Chapter Four

A Response to Hume's Problem of Induction

Abstract: David Hume (1748) states that in order to be justified in believing that induction is a reliable method of inference, one must possess either a deductive argument or a non-circular inductive argument in support of induction. Hume argues that there are no such arguments available, and that our belief that induction is reliable is unjustified. In this chapter, I concur with Hume that there is no justified belief (or argument) that supports induction as a reliable methodological norm. This is because condition 3 in the PE definition of knowledge cannot be satisfied. We cannot have relevant reasons (due to circular reasoning) to possess a 'justified belief' that the future will resemble the past. However, particular inductive conclusions are contingently knowable, and as Hume admitted, we are 'personally justified' in using induction. This chapter explores the relations between the concepts of justified belief, personal justification, inductive argument, deductive argument, and knowledge.

With three chapters of epistemology behind us, we are in position to respond to what is variously called 'the traditional problem of induction' or 'Hume's problem of induction.' Hume asks what are the general reasons that support our belief that the future will resemble the past? For example, what non-circular reasons can we give for thinking that since the sun has always risen in the east, that it will again rise in the east tomorrow? What justifies the belief that we can move from premises, based on past sense experience, to conclusions about unobserved cases or future events that we haven't experienced?

The Traditional Problem of Induction

In Enquiries Concerning Human Understanding (1748) David Hume provides the clearest formulation of his skeptical doubts about the justification of inductive inferences. An 'inductive inference' is a move from premises that assert regularity in an observed class of cases, to a conclusion that the regularity will hold in further cases. For example, we believe that billiard balls when hit by other billiard balls will have certain predictable movements. Similarly, we believe that all metals expand when heated. We believe that there are causal relations between physical objects (and events) that makes the external world predictable. But what justifies the belief that future causal

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1 It should be noted that Hume never uses the word 'induction,' but the concept is commonly used when describing his hypothesis. Also, it should be noted that we are concerned with Hume's traditional problem, and will not discuss recent variations of the problem about what constitutes a 'good induction.'
relations will resemble the past? The truth of the premises in a valid deductive argument guarantee the truth of a conclusion, but true empirical propositions about the past or present do not guarantee the truth of a conclusion about future or unobserved events. With inductive arguments it is possible that all of the stated premises may be true, but a prediction about the future (or unobserved case) may be false. Upon what premises do we believe that induction is a justifiable method of inference?

Hume hypothesizes that inductive inferences are based upon two general beliefs. The first is that 'nature is uniform.' The second is that 'the future resembles the past.' But what is the basis for these beliefs? He argues that any explanation or argument that attempts to justify induction (as a defensible scientific method) typically makes a question-begging inductive assumption that the future will resemble the past. Hume concludes that we simply assume that nature is uniform and that the future will resemble the past as a matter of psychological habit. There is no reasonable nor a justifiable defense for our use of induction. Empirical science rests upon an unjustified belief about the reliability of induction. Hume's argument is this:

1) If $\mathbf{S}$ is justified in accepting induction, then $\mathbf{S}$ possesses either a deductive argument or a noncircular inductive argument in support of induction.

2) There is no deductive argument to justify induction.

3) There is no noncircular inductive argument to justify induction.

4) Therefore, $\mathbf{S}$'s belief/adoption of induction is not justified.

It may seem a bit disturbing that we are unable to state noncircular reasons for using induction, even though it is clear that scientific progress and true prediction follow from inductive inferences. Hume's conclusion that we have no justification (i.e. independent relevant reasons) for using our past experiences as a guide to predicting the future is a contemporary philosophical paradox.

The Distinction between Deductive and Inductive Arguments

The first step in responding to Hume's Problem is to make sure we are clear on the distinction between deductive and inductive arguments. An inductive argument is
where a set of premises is offered as support for believing a conclusion. The conclusion follows with probability. With inductive arguments, it is possible to have evidence that makes a conclusion probable, but despite strong evidential premises, the conclusion could be false. In contrast, what makes a deductive inference justified is that these arguments are of a form that if their premises are true, their conclusion is necessarily true. In other words, with a valid form of deductive argument, it is impossible for a conclusion to be false, if the premises are true.

A prominent feature of a deductive argument is that the content of its conclusion is always limited to what is already implicit in the premises. Deductive inferences do not amplify the future; their conclusions do not assert a claim about future circumstances not already stated in the premises. The following is an example of a deductive inference:

(1) If Abraham Lincoln was born and raised in Illinois until age eight, then he lived at least part of his life in Illinois.

(2) Abraham Lincoln was born and raised in Illinois until age eight.

(3) Therefore, Abraham Lincoln lived at least part of his life in Illinois.

This valid argument form is that of *modus ponens*. The conclusion is entailed by the following form of its premises and conclusion: (1) If \( p \), then \( q \). (2) \( p \) (3) Therefore, \( q \).

There are several standard valid argument forms (found in any introductory deductive logic textbook) that each have a distinctive mode of moving from premises to necessary conclusion. With a valid argument, if anyone should assert the truth of its premises, and deny the truth of a conclusion, then that person would have an inconsistent set of beliefs and would somehow be contradicting himself. A great value of logic is that it helps us determine whether our existing beliefs are consistent, and helps us elucidate any tacit deductive conclusions that follow from our existing beliefs.\(^2\)

\(^2\) While the above argument about Abraham Lincoln is valid, the argument is not historically sound, because premise \#2 is false. Premise \#2 is false because, in fact, Lincoln was born in Kentucky and was raised in Kentucky until age eight. The stated conclusion, although validly deduced (and historically true), is not the result of a sound deductive inference. Many times a sound deductive argument is used to illustrate deductive reasoning. A valid but unsound argument is used in this example, just to illustrate the concepts of ‘validity’ and ‘soundness’ to any readers unfamiliar with deductive logic.
In contrast, an inductive argument is an argument where from the observation of particular instances, a generalized conclusion is formed. But the truth of an inductive conclusion is not entailed by its premises. An inductive argument and its conclusion are 'ampliative' in that it is assumed that future events (or statistical frequencies) will be the same (or similar) compared to the material regularities that have occurred in the past.

Hume wants to know what justifies this assumption that the future will resemble the past? Is there justified belief for accepting the inductive method (as used in physical science), or is our acceptance of the inductive method just the following of unconscious psychological habit? Is scientific induction just a product of persons (and their minds) coming to expect similarities of the past to carry on into the future? According to Hume, if the justification of inductive arguments rests upon circular inductive arguments, then we really have no justification for using induction as a method of inference.

An Example of Induction: Sugar Will Dissolve in Water.

Let us examine a particular inductive inference about a future (unobserved) event. Let us imagine we are now standing in front of a stove. We are willing to predict that if we drop a small cube of sugar into a large pan of boiling water, then the sugar will dissolve into the water. The sugar cube will completely disperse into water and be unobservable by sight. How do we know that this will happen? It is apparent that we use background knowledge and beliefs, and believe that due to the physical natures of sugar and boiling water, and based upon our prior experiences and beliefs that any future interactions between these items will continue to be the same. The inductive argument for justifying induction looks like this:

1) From my past background experiences, I believe that after dropping a small sugar cube into a boiling cup of water, the sugar cube ordinarily dissolves (i.e. disperses) in the water. The sugar cube does not persist as an intact entity.

2) From elementary school science classes I was taught some general principles and facts about the solubility of sugar in water. For example, I learned that sugar dissolves faster in hot water that cold water. I also learned that if the water was already fully saturated with sugar, then the sugar would not dissolve.
3) I have previously dropped a sugar cube into a large pan of hot water, and the sugar has dissolved immediately.

4) Therefore, if I should now drop a sugar cube into a large pan of pure hot water, then the sugar will dissolve immediately.

Why is this conclusion about the future, 'justified' from past observations? What justifies an ampliative inference from observed cases to unobserved cases?

Hume admits that we are personally justified in believing that the future will resemble the past, and that we all use induction, but denies that we have a *reasoned basis* for believing that past observational data is a reliable guide for predicting the future. The course of nature may change in the future. It is consistent to believe that sugar cubes will not dissolve in hot water. And because we have no noncircular reasons for believing that the future will resemble the past, we merely *assume* a principle of induction when making inductive arguments:

**Principle of Induction:** Future unobserved cases and merely possible cases are likely to resemble observed cases.

According to Hume, it is paradoxical that the inductive method, which is the foundation of scientific inference is simply a matter of unjustified faith that the future will resemble the past. The usual response that inductive reasoning has always worked in the past, and that it will likely continue to work in the future, is clearly question-begging and circular. The contrary of every inductive conclusion is possible. In the *Treatise*, Hume states:

There can be no *demonstrative* arguments to prove that those instances, of which we have had no experience, resemble those, of which we have had experience. We can at least conceive a change in the course of nature; which sufficiently proves, that such a change is not absolutely impossible. (Book I, section VI).

**The Structure of Hume's Argument**

There are two forms of deductive argument that will help put Hume's problem into perspective. The problem of induction can be put in a *modus ponens* form:

1) If we do not possess a relevant (non-question-begging) explanation or argument for believing that the inductive method yields true conclusions, then we do not possess a justified belief that induction is a reliable method for scientific prediction.
2) We do not possess non-question-begging arguments to show that the inductive method will yield true conclusions about future events.

3) Therefore, we do not possess a justified belief that induction is a reliable basis for scientific prediction.

Also, as already stated, the problem can be presented in the form of a dilemma:

1) If S is justified in accepting induction, then S possesses either a deductive argument or a noncircular inductive argument in support of induction.

2) There is no deductive argument to justify induction.

3) There is no noncircular inductive argument to justify induction.

4) Therefore, S's belief/adoption of induction is not justified.

Both of these arguments are valid. If the premises are true, as most philosophers believe they are true, then Hume's conclusion is true that we do not possess a justified belief for believing that induction is a reliable method for making predictions about the future! In the next section I explain why I likewise accept Hume's conclusion that we cannot possess a justified belief that induction is reliable, and why this isn't a serious problem.

**Problem Explained: Knowledge Condition 3 Cannot Be Satisfied**

There have been several attempts at providing non-inductive arguments to justify induction, but as Hume asserts, they unfailingly resort to some inductive premises, and are therefore circular (and non-truth-connecting) for explaining why induction should be accepted. Most contemporary philosophers share the opinion that Hume's argument is sound. But despite this philosophical agreement, there remains discomfort about how this conclusion can be true. How can physical science which has been wildly successful in recent centuries be based upon an assumption that cannot be justified?

I will affirm and explain the truth of Hume's conclusion that one cannot possess a justified belief that induction is reliable by making reference to condition 3 in the PE definition of knowledge, and by providing a deductive argument for why condition 3 cannot be satisfied. Let us restate PE condition 3:
S believes p upon a set of implicitly or explicitly held reasons that are substantially relevant (i.e. truth-connecting) for why p should be believed. The evidence and the belief forming processes that generate p are why p should be believed.

The deductive argument for why PE condition 3 cannot be satisfied is as follows:

1) Premises that beg the question (i.e. assume the truth of induction) are not relevant for establishing the reliability of induction.

2) There are only question-begging (non-relevant) premises for inferring the reliability of induction.

3) If S cannot possess relevant premises in support of the reliability of induction, then S cannot have a justified belief that induction is reliable.

4) S cannot have a justified belief that induction is reliable.

This argument states that if there are no non-circular arguments supporting inductive arguments, then S cannot have a justified belief that induction is a reliable method for making predictions about the future. Hume's argument is correct in observing that persons fail to have relevant (i.e. noncircular, truth-connecting) premises for believing that the principle of induction is reliable, and this is supported by this supplemental argument showing that PE condition 3 cannot be attained.

But, is this conclusion that we cannot possess a justified belief for accepting the principle of induction (p. 154) an epistemic problem? Not really. Hume's conclusion is not a problem, but is a brute fact about the epistemic status of the principle of induction. No one has provided a non-circular argument to support the truth of the principle of induction, and no successful argument is expected. We can conclude that we believe (or assume) that the principle of induction is true, without knowing it. Or otherwise, we may adopt the principle of induction as a methodological norm or axiom.

Interlude

Perhaps the above discussion is sufficient for responding to Hume's problem of induction. We have stated what Hume's problem is, and have acknowledged the soundness of the argument, and have explained why Hume's skeptical conclusion is true.
We are finished. But another problem remains. Hume states that we cannot really know the true causal power of things, or the course of the future, and that all we can know is the customs and habits of our mind formed through its experiences. Without a justified belief for why we should use induction as a method for making predictions about the future, we have no claim to know what to expect in the future. Hume's problem can be extended to be both a problem about trusting induction as a general method, and a problem about our ability to have knowledge of particular inductive beliefs about the future. Below, we will provide an argument showing how we can have knowledge about the future, even if we don't know that the principle of induction is true.

Are We Personally Justified in Accepting the Principle of Induction?

Hume admits that persons are justified in using induction, and acknowledged that his skeptical concerns about the foundations of inductive arguments would have little affect on practical concerns. But, does the fact that we don't have a justified belief that induction is a reliable method for inductive inference, imply that we don't have knowledge of any future events, and that any belief about the future is a function of psychological habit? In other words, if we don't have a justified belief for inductive inferences in general, does this prevent us from having a justified belief (and knowledge) about future events in particular instances? Is the inductive prediction that 'if I should drop a sugar cube into a large pan of hot water, the sugar cube will dissolve immediately' merely a belief about the future, based on strong evidence that cannot be known?

I propose to argue that 1) persons can have knowledge of particular inductive conclusions and that 2) persons can be personally justified in accepting the principle of induction (i.e. that future unobserved and merely possible cases are likely to resemble observed cases). The remaining sections will show how knowledge about future states of affairs is possible, and why we are 'personally justified' in using inductive arguments and accepting the principle of induction.

Two Senses of 'Justification'

In chapter one, two senses of 'justification' were identified. The first sense is about what it takes for a person to be justified in believing a proposition, and the second
sense is concerned with whether a belief has the property of being justified from an external perspective. These senses of 'personal justification' and 'belief justification' are as follows:

**Personal justification (sense PJ):** 'S is justified in believing p' if p is acquired as an immediate non-inferential belief, or S has reasonably (non-recklessly) acquired strong evidence and used good inferential reasoning for believing p.

**Belief justification (sense BJ):** 'p is a justified belief' if p is believed from inductive evidence (or deductive reasoning) that is relevant (i.e. truth-connecting, pertinent, non-defective) for why p should be believed true.

Sense BJ is pertinent to our stated rejection of the possibility that persons can have a non-question-begging argument in favor of induction in general. It was argued that no one has provided a non-circular argument to support the use of induction as a justified belief, and that PE condition 3 cannot be met. Hume's conclusion is acknowledged.

In the following section, sense PJ and a local-contextualist theory of justification will be pertinent for why the principle of induction should be (and commonly is) accepted as a principle for ampliative inference.

**The Local-Contextual Theory of Personal Justification**

In chapter three, we theorized what it is for S to be 'personally justified' in believing p:

**Local-Contextual Theory of Personal Justification:** 'S is personally justified in believing p' when S holds a contextually basic belief. A contextually basic belief is achieved when S and an objector group agree that p is highly likely to be true, and S is not required to provide further reasons in defense of p. A regress-of-reasons problem ends upon human agreement where S (and any critical objector) terminates the need for additional premises or argument for believing p.

With this theory of personal justification, we are in position to show that Hume's dilemma argument is unsound, when alternatively 'personal justification' is explicitly inserted in place of 'belief justification' which was assumed in earlier arguments:

1) If S is personally justified in accepting induction, then S possesses either a deductive argument, or a non-circular inductive argument in support of induction.

2) There is no deductive argument to personally justify S's use of induction.
3) There is no non-circular inductive argument to personally justify S's use of induction.

4) Therefore, S's belief/adoption of induction is not personally justified.

The above argument is now unsound because premise 1 is false, and the conclusion 4 is false. The reason why premise 1 is false is that it presents a false dilemma. In order to be personally justified in accepting the principle of induction as a belief (or a methodological axiom) about the regularity of the external world, one does not need to provide either a deductive or a non-circular inductive argument in support of induction. A third option is available, that of having a contextually basic belief.

Personal justification occurs when S holds a contextually basic belief. In order to create a sound deductive argument, we can amend premise 1 to include another disjunct that acknowledges a local-contextual theory of personal justification. Instead of two alternatives, there are now three alternatives related to having a personal justification for believing a proposition:

1) If S is personally justified in accepting induction, then S possesses either (a) a deductive argument, or (b) a non-circular inductive argument, or (c) a contextually basic belief in support of induction.

2) There is no deductive argument to personally justify S's use of induction.

3) There is no non-circular inductive argument to personally justify S's use of induction.

4) S is personally justified in accepting the principle of induction if the belief/norm is a contextually basic belief. The use of induction (and the principle that the future will resemble the past) is a contextually basic belief because S personally believes that induction is a reliable mode of inference for having beliefs about the future, and there are no sincere objectors who argue against induction as a method of inference, and there are no serious alternative hypotheses offered by theorists as a substitution for induction.

5) Therefore, S's belief/adoption of induction is personally justified (Modus ponens from 1 and 4).

This argument addresses the question of 'what justifies our use of inductive inferences.' From a local-contextual theory about the nature of personal justification, it is argued that
a personal justification for the overall sufficiency of evidence for any inductive argument ultimately ends in a person-dependent manner, which makes premise 4 available. The belief that induction is a reliable method for predicting the future is accepted by physical scientists without further demands for argument or evidence. While it is true that we do not possess a *justified belief* for believing induction is a reliable method for making predictions about the future, it is simultaneously true that we are *personally justified* in believing that induction is a reliable method for making predictions about the future.

**Can We Have Knowledge About the Future (In Particular Instances)?**

In chapter one it was shown that human knowledge is indeed possible, including examples of knowledge about future unexperienced events (e.g. whether Lehrer knows Haller is in his office, and whether Jack knows a certain horse will win a race). These examples focused upon the contextual relations of S’s evidence, strength of belief, and material conditions. In this chapter, it is suggested that we can know that tomorrow the sun will rise in the east, the movement of billiard balls is predictable, a metal bar will expand when heated, and sugar will dissolve in hot water. Let us now examine one final example of how it is possible that knowledge can be attained about a future event.

Consider an example of how we can have knowledge about the future, based on past observation and scientific theory. Let us suppose that it is concluded by scientists, on strong evidence in 2007, that one in 150 babies (7%) will be born in the United States with attention deficit disorders or autism.³ This probabilistic assertion is based upon past statistical observations of new-born babies and sophisticated genetic models, and an inductive assumption that these observations and genetic models are reliable indicators for how the future will resemble the past. What are the material conditions for *knowing p*: 'One in 150 babies will be born with learning disorders' (in the foreseeable future)? With the PE definition, it is inferred that 'S knows p' (where S is a scientist and p is a proposition about future baby disorders) if the following conditions are satisfied:

1) If S’s experienced sample population and genetic theories for making this inductive inference mirrors the existing birth pattern of the selected population.

³ This is an actual statistic from the United States Federal Centers for Disease Control and the Interdisciplinary Council on Developmental and Learning Disorders (2007).
2) If the genetic theories and premises for detecting this regularity are relevant to why \( p \) should be believed.

3) If there are no new or undetected factors that disturb this trend.

*These three 'if' clauses are crucial.* If any one of these is false, then we *don't know* the percentage of babies to be born with learning disorders. To be explicit, we wouldn't know \( p \) if our sample population was skewed, or if our genetic models were flawed, or if there is an undetected evolutionary trend that will make learning disorders more (or less) common in the future. We are capable of knowing facts about the future in the same way that we know facts about the present. A proposition \( p \) (about the future) which manifests itself as being true, is an instance of knowledge, if it is based upon strong and relevant reasons for why \( p \) became true (assuming 4b is satisfied). Probability statements about the future are, in principle, knowable.

**Conclusion**

We have argued that \( S \) can know propositions about the future (e.g. this sugar cube will dissolve in this boiling pan of water), even if \( S \) cannot possess relevant reasons to believe 'the method of induction will remain reliable.' The principle of induction is a belief accepted by almost everyone. That future unobserved cases are likely to resemble observed cases, is contextually basic. No one has serious reservations about making inductive inferences, and there is seemingly no unresolved evidence or serious alternatives, that would count against induction. We are 'personally justified' in accepting the principle of induction, even if we cannot possess a 'justified belief' that is true.