a highly restricted similarity, since he attributes the disposition to acquire these expectations to an 'instinct or mechanical tendency'.[12] Hume's similarity is therefore the *specific* similarity that governs

[8] D. Hume, *An Enquiry concerning Human Understanding* (Oxford: Clarendon Press, 1975), 34.

[9] Op. cit., 36.

[10] Op. cit., 39.

[11] C. S. Peirce, 'The Order of Nature', *Essays in the Philosophy of Science,* V. Thomas (ed.) (Indianapolis: Bobbs-Merrill, 1975), 116.

[12] D. Hume, *An Enquiry concerning Human Understanding*, 55.



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

our innately determined extrapolations, the extrapolations that derive from our generalization instinct. This similarity has been investigated in experiments on stimulus generalization with naïve organisms,[13] and these experiments give us instrumentally defined similarity relations. (Quine calls the similarities that are mapped in the experiments *perceptual* similarities.)[14] And the experiments show that the similarity relations that govern the generalizations of naïve persons determine extrapolations that are intuitively valid, such as from green emeralds to other green emeralds or from black ravens to other black ravens. On the other hand, none of the experiments shows counterintuitive extrapolations as from green emeralds to grue emeralds or from non-ravens, e.g., white shoes, to other non-ravens, e.g., green emeralds.

This restricted interpretation of Hume's notion of similarity, which is based on his conclusion that our inductive inferences derive from an instinct, is also supported by Hume's frequent qualifications of the notion in psychological terms. Thus when he describes the extrapolation from certain objects to other objects he describes them as 'objects which are in *appearance* similar' to the original ones.[15] And in the example of the candle, Hume notices that the child will expect a similar effect from a cause that is similar in its *sensible qualities* and appearance. Here Hume states that the similarity is based on sensible qualities, and it is clear that similarities such as those that hold between candles and other non-ravens or between green emeralds and grue emeralds are not based on the sensible qualities Hume has in mind.

If we now use Hume's similarity notion for describing the hypotheses inferred in inductive inferences then, instead of using the notions of experience-*of* and experience-*as,* we can express Hetherington's solution of the Goodman paradox in the following way. It depends on the subject's psychology whether emerald *e* appears to be similar to green objects or rather to grue objects. In the former case, the subject will infer 'All emeralds are green' from the observation of emerald *e,* while in the latter case, e.g., if the subject 'has a constant consciousness of the passage of time', the inferred hypothesis might be 'All emeralds are grue'. By distinguishing between different feelings of similarity we can thus

[13] See, e.g., A. C. Catania, *Learning* (Upper Saddle River: Prentice Hall, 1998), 135–9 and S. Walker, *Animal Learning: An Introduction* (London: Routledge & Kegan Paul, 1987), 255–60.

[14] W. V. Quine, *The Roots of Reference*. (La Salle, IL: Open Court, 1974), 16–20.

[15] D. Hume, *An Enquiry concerning Human Understanding*, 34, my italics.



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

express Hetherington's solution of the Goodman paradox in Hume's terminology. And generalization experiments support the conclusion that the similarity feelings of normal persons induce them to expect emeralds to be green rather than grue, if they observe a green emerald. This then accounts for the fact that, for normal people, the observation of a green emerald 'confirms the prediction that the next one will be green [while it] does not confirm the prediction that the next one will be grue'.[16] (The fact that Hume's similarity notion can be instrumentally defined, while this is more difficult for Hetherington's notions of experience-*of* and experience-*as,* points to an advantage of Hume's method for selecting the hypotheses that are 'confirmed by their instances'.)

## 4. The Reliability Phenomenon Again

Let me now turn to the reliability of the inferences that agree with Hetherington's criterion—in Hume's terminology, the reliability of the extrapolations that agree with his restricted notion of similarity. How does Hume explain this reliability? In agreement with his naturalistic approach, he does it with the help of a plausible scientific theory. He first notices, as we have seen already, that the extrapolations derive from an instinct, and this instinct can even be detected in animals, as when a 'creature expects from the present object the same consequences which it has always found in its observation to result from similar objects'.[17] In a second stage, Hume notices the usefulness of instinctive behaviour. He remarks, for example, that it is an instinct 'which teaches a bird, with such exactness, the art of incubation and the whole economy and order of its nursery'.[18] Finally, he proposes an empirical hypothesis which explains why our elementary inductive inferences, the inferences that derive from a useful instinct, are [almost] 'infallible':

> As nature has taught us the use of our limbs without giving us the knowledge of the muscles and nerves by which they are actuated, so has she implanted in us an instinct which carries forward the thought [the operation of the mind by which we infer like effects from like causes] in a correspondent course to that which she has established among external objects.[19]

[16] N. Goodman, *Fact, Fiction, and Forecas*t, 82.
[17] D. Hume, *An Enquiry concerning Human Understanding*, 106.
[18] D. Hume, *An Enquiry concerning Human Understanding*, 108.
[19] D. Hume, *An Enquiry concerning Human Understanding*, 55.



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

Hume attributes here to nature the disposition which enables us to extrapolate in such a manner that it corresponds to what occurs in the external world or, as Hume states a couple of lines earlier, he conjectures that 'the ordinary wisdom of nature' has created 'a kind of pre-established harmony between the course of nature and the succession of our ideas ... the operation of the mind by which we infer like effects from like causes'.[20] And Hume's hypothesis, which explains the high degree of reliability of the similarity-based extrapolations, is supported by the fact that other dispositions implanted by nature have been successful, such as the [successful] use of our limbs.

Hume's explanation of the reliability of our inductive extrapolations has been largely ignored. But lately some philosophers have given a similar explanation of the reliability of these extrapolations; however, since they were already acquainted with Darwin's theory, they attributed the reliability to natural selection rather than to the wisdom of nature.[21] But Hume's explanation was probably the best that could be formulated in his time.[22]

It is interesting to note that in one of his latest publications, W. V. Quine, too, appeals to a pre-established harmony in order to explain the reliability of the extrapolations: 'What we have is ... a pre-established harmony between standards of perceptual similarity and the environment'.[23] This harmony is accounted for by natural selection because:

> Successful expectation has always had survival value, notably in the elusion of predators and the capture of prey. Natural

[20] D. Hume, *An Enquiry concerning Human Understanding*, 54–5.

[21] See, e.g., P. Gardenfors, 'Induction, Conceptual Spaces and AI'. *Philosophy of Science* 57, (1990), 78-95; W. V. Quine, 'Natural Kinds', *Ontological Relativity and other Essays,* W. V, Quine (ed.) (New York: Columbia University Press, 1969), 114–38; W. V Quine and J. S. Ullian, *The Web of Belief* (New York: Random House, 1970), 57-58; N. Stemmer, 'The Objective Confirmation of Hypotheses', *Canadian Journal of Philosophy* 11 (1981), 395–404.

[22] Natural selection supports only the conclusion that the inferences *have* been reliable, since evolutionary theory can only tell us something about the past. This point bears on those solutions of the Goodman paradox that intend to justify our elementary inductive inferences with the help of evolutionary theory. But I will not enter into this topic; it is discussed among others in N. Goodman, *Problems and Projects*. (Indianapolis: Bobbs-Merrill, 1972), 358 and N. Stemmer, 'A Partial Solution to the Goodman Paradox', *Philosophical Studies* 34 (1978), 177–85.

[23] W.V. Quine, 'Progress on two Fronts', *The Journal of Philosophy* 93 (1996), 160–1.



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press

> selection has accordingly favoured innate standards of perceptual similarity which have tended to harmonize with trends in the environment.[24]

Since Quine's 'trends in the environment' expresses the same as Hume's 'course of nature', Quine's harmony hypothesis differs very little from Hume's harmony conjecture.

## 5. Conclusions

Hetherington's proposal gives us a correct criterion for selecting the hypotheses that are confirmed by their instances, and so does Hume's proposal. But Hume takes us a step further. He also proposes a plausible scientific theory that explains the frequent reliability of these hypotheses. And with this step, Hume directly connects with the conclusions on inductive reasoning of some recent naturalistic philosophers.[25]

*Beth David Institute, Jerusalem*

[24] Op. cit., 161.

[25] I am indebted to Max Hocutt for helpful comments on an earlier version of this paper. E-mail for correspondence: nstemmer@netvision.net.il



https://doi.org/10.1017/S0031819104000488 Published online by Cambridge University Press