THE INFERENCE TO THE BEST EXPLANATION[1]

I WISH to argue that enumerative induction should not be considered a warranted form of nondeductive inference in its own right.[2] I claim that, in cases where it appears that a warranted inference is an instance of enumerative induction, the inference should be described as a special case of another sort of inference, which I shall call "the inference to the best explanation."

The form of my argument in the first part of this paper is as follows: I argue that even if one accepts enumerative induction as one form of nondeductive inference, one will have to allow for the existence of "the inference to the best explanation." Then I argue that all warranted inferences which may be described as instances of enumerative induction must also be described as instances of the inference to the best explanation.

So, on my view, either (a) enumerative induction is not always warranted or (b) enumerative induction is always warranted but is an uninteresting special case of the more general inference to the best explanation. Whether my view should be expressed as (a) or (b) will depend upon a particular interpretation of "enumerative induction."

In the second part of this paper, I attempt to show how taking the inference to the best explanation (rather than enumerative induction) to be the basic form of nondeductive inference enables one to account for an interesting feature of our use of the word "know." This provides an additional reason for describing our inferences as instances of the inference to the best explanation rather than as instances of enumerative induction.

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"The inference to the best explanation" corresponds approximately to what others have called "abduction," "the method of hypothesis,"

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[2] Enumerative induction infers from observed regularity to universal regularity or at least to regularity in the next instance.

"hypothetic inference," "the method of elimination," "eliminative induction," and "theoretical inference." I prefer my own terminology because I believe that it avoids most of the misleading suggestions of the alternative terminologies.

In making this inference one infers, from the fact that a certain hypothesis would explain the evidence, to the truth of that hypothesis. In general, there will be several hypotheses which might explain the evidence, so one must be able to reject all such alternative hypotheses before one is warranted in making the inference. Thus one infers, from the premise that a given hypothesis would provide a "better" explanation for the evidence than would any other hypothesis, to the conclusion that the given hypothesis is true.

There is, of course, a problem about how one is to judge that one hypothesis is sufficiently better than another hypothesis. Presumably such a judgment will be based on considerations such as which hypothesis is simpler, which is more plausible, which explains more, which is less *ad hoc*, and so forth. I do not wish to deny that there is a problem about explaining the exact nature of these considerations; I will not, however, say anything more about this problem.

Uses of the inference to the best explanation are manifold. When a detective puts the evidence together and decides that it *must* have been the butler, he is reasoning that no other explanation which accounts for all the facts is plausible enough or simple enough to be accepted. When a scientist infers the existence of atoms and sub-atomic particles, he is inferring the truth of an explanation for various data which he wishes to account for. These seem the obvious cases; but there are many others. When we infer that a witness is telling the truth, our inference goes as follows: (i) we infer that he says what he does because he believes it; (ii) we infer that he believes what he does because he actually did witness the situation which he describes. That is, our confidence in his testimony is based on our conclusion about the most plausible explanation for that testimony. Our confidence fails if we come to think there is some other possible explanation for his testimony (if, for example, he stands to gain a great deal from our believing him). Or, to take a different sort of example, when we infer from a person's behavior to some fact about his mental experience, we are inferring that the latter fact explains better than some other explanation what he does.

It seems to me that these examples of inference (and, of course, many other similar examples) are easily described as instances of the inference to the best explanation. I do not see, however, how such

examples may be described as instances of enumerative induction. It may seem plausible (at least prima facie) that the inference from scattered evidence to the proposition that the butler did it may be described as a complicated use of enumerative induction; but it is difficult to see just how one would go about filling in the details of such an inference. Similar remarks hold for the inference from testimony to the truth of that testimony. But whatever one thinks about these two cases, the inference from experimental data to the theory of subatomic particles certainly does not seem to be describable as an instance of enumerative induction. The same seems to be true for most inferences about other people's mental experiences.

I do not pretend to have a conclusive proof that such inferences cannot be made out to be complicated uses of enumerative induction. But I do think that the burden of proof here shifts to the shoulders of those who would defend induction in this matter, and I am confident that any attempt to account for these inferences as inductions will fail. Therefore, I assert that even if one permits himself the use of enumerative induction, he will still need to avail himself of at least one other form of nondeductive inference.

As I shall now try to show, however, the opposite does not hold. If one permits himself the use of the inference to the best explanation, one will not still need to use enumerative induction (as a separate form of inference). Enumerative induction, as a separate form of nondeductive inference, is superfluous. All cases in which one appears to be using it may also be seen as cases in which one is making an inference to the best explanation.

Enumerative induction is supposed to be a kind of inference that exemplifies the following form. From the fact that all observed A's are B's we may infer that all A's are B's (or we may infer that at least the next A will probably be a B). Now, in practice we always know more about a situation than that all observed A's are B's, and before we make the inference, it is good inductive practice for us to consider the total evidence. Sometimes, in the light of the total evidence, we are warranted in making our induction, at other times not. So we must ask ourselves the following question: under what conditions is one permitted to make an inductive inference?

I think it is fair to say that, if we turn to inductive logic and its logicians for an answer to this question, we shall be disappointed. If, however, we think of the inference as an inference to the best explanation, we can explain when a person is and when he is not warranted in making the inference from "All observed A's are B's"

to "All *A*'s are *B*'s." The answer is that one is warranted in making this inference whenever the hypothesis that all *A*'s are *B*'s is (in the light of all the evidence) a better, simpler, more plausible (and so forth) hypothesis than is the hypothesis, say, that someone is biasing the observed sample in order to make us think that all *A*'s are *B*'s. On the other hand, as soon as the total evidence makes some other, competing hypothesis plausible, one may not infer from the past correlation in the observed sample to a complete correlation in the total population.

The inference from "All observed *A*'s are *B*'s" to "The next observed *A* will be *B*" may be handled in the same way. Here, one must compare the hypothesis that the next *A* will be different from the preceding *A*'s with the hypothesis that the next *A* will be similar to preceding *A*'s. As long as the hypothesis that the next *A* will be similar is a better hypothesis in the light of all the evidence, the supposed induction is warranted. But if there is no reason to rule out a change, then the induction is unwarranted.

I conclude that inferences which appear to be applications of enumerative induction are better described as instances of the inference to the best explanation. My argument has been (1) that there are many inferences which cannot be made out to be applications of enumerative induction but (2) that we can account for when it is proper to make inferences which appear to be applications of enumerative induction, if we describe these inferences as instances of the inference to the best explanation.

II

I now wish to give a further reason for describing our inferences as instances of the inference to the best explanation rather than enumerative induction.[3] Describing our inference as enumerative induction disguises the fact that our inference makes use of certain lemmas, whereas, as I show below, describing the inference as one to the best explanation exposes these lemmas. These intermediate lemmas play a part in the analysis of knowledge based on inference. Therefore, if we are to understand such knowledge, we must describe our inference as inference to the best explanation.

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[3] In what follows, when I speak of "describing an inference as an instance of enumerative induction," I understand this phrase to rule out thought of the inference as an instance of the inference to the best explanation. I have no objection to talking of enumerative induction where one recognizes the inference as a special case of the inference to the best explanation.

Let me begin by mentioning a fact about the analysis of "know" which is often overlooked.[4] It is now generally acknowledged by epistemologists that, if a person is to know, his belief must be both true and warranted. We shall assume that we are now speaking of a belief which is based on a (warranted) inference.[5] In this case, it is not sufficient for knowledge that the person's final belief be true. If these intermediate propositions are warranted but false, then the person cannot be correctly descibed as *knowing* the conclusion. I will refer to this necessary condition of knowledge as "the condition that the lemmas be true."

To illustrate this condition, suppose I read on the philosophy department bulletin board that Stuart Hampshire is to read a paper at Princeton tonight. Suppose further that this warrants my believing that Hampshire will read a paper at Princeton tonight. From this belief, we may suppose I infer that Hampshire will read a paper (somewhere) tonight. This belief is also warranted. Now suppose that, unknown to me, tonight's meeting was called off several weeks ago, although no one has thought to remove the announcement from the bulletin board. My belief that Hampshire will read a paper at Princeton tonight is false. It follows that I do not know whether or not Hampshire will read a paper (somewhere) tonight, even if I am right in believing that he will. Even if I am accidentally right (because Hampshire has accepted an invitation to read a paper at N.Y.U.), I do not know that Hampshire will read a paper tonight. The condition that the lemmas be true has not been met in this case.

I will now make use of the condition that the lemmas be true in order to give a new reason for describing the inferences on which belief is based as instances of the inference to the best explanation rather than of enumerative induction. I will take two different sorts of knowledge (knowledge from authority and knowledge of mental experiences of other people) and show how our ordinary judgment of when there is and when there is not knowledge is to be accounted for in terms of our belief that the inference involved must make use of certain lemmas. Then I will argue that the use of these lemmas can be understood only if the inference is in each case described as the inference to the best explanation.

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[4] But see Edmund L. Gettier, "Is Justified True Belief Knowledge?," *Analysis*, 23 (1963), 121-123 and Clark, "Knowledge and Grounds: A Comment on Mr. Gettier's Paper," *Analysis*, 24 (1963), 46-48.

[5] Cf. "How Belief Is Based on Inference," *The Journal of Philosophy*, LXI (1964), 353-360.

First, consider what lemmas are used in obtaining knowledge from an authority. Let us imagine that the authority in question either is a person who is an expert in his field or is an authoritative reference book. It is obvious that much of our knowledge is based on authority in this sense. When an expert tells us something about a certain subject, or when we read about the subject, we are often warranted in believing that what we are told or what we read is correct. Now one condition that must be satisfied if our belief is to count as knowledge is that our belief must be true. A second condition is this: what we are told or what we read cannot be there by mistake. That is, the speaker must not have made a slip of the tongue which affects the sense. Our belief must not be based on reading a misprint. Even if the slip of the tongue or the misprint has changed a falsehood into truth, by accident, we still cannot get knowledge from it. This indicates that the inference which we make from testimony to truth must contain as a lemma the proposition that the utterance is there because it is believed and not because of a slip of the tongue or typewriter. Thus our account of this inference must show the role played by such a lemma.

My other example involves knowledge of mental experience gained from observing behavior. Suppose we come to know that another person's hand hurts by seeing how he jerks it away from a hot stove which he has accidentally touched. It is easy to see that our inference here (from behavior to pain) involves as lemma the proposition that the pain is responsible for the sudden withdrawal of the hand. (We do not know the hand hurts, even if we are right about the pain being there, if in fact there is some alternative explanation for the withdrawal.) Therefore, in accounting for the inference here, we will want to explain the role of this lemma in the inference.

My claim is this: if we describe the inferences in the examples as instances of the inference to the best explanation, then we easily see how lemmas such as those described above are an essential part of the inference. On the other hand, if we describe the inferences as instances of enumerative induction,[6] then we obscure the role of such lemmas. When the inferences are described as basically inductive, we are led to think that the lemmas are, in principle, eliminable. They are not so eliminable. If we are to account properly for our use of the word "know," we must remember that these inferences are instances of the inference to the best explanation.

In both examples, the role of the lemmas in our inference is explained

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[6] See note 3.

only if we remember that we must infer an explanation of the data. In the first example we infer that the best explanation for our reading or hearing what we do is given by the hypothesis that the testimony is the result of expert belief expressed without slip of tongue or typewriter. From this intermediate lemma we infer the truth of the testimony. Again, in making the inference from behavior to pain, we infer the intermediate lemma that the best explanation for the observed behavior is given by the hypothesis that this behavior results from the agent's suddenly being in pain.

If in the first example we think of ourselves as using enumerative induction, then it seems in principle possible to state all the relevant evidence in statements about the correlation between (on the one hand) testimony of a certain type of person about a certain subject matter, where this testimony is given in a certain manner, and (on the other hand) the truth of that testimony. Our inference appears to be completely described by saying that we infer from the correlation between testimony and truth in the past to the correlation in the present case. But, as we have seen, this is not a satisfactory account of the inference which actually does back up our knowledge, since this account cannot explain the essential relevance of whether or not there is a slip of the tongue or a misprint. Similarly, if the inference used in going from behavior to pain is thought of as enumerative induction, it would again seem that getting evidence is in principle just a matter of finding correlations between behavior and pain. But this description leaves out the essential part played by the lemma whereby the inferred mental experience must figure in the explanation for the observed behavior.

If we think of the inferences which back up our knowledge as inferences to the best explanation, then we shall easily understand the role of lemmas in these inferences. If we think of our knowledge as based on enumerative induction (and we forget that induction is a special case of the inference to the best explanation), then we will think that inference is solely a matter of finding correlations which we may project into the future, and we will be at a loss to explain the relevance of the intermediate lemmas. If we are adequately to describe the inferences on which our knowledge rests, we must think of them as instances of the inference to the best explanation.

I have argued that enumerative induction should not be considered a warranted form of inference in its own right. I have used two arguments: (a) we can best account for when it is proper to make inferences which appear to be applications of enumerative induction by describing these inferences as instances of the inference to the best

explanation; and (b) we can best account for certain necessary con-
ditions of one's having knowledge (for example, which is knowledge
from authority or which is knowledge of another's mental experience
gained through observing his behavior) if we explain these conditions
in terms of the condition that the lemmas be true and if we think of the
inference on which knowledge is based as the inference to the best
explanation rather than as enumerative induction.

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