Enumerative Induction as a Subset of Inference to the Best Explanation

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In his paper *The Inference to the Best Explanation,* Gilbert Harman explains his position on enumerative induction. He first argues that inferences that seem to be instances of enumerative induction are actually better explained as inferences to the best explanation (IBE). He claims that the former are actually "uninteresting special case[s] of the more general inference to the best explanation" (Harman, 1965). Indeed, according to Harman, all cases of enumerative induction can be explained using IBE, making the former redundant as a separate form of inference**.** By contrast, the use of IBE need never be accompanied by enumerative induction, i.e. there are no situations that can be explained by the latter but not by the former. Enumerative induction is the process whereby a conclusion about, say, type A, is drawn based on several examined cases of type A. An often-cited example is as follows: if we observe one white swan, and then observe another white swan, and then another, up to a very large number of observations of white swans (with no exceptions), then we are likely to conclude that all swans are white. We have thus extrapolated from observed instances to a general conclusion that applies to other cases that are as of yet unobserved. Harman's second main argument in favor of his view is that in selecting a hypothesis to explain certain evidence, we often make use of certain lemmas. The use of these lemmas, according to Harman, is obscured if the process of hypothesis selection is described as one of enumerative induction, whereas the use of IBE appropriately highlights them as crucial steps in arriving at an explanation.

In arguing for the necessity of IBE, Harman begins by explaining the process of the inference to the best explanation. The process begins with the existence of several competing hypotheses, which all purport to explain the same data. The key is to then reject all of the alternative hypotheses in favor of the one that provides the best explanation for the data, inferring its truth from its superior explanatory power. Here, Harman admits the existence of a quandary:

how to define "best". Unfortunately, he chooses not to tackle the issue, merely mentioning in passing a few possible criteria: "which hypothesis is simpler, which is more plausible, which explains more, which is less *ad hoc* …" (Harman, 1965). Clearly, the author believes that this issue can be dealt with later, after first establishing that there is no need to describe our inferences as inductive. In setting this task aside for later, Harman is assuming something that may prove to be problematic: that the task is indeed accomplishable. It may not be possible to objectively define "best", which would pose a serious dilemma for philosophers attempting to use or explain IBE. Alternatively, as suggested by Okasha, we often define the "best" hypothesis as the one that has gained the most inductive support (Okasha, 2002). This, too, may prove to be a conundrum. These problems notwithstanding, many of Harman's points still hold, and must be considered in the following paragraphs.

In order to convince us of his first argument, that enumerative induction is superfluous if we consider IBE, the author provides several examples that can be explained by IBE and not by induction. It is important to note here, though, that although such examples may establish the need for IBE, they do not necessarily show that enumerative induction is superfluous. The examples Harman gives include the way a physicist infers the existence of atoms and sub-atomic particles. He asserts that the inference of the existence of sub-atomic particles can only be explained using IBE. However, he does not explain why this is the case; he just assumes it to be so. Perhaps an explanation can be offered here. There isn't a convincing sense in which inductive reasoning is being used to infer the existence of these particles, because there haven't been any past observations verifying this hypothesis. In other words, the *first time* a physicist posited the existence of sub-atomic particles, she could not have been using enumerative induction, as induction extrapolates from cases that have already been fully observed to cases that are as of yet unobserved. Clearly, this is not what is happening here: we are not saying that since all observed things have had atoms and sub-atomic particles so far, the rest will too. Rather, we are making an entirely new inference about an unobservable entity, something that

seems to be beyond the scope of induction. In our example, the physicist is looking at something for the first time; there exists no buildup of relevant past observations that can now be inductively used to explain what is happening in the present situation. Indeed, this is her first observation, and the first time she formulates this hypothesis! Thus, she cannot be extrapolating from the already observed to the as of yet unobserved. Rather, the scientist attempting to explain a novel phenomenon must be using something other than enumerative induction. The most sensible answer here is that the physicist selected the best explanation of the data: a hypothesis postulating the existence of such particles. There is a sense in which induction can *then* be used for many *other* unobservable entities in the future, after IBE has been used to speculate the existence of atoms and sub-atomic particles in the first place. In this sense, after the original claim has been advanced, similar findings in experiments may inductively suggest that all objects are made of atoms and sub-atomic particles. However, it seems inescapable that the *original* claim was made using IBE. In fact, it is tempting to say that this is usually the case with first-time discoveries, especially concerning unobservable entities. Certainly, it seems that the first time scientists suggested the existence of magnetic fields, quarks, and many other unobservable entities, they were using IBE. No other explanation provided a better fit for the data, and so the hypotheses were accepted. It seems impossible to construct a convincing argument for the use of induction in such cases. Again, it may be argued that *from then on*, inductive reasoning can be used to claim that because previous A's were said to have magnetic fields, and because a new object appeared to be an A as well (was similar in all relevant respects); this object should have a magnetic field. We will see in a moment whether it is indeed the case that we then use induction for future cases. For now, we can content ourselves with our demonstration that the original speculation seems to have necessarily been a product of IBE.

Now, let's move on to examine whether after the initial IBE inference, we might still be using IBE in future encounters with unobservable bodies, for it deserves greater elaboration. This point can be made in two different senses, and

taken together, they may suggest that induction is actually just a special form of IBE. The first sense in which we are still using IBE at a later stage in the scientific process (as described above) is as follows: when trying to explain a phenomenon, it may make more sense (given the trouble with assuming uniformity of nature) to consider the particular phenomenon itself, excluding past observations of similar situations. So, for instance, if we want to argue that we have located an electron, it may make more sense to argue for this claim only on the basis of the evidence we have discovered in the present experiment, without resorting to the use of past experiments that supposedly produced similar discoveries. This is because, as David Hume pointed out, we have no reason to assume that the present and the future will be like the past. And, as he noted, it does not help to argue that we know that nature is uniform because it has been uniform in the past, since this is circular reasoning. Given this difficulty, if we simply consider the evidence of the present experiment itself, as outlined above, then we are unlikely to be using induction. Instead, each and every case (or experiment) becomes identical to the original inference, in which IBE was used to select the best explanation for the data.

The second sense in which induction is a subset of IBE may seem even more robust. In using induction, we extrapolate from the observed to the unobserved, assuming that (roughly) the future will conform to the past. Why do we assume this? The answer seems to be that *we infer its truth from the fact that it is the best explanation*. We seem to think that when something has applied so many times in the past, the best explanation for a similar situation in the future will be the same explanation used in the past. We reject the alternative hypothesis, finding it less plausible that (for example) our world will radically change and the Earth will stop orbiting the sun. This, then, is an instance of IBE: the rejection of seemingly inferior alternative hypotheses in favor of the one we regard as supplying the best explanation. In the sense outlined above, IBE is more fundamental than induction. Indeed, the latter seems to depend on the former, making it a special case of IBE. This is what Harman meant when he said that all cases of induction can be explained using IBE. In fact, Harman

makes this second point – though without clearly articulating that induction is *systematically dependent* on IBE, as shown above. It is precisely this fact that suggests that it is impossible to think of a situation in which inductive reasoning could not be replaced by IBE. This would serve as a rejoinder to those who claim that induction is more fundamental than IBE, as the "best" explanation is the one that has the greatest amount of inductive support. Instead, this analysis suggests that inductive support is only ever accumulated because we use IBE to arrive at the conclusion that the future will likely have the same laws as the past.

For a final example of a situation in which we can only be using IBE, consider the following. Suppose we are trying to explain a particular phenomenon, and have had several past observations, leading to a buildup of relevant information. Unfortunately, about half of our previous observations and information point to explanation X for this phenomenon, and half of our previous observations suggest explanation Y for this same phenomenon. Or alternatively, all of our information points equally to both explanation X and explanation Y. That is, the two explanations do not differ in their predictions of the phenomenon under investigation. Either explanation would account for all of the evidence at hand. What should we do here? In picking between explanation X and explanation Y, we need to use IBE. We are clearly not using induction, since, as we've said, our inductive reasoning makes us completely undecided about which is better, explanation X or explanation Y. Given that they have the same amount of inductive support, we must use some other method to discriminate between them and decide which is a better explanation. What we would do in such a situation is as follows: reject the seemingly inferior explanation in favor of the "better" one. We may use such criteria as parsimony or which explanation is less ad hoc. This method of choosing between competing explanations by choosing the superior one is a process of Inference to the Best Explanation.

Harman’s second main argument is that in explaining the evidence at hand, we often make use of certain lemmas. The crucial role that these lemmas play is obscured if we describe the inferential process as inductive. If we

describe it as IBE, however, then their role is properly established. In order to clarify his point about exposing or obscuring lemmas, Harman presents us with two examples. The first is that when we hear someone say something, "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" (Harman, 1965). Similarly, if we see somebody quickly withdrawing his hand from a hot oven he has just touched, we infer that his hand hurts. In this case, our lemma is that it is the pain that caused the withdrawal.

According to Harman, describing such inferences as instances of enumerative induction masks the lemmas involved. Indeed, the implication of this for the first example, as Harman points out, is that we would be able to find all the past correlations between a person's utterance of something (and the circumstances surrounding it) and its truth. Then, using induction, we would say that the inference is simply from the past relationship between utterance and truth to the present case. The same process applies to the second example, with correlations between such a behavior and pain. As Harman asserts, these accounts hide the "essential relevance" (Harman, 1965) of the lemmas that the speaker believed the statement, and that the pain was responsible for the withdrawal, respectively. Here, a possible response to Harman would be that if indeed, all past instances/correlations showed that people do not pull their hands away because of pain, but rather because of fury (for example), then perhaps we would be inclined to say that this person is furious, not in pain. In such an instance, it would seem that we used enumerative induction. However, Harman could counter this response in one of two ways. He could say that we are still using IBE, because given all the past correlations, the assumption that the same explanation holds in the present is indeed the better explanation. This is an instance of the previous explanation of why induction may be seen to be systematically dependent on IBE. Alternatively, he could say that we are still using IBE, but a different lemma is playing a part: the idea that the person's fury

is responsible for the withdrawal of his hand. Perhaps he would opt for the second reply, as it highlights the lemma involved.

Although this may seem like a novel idea, it shouldn't strike us as too surprising. It should be relatively uncontroversial to hear that we have intermediate beliefs that help us to arrive at an explanation of a given phenomenon. After all, the suggested alternative is that we use enumerative induction and simply project the correlation from past into the present and future. Perhaps a final example can elucidate the idea further. Suppose I notice that Jack is soaking wet, and I explain this by saying that it is currently raining. If I have done this through a simple examination of past correlations (i.e. usually someone is wet because it has rained on them), then I obscure the roles of some very important lemmas. These lemmas include that Jack was outside in the first place, and did not have an umbrella or a trench coat. Clearly, these intermediate lemmas did play a role in my explanation, because I would not have postulated rain as the cause of Jack's wetness had I thought that he was equipped with an umbrella. It is clear, then, that describing the inferential process as one of IBE - as opposed to one of enumerative induction - highlights our use of lemmas.

Perhaps a much bigger potential problem for Harman is not whether we use lemmas, but rather where our lemmas come from. What if the lemmas themselves are based on enumerative induction? This reply would suggest that the reason we think pain is responsible for the withdrawal, or that the utterance was made because the speaker genuinely believes it to be true, is because it has been so in the past. This would be a predicament, because given Harman's assertion that the lemmas are an ineliminable part of IBE, it would make IBE dependent on enumerative induction. It seems, however, that this objection is escapable, as Harman could respond by saying that our lemmas are based on intuitive reasoning, not enumerative induction. Perhaps this would be a plausible reply, as it does seem as though we attribute withdrawal to pain because it is intuitively satisfying. However, Harman would probably need to account for *why* we find this explanation intuitively acceptable. Alternatively, we may be attributing withdrawal to pain because we have had similar

experiences, and are using IBE to arrive at the conclusion that other minds exist and operate in roughly the same way as ours. However, there are special cases that do not seem to conform to this model. If we have witnessed someone accidentally touch an oven several times and quickly withdraw his hand each time, explaining that he didn't feel any pain (maybe he has a faulty nervous system), then perhaps we would not be inclined to attribute withdrawal to pain the next time we witness such behavior. Our lemma might instead be the reason he cited in the past, such as fear of an ugly burn on his hand[1]. This may show that there are certain instances in which it is harder to rule out the use of enumerative induction in establishing lemmas. Nonetheless, it may still be possible to rebut such an argument by claiming that the lemma in use would be that the person is likely to stay the same, or maintain the same faulty nervous system.

In essence, Harman's claim that enumerative induction masks the vital roles played by lemmas in our inferences is a solid one. Though there may be certain instances in which the lemmas may appear to be partly induction-based, the claim holds for most cases and the objection is avoidable. Further, his argument that enumerative induction should not be viewed as a separate form of reasoning is also powerful, although he does not articulate the full slew of reasons why this is so, as this paper has attempted.

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[1] This is similar to the reply in the preceding paragraph, with a slight but important difference: the preceding paragraph concerns the inference possibly being based on induction, whereas this point specifically concerns the lemmas.

References

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