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Natural Necessity and Induction

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In 'Induction Justified (But Just Barely)', *Philosophy* **58,** No. 226 (October 1983), R. W. Clark ingeniously uses Humean scepticism as the foundation for a probabilistic justification of induction: 'On the supposition that Hume's sceptical arguments have not been met, the empirical world is a place where ... all the glue has been removed. ... We have a field of distinct events having no logical or evidential ties to one another ... an ideal setting for the calculation of *a priori* probabilities' (p. 481). Clark's method is to argue that observed constant conjunctions of events provide strong evidence that those events are governed by natural necessities, since invariable regularities would be *a priori* immensely improbable were they not so governed. He points out the difficulty of knowing *which* natural necessities actually obtain, since we will never know in any particular case that we have taken account of all the relevant factors, and he draws the conclusion that a 'strong' justification of induction (showing that some inductive arguments establish that their conclusions are probable) is impossible. He goes on to claim, however, that the non-specific knowledge *that events are governed by some natural necessity or other* is sufficient to yield a 'weak' justification of induction, in other words to show that the conclusions of some inductive arguments are more probably true than others. 'Hence, there can be progress in science' (p. 485).

Clark's approach is subject to four main objections. First, his determination of *a priori* probabilities (pp. 481–483) seems to rely on the Principle of Indifference, to which there are well-known objections which cannot be circumvented simply by his stipulation that it be confined to cases 'where relevant empirical knowledge could not be obtained' (p. 482). Suppose that A and B are independent contingent statements of whose truth or falsehood we have and can have no empirical knowledge: it might seem tempting to argue that in the absence of such knowledge both A and B have a probability of ½, since for all we know each of them is just as likely to be true as false. It is equally plausible, however, to argue that the probability of the statement (A & B) is ½, likewise the statement (A & not B), and for the same reason. But these last two judgments have the consequence that the probability of A is 1, contradicting the previous conclusion that it is ½. Indeed, a parallel argument involving the statements (not A & B) and (not A & not B) would conflict with both of these, giving the probability of A as zero!

Such difficulties do not arise only with compound statements, for the Principle of Indifference is vulnerable to this sort of objection even when considering the value of a mathematical constant within a known numerical range. Suppose we know that N lies somewhere between ½ and 2, but have no other relevant information. Then since the range between ½ and 2 can be divided into three equal parts, of which two are greater than 1 and the other less than 1, the Principle of Indifference would yield the conclusion that N is twice as likely to be greater than 1 as it is to be less than 1. The problem is that N's reciprocal R also lies within the same range, and so should be subject to the same kind of reasoning. But it is contradictory to claim that both N and R are probably greater than 1, since if any number is greater than 1, its reciprocal will be less than 1.

If the Principle of Indifference is to be defended against criticisms of this type, it would seem that some criterion must be given for distinguishing those cases to which it may legitimately be applied from those to which it may not. This need not detain us here, since for present purposes it is sufficient merely to note the untenability of Clark's claim that 'until we have overcome Humean scepticism, all events that are not directly perceived are "equally possible" if they are logically possible' (p. 483).

Clark's argument for the existence of natural necessities is essentially an inverse probability argument, and this gives rise to a second and more technical difficulty. Constant regularities would, he says, be most unlikely to occur were there no natural necessity, whereas natural necessity would make them probable. Since we do in fact observe such regularities, this observation confirms the hypothesis that natural necessities are in operation.

Now inverse probability arguments rely on Bayes' theorem, which states that the probability of some hypothesis H *after* the observation of a piece of evidence E is equal to the initial probability of both hypothesis and evidence divided by the initial probability of the evidence. The initial probability of both hypothesis and evidence is itself equal to the initial probability of the hypothesis multiplied by the conditional probability of the evidence given that the hypothesis is true. Thus we have:

Probability (H given E) =

$$\text{Initial Probability (H)} \times \frac{\text{Probability (E given H)}}{\text{Initial Probability (E)}}$$

It follows from this that Clark's argument cannot get started without some consideration of the initial probability of his natural necessity hypothesis (H), that is to say its probability *in advance of* the observation of regularities (E). These regularities certainly might seem to provide confirming evidence, in that the probability of (E given H) is apparently greater than the initial probability of E,[1] so that the fraction on the right-hand side of the above equation is greater than 1. But this in itself tells us nothing about the probability of (H given E) unless we have some way of determining the initial probability of H to start with. If the Principle of Indifference is suspect, then this obstacle might appear to be insurmountable.

Clark could reply in either of two ways. First, just as the probability of (E and H) is equal to the initial probability of H multiplied by the probability of (E given H), so the probability of (E and not H) is equal to the initial probability of (not H) multiplied by the probability of (E given not H). Combining these:

$$\begin{aligned}\text{Initial Probability (E)} &= \text{Probability (E and H)} \\ &\quad + \text{Probability (E and not H)} \\ &= \text{P(H)} \times \text{P(E given H)} \\ &\quad + \text{P(not H)} \times \text{P(E given not H)}\end{aligned}$$

And substituting this result into Bayes' formula:

$$\text{P(H given E)} = \frac{\text{P(H)} \times \text{P(E given H)}}{\text{P(H)} \times \text{P(E given H)} + \text{P(not H)} \times \text{P(E given not H)}}$$

This reformulation makes it clear that *if* the probability of (E given not H) is negligible compared with the other factors involved, in particular the initial probability of H, *then* the probability of (H given E) will approach 1, since the denominator of the right-hand side will reduce to the numerator. Thus Clark is spared the task of justifying an initial probability for H, the hypothesis of natural necessity. He can content himself with the claim that this hypothesis, though perhaps improbable, is significantly *less* improbable than the supposition that an absence of natural necessity would give rise to the considerable regularities which we observe. Assuming that some sense can indeed be made of the notion of natural necessity, such a position would at least be plausible.

Clark's second means of reply to the objection posed is more fundamental. He need not claim that the hypothesis of natural necessity is actually rendered *probable* (i.e. more probably true than false) by the evidence of regularity, for as long as its probability is merely greater than zero, it can still give some support to the use of induction. If the

[1] As we shall see later, this appearance is deceptive.

past is a guide to the future *only* on the supposition of natural necessity, then we have reason to act on that supposition even if it is very improbable, since a fallible guide is better than no guide at all. *If we have no other way of choosing* between a number of possible predictions, then even a very small probability that the future is determined of necessity will be sufficient to tip the balance in favour of conforming our expectations to our uniform past experience. Thus Clark's 'weak' justification of induction does not have to depend on a high value for the initial probability of H: any non-zero probability will do. And as before, a non-zero assignment of probability to the hypothesis of natural necessity depends, arguably, not on the Principle of Indifference so much as on a mere demonstration that the hypothesis is coherent.

This second reply might appear to be vulnerable to two objections, which however tend to cancel each other out to some extent. First, if the hypothesis of natural necessity is ascribed a non-zero initial probability, then the argument given will justify a reliance on induction even without the confirming inverse probability argument. Secondly, there are many coherent alternative hypotheses which would not entail future uniformity, and if these are also to be given a non-zero initial probability, then they could presumably yield an exactly parallel argument for the opposite conclusion. I imagine Clark would answer that the inverse probability argument is needed precisely to hoist the probability of his natural necessity hypothesis above that of its competitors. But a problem still remains for those competitors which are equally confirmed by the experienced uniformity, and this casts doubt on both of the suggested replies, as we shall see later.

The outcome of our investigation so far is that if it is possible to make sense of the hypothesis of natural necessity, then we may have some reason for basing our predictions upon it. Clark would have us conclude that induction is thereby vindicated, at least to some extent, and he thus appears to take for granted without any argument whatever that a justified belief in natural necessity permits a justified confidence in induction. It is here that he unexpectedly encounters the third and most devastating objection, which dates back to Hume himself:[2]

> When a man says, *I have found, in all past instances, such sensible qualities conjoined with such secret powers*: And when he says, *Similar sensible qualities will always be conjoined with similar secret powers*, he is not guilty of a tautology, nor are these propositions in any respect

[2] *Enquiry Concerning Human Understanding*, 3rd edn, Selby-Bigge (ed.) (Oxford University Press, 1975), 37–38 (section 32). Hume presents the same argument, though less elegantly, in his *Treatise of Human Nature*, 2nd edn, Selby-Bigge (ed.) (Oxford University Press, 1978), 90–91.

> the same. You say that the one proposition is an inference from the other. But you must confess that the inference is not intuitive; neither is it demonstrative: Of what nature is it, then? To say it is experimental, is begging the question. For all inferences from experience suppose, as their foundation, that the future will resemble the past, and that similar powers will be conjoined with similar sensible qualities. If there be any suspicion that the course of nature may change, and that the past may be no rule for the future, all experience becomes useless, and can give rise to no inference or conclusion. It is impossible, therefore, that any arguments from experience can prove this resemblance of the past to the future; since all these arguments are founded on the supposition of that resemblance. Let the course of things be allowed hitherto ever so regular; that alone, without some new argument or inference, proves not that, for the future, it will continue so. In vain do you pretend to have learned the nature of bodies from your past experience. Their secret nature, and consequently all their effects and influence, may change, without any change in their sensible qualities. This happens sometimes, and with regard to some objects: why may it not happen always, and with regard to all objects? What logic, what process of argument secures you against this supposition?

In other words, even if we have reason to believe that all observed events have in fact been governed by natural necessities, this in itself gives us no reason for supposing that unobserved events have been or will be similarly governed. It is a common but erroneous assumption that Hume's inductive scepticism depends upon his analysis of causation. In this passage he demonstrates that even if causation is a matter of 'secret powers', natural necessities or whatever, his challenge to the rationality of induction is unaffected.

In the context of a defence of induction, the idea of natural necessity is utterly useless; but it is not difficult to understand why Clark is tempted to suppose otherwise. Necessary connections are characteristically universal, so if B follows from A of necessity, then B ought always to follow A, and to be predictable from it on every occasion. The problem is that Clark's 'natural necessity' is not logical necessity: it is logically a contingent feature of A that it 'necessitates' B, and is therefore a feature which can be discovered only by (past) experience. So in taking the observed constant conjunction of A and B to be indicative of a true *universal* necessity, rather than merely a temporary propensity, Clark is illicitly importing induction itself into his putative justification, making it viciously circular. Thus the *a posteriori*, contingent nature of non-logical necessity, the very feature which enables it to connect logically distinct events, renders it quite unsuitable for a justification of induction, since it is induction which must be used to establish its continued existence.

It is, no doubt, very appealing to see scientific progress as the unveiling of natural necessities, since this gives the appearance of explaining not only the connections between individual events at a single time, but also the amazing coincidence of striking similarity between patterns of events at different times. Clark tries to account for the latter by invoking natural necessities which underlie the former, but as we have seen, he can give no reason for supposing that these relations of necessitation between events should remain constant. To appeal to a criterion of simplicity is merely to postpone the issue: of course complete uniformity over time is in an obvious sense a simple hypothesis (though it is notoriously difficult to specify exactly what 'simplicity' amounts to), but on what grounds are we to justify our prejudice in favour of simplicity? Postponing the issue in this way may indeed be our best option in the end, since it at least has the merit of reducing induction to a principle which can be applied elsewhere (for example, in the 'justification' of another of Hume's natural beliefs, that in the external world). It is difficult to see, however, why necessity should play any part in such an account, since the simple assumption of uniformity can be applied just as well to constant conjunctions as it can to the natural necessities which are brought in to explain them.

An identical conclusion can be reached by pushing further the second objection, as hinted earlier. The point is that Clark has to contend with many competing hypotheses, including those of the form: 'The world is uniform until time t, but thereafter changes', and such a hypothesis would itself be confirmed by uniformity before time t. He would have to give some reason for ascribing to it a lower *initial* probability than that which he ascribes to the hypothesis of natural necessity, and presumably he could do this only on the pretext of its arbitrariness or lack of simplicity. The question then arises how he is to justify these criteria of initial probability, and if he can do so, why he requires *in addition* a sophisticated argument involving natural necessity to establish the simple and non-arbitrary hypothesis of inductive uniformity.

The same fate befalls one last way in which Clark might seek to reinstate his argument, by borrowing an ingenious idea of J. L. Mackie's.[3] This would be to say that, given the overwhelming evidence that natural necessities have been in operation for a long period of time, it is *a priori* very unlikely that such a long period should terminate in the

[3] 'A Defence of Induction', in *Perception and Identity*, G. F. Macdonald (ed.) (London and Basingstoke: Macmillan, 1979).

near future. I have shown elsewhere that this form of argument fails,[4] but here need only point out that even if it were successful, such a justification would gain nothing from being stated in terms of necessities, since it can be put equally effectively in terms of mere uniformities, as in Mackie's original article. Thus once again, there seems to be no way in which the introduction of natural necessities can give any support to the use of induction. Even if true, the hypothesis of natural necessity provides no additional reason for expecting nature to be uniform. And it follows from this that Clark's most basic assumption is mistaken, for the hypothesis of natural necessity is in no way confirmed by the observation of regularities!

These considerations are fatal not only to Clark's defence of induction, but also to his conception of science. For if natural necessity cannot predict *future* conjunctions of A's and B's, then neither can it explain *past* conjunctions of A's and B's. And if it cannot explain past conjunctions of A's and B's, then neither can it explain any *individual* conjunction of A and B. A satisfactory explanation must appeal to general principles, and it is therefore wasted breath to say of some occasion when A was followed by B, that this came about *because* on that occasion A was, quite inexplicably, conjoined with a power to produce B. If we cannot explain why particular powers are operative in particular circumstances, then it is useless to invoke those powers to explain what happens. For if we do, then in saying *that A had a power to produce B,* we seem merely to be stating in different words *that B in fact followed*.

Exactly this sort of redescription masquerading as explanation occurs in *Causal Powers*, Harré and Madden's influential defence of an essentialist philosophy of science (Oxford: Blackwell, 1975). They argue that an object's powers are built into the concept of that object, so that 'there is something inconsistent in the conjunction of the description of a cause with the denial of the description of its usual effect, unless one reconstrues the cause so described as being a thing, material or event only superficially similar to the kind of cause from which the causal hypothesis was originally derived' (p. 45). Now if an A is partially *defined* by reference to its 'secret power' to produce B, then there is indeed no difficulty in predicting that A's will be followed by B's. But this is merely a Pyrrhic victory against the inductive sceptic, who will simply restate his point by asking how we are to know that something is in fact an A in advance of its manifestation of this defining power. Hume's problem, that of inferring the secret powers or future behaviour from the 'sensible qualities', remains quite untouched.

This brings us to the fourth and final objection to Clark's defence of induction, which is really no more than a corollary of the third. The

[4] 'Mackie's Defence of Induction', *Analysis* **42.1** (January 1982).

point is that natural necessities are incapable of binding distinct events together, and yet this is precisely the purpose for which they were postulated. The third objection demonstrated that natural necessities, even if they are supposed to exist, cannot fulfil their intended role. This being so, we must conclude that *nothing* can fulfil that role, and thus that the very idea of natural necessity is logically incoherent.[5]

Let us spell out this train of reasoning in more detail. Events of type A are, we observe, invariably followed by events of type B: we postulate a relation of necessitation between A's and B's, and this relation is then invoked to account for each particular conjunction of A and B. The account thus given is apparently explanatory, precisely because the 'necessity' to which we appeal is manifested in conjunctions other than the particular one being explained.

The difficulty, as we have seen, is that this supposed 'necessity' cannot in fact do anything at all to account for the constant conjunction between A's and B's: it merely replaces an unexplained constant conjunction with an unexplained constant relation of necessitation. If we are trying to understand why *A's* and *B's* always go together, it is quite unenlightening to be told that this is because *A's* always go together with *a power to produce B's*. It would be equally futile to attribute this latter conjunction to a further power or relation of necessitation: we would be left wondering why this further relation should itself be constant, that is, why *A's* should always go together with *a power to yield the power to produce B's*. Thus the postulated natural necessities, which are invoked precisely to eliminate the brute coincidence of uniformity, cannot do so at all, and such a vicious regress is obviously best cut off at the first step.[6]

It may be that the idea of natural necessity derives its appeal from the same source as the Cosmological Argument for God's existence, namely the Principle of Sufficient Reason. Impressed by the contingency of the world's existence or of its uniformity, we look for an explanation: a reason why things should be like this rather than otherwise. We imagine that if we dig deeply enough into the nature of things,

[5] Hume himself argues that the idea of necessity is incoherent as ascribed to external objects, since it is an idea derived from an internal impression (*Treatise*, pp. 160–166). The argument of the text, however, in no way depends on his theory of ideas, and thus gives him a more reliable route to the same destination.

[6] This argument conjures up the picture of somebody trying to fix a steel plaque to a brick wall using magnets: no matter how many he attaches to the plaque, he cannot in any way attract it to the wall. Similarly, if there is a logical gap between A and B, and if *the power to produce B* implies that B follows, then there will be exactly the same logical gap between A and that power.

contingency will give way to necessity, and superficial coincidence to intelligible connection. But here we are mistaken, for the Principle of Sufficient Reason makes demands that are impossible to satisfy. Both the God invoked to explain the world, and the constant necessities invoked to explain its uniformity, turn out to be just as ineradicably contingent as the very brute facts whose sufficient reason they are intended to provide. This need not worry the theist, but it is clearly fatal to the inductive essentialist.

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