

Popper Selections

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7 The Problem of Induction (1953, 1974)

I

For a brief formulation of the problem of induction we can turn to Born, who writes: ‘. . . no observation or experiment, however extended, can give more than a finite number of repetitions’; therefore, ‘the statement of a law – B depends on A – always transcends experience. Yet this kind of statement is made everywhere and all the time, and sometimes from scanty material.’¹

In other words, the logical problem of induction arises from (1) Hume’s discovery (so well expressed by Born) that it is impossible to justify a law by observation or experiment, since it ‘transcends experience’; (2) the fact that science proposes and uses laws ‘everywhere and all the time’. (Like Hume, Born is struck by the ‘scanty material’, i.e. the few observed instances upon which the law may be based.) To this we have to add (3) *the principle of empiricism* which asserts that in science only observation and experiment may decide upon the *acceptance or rejection* of scientific statements, including laws and theories.

These three principles, (1), (2), and (3), appear at first sight to clash; and this apparent clash constitutes the *logical problem of induction*.

Faced with this clash, Born gives up (3), the principle of empiricism (as Kant and many others, including Bertrand Russell, have done before him), in favour of what he calls a ‘metaphysical principle’; a metaphysical principle which he does not even attempt to formulate; which he vaguely describes as a ‘code or rule of craft’; and of which I have never seen any formulation which even looked promising and was not clearly untenable.

But in fact the principles (1) to (3) do not clash. We can see this the moment we realize that the acceptance by science of a law or of a theory is *tentative only*; which is to say that all laws and theories are conjectures, or tentative *hypotheses* (a position which I have sometimes called 'hypotheticism'); and that we may reject a law or theory on the basis of new evidence, without necessarily discarding the old evidence which originally led us to accept it. (I do not doubt that Born and many others would agree that theories are accepted only tentatively. But the widespread belief in induction shows that the far-reaching implications of this view are rarely seen.)

The principle of empiricism (3) can be fully preserved, since the fate of a theory, its acceptance or rejection, is decided by observation and experiment – by the results of tests. So long as a theory stands up to the severest tests we can design, it is accepted; if it does not, it is rejected. But it is never inferred, in any sense, from the empirical evidence. There is neither a psychological nor a logical induction. *Only the falsity of the theory can be inferred from empirical evidence, and this inference is a purely deductive one.*

Hume showed that it is not possible to infer a theory from observation statements; but this does not affect the possibility of refuting a theory by observation statements. The full appreciation of this possibility makes the relation between theories and observations perfectly clear.

This solves the problem of the alleged clash between the principles (1), (2), and (3), and with it Hume's problem of induction.

II

Hume's problem of induction has almost always been badly formulated by what may be called the philosophical tradition. I will first give a few of these bad formulations, which I shall call the *traditional formulations of the problem of induction*. I shall replace them, however, by what I regard as better formulations.

Typical examples of formulations of the problem of induction that are both traditional and bad are the following.

What is the justification for the belief that the future will resemble the past? What is the justification of so-called *inductive inferences*?

By an inductive inference is here meant an inference from repeatedly *observed instances* to some as yet *unobserved instances*. It is of comparatively minor significance whether such an inference from the observed to the unobserved is, from the point of view of time, predictive or retrodictive; whether we infer that the sun will rise tomorrow or that it did rise 100,000 years ago. Of course, from a pragmatic point of view, one might say that it is the predictive type of inference which is the more important. No doubt usually it is.

There are various other philosophers who also regard as misconceived this traditional problem of induction. Some say that it is misconceived because no justification is needed for inductive inference; no more in fact than for deductive inference. Inductive inference is inductively valid just as deductive inference is deductively valid. I think it was Professor Strawson who was the first to say this.

I am of a different opinion. I hold with Hume that there simply is no such logical entity as an inductive inference; or, that all so-called inductive inferences are logically invalid – and even *inductively* invalid, to put it more sharply [see the end of this selection]. We have many examples of deductively valid inferences, and even some partial criteria of deductive validity; but no example of an inductively valid inference exists.² And I hold, incidentally, that this result can be found in Hume, even though Hume, at the same time, and in sharp contrast to myself, *believed in the psychological power of induction*; not as a valid procedure, but as a procedure which animals and men successfully make use of, as a matter of fact and of biological necessity.

I take it as an important task to make clear, even at the cost of some repetition, where I agree and where I disagree with Hume.

I agree with Hume's opinion that induction is invalid and in no sense justified. Consequently neither Hume nor I can accept the traditional formulations which uncritically ask for the justification of induction; such a request is uncritical because it is blind to the possibility that induction is invalid in *every sense*, and therefore *unjustifiable*.

I disagree with Hume's opinion (the opinion incidentally of almost all philosophers) that induction is a fact and in any case needed. I hold that neither animals nor men use any procedure like

induction, or any argument based on the repetition of instances. The belief that we use induction is simply a mistake. It is a kind of optical illusion.

What we do use is a method of trial and the elimination of error; however misleadingly this method may look like induction, its logical structure, if we examine it closely, totally differs from that of induction. Moreover, it is a method which does not give rise to any of the difficulties connected with the problem of induction.

Thus it is not because induction can manage without justification that I am opposed to the traditional problem; on the contrary, it would urgently need justification. But the need cannot be satisfied. Induction simply does not exist, and the opposite view is a straightforward mistake.

III

There are many ways to present my own non-inductivist point of view. Perhaps the simplest is this. I will try to show that the whole apparatus of induction becomes unnecessary once we admit the general fallibility of human knowledge or, as I like to call it, the *conjectural character of human knowledge*.

Let me point this out first for the best kind of human knowledge we have; that is, for scientific knowledge. I assert that scientific knowledge is essentially conjectural or hypothetical.

Take as an example classical Newtonian mechanics. There never was a more successful theory. If repeated observational success could establish a theory, it would have established Newton's theory. Yet Newton's theory was superseded in the field of astronomy by Einstein's theory, and in the atomic field by quantum theory. And almost all physicists think now that Newtonian classical mechanics is no more than a marvellous conjecture, a strangely successful hypothesis, and a staggeringly good approximation to the truth.

I can now formulate my central thesis, which is this. Once we fully realize the implications of the conjectural character of human knowledge, then the problem of induction changes its character completely: there is no need any longer to be disturbed by Hume's negative results, since there is no need any longer to ascribe to

human knowledge a *validity* derived from repeated observations. Human knowledge possesses no such validity. On the other hand, we can explain all our achievements in terms of the method of trial and the elimination of error. To put it in a nutshell, our conjectures are our trial balloons, and we test them by criticizing them and by trying to replace them – by trying to show that there can be better or worse conjectures, and that they can be improved upon. The place of the problem of induction is usurped by the problem of the comparative goodness or badness of the rival conjectures or theories that have been proposed.

The main barrier to accepting the conjectural character of human knowledge, and to accepting that it contains the solution of the problem of induction, is a doctrine which may be called the commonsense theory of human knowledge or the *bucket theory of the human mind*.³

IV

I think very highly of common sense. In fact, I think that all philosophy must start from commonsense views and from their critical examination.

For our purposes here I want to distinguish two parts of the commonsense view of the world and draw attention to the fact that they clash with one another.

The first is commonsense realism; this is the view that there is a real world, with real people, animals and plants, cars and stars in it. I think that this view is true and immensely important, and I believe that no valid criticism of it has ever been proposed. [See also selection 17 below.]

A very different part of the commonsense view of the world is the commonsense *theory of knowledge*. The problem is the problem of how we get knowledge about the world. The commonsense solution is: by opening our eyes and ears. *Our senses are the main if not the only sources of our knowledge of the world.*

This second view I regard as thoroughly mistaken, and as insufficiently criticized (in spite of Leibniz and Kant). I call it the bucket theory of the mind, because it can be summed up by the diagram overleaf.