Toward a solution to the problem of induction

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The problem of induction is to find a justification for our belief that the proper use of inductive reasoning will generate true conclusions from true premises most of the time. The standard Humean formulation may be presented thus: There seems not to exist any rational argument to the conclusion that we have good reason to believe in the uniformity of nature. Any attempt to justify our belief that what has not yet been observed will be in some relevant respect similar to what has already been observed seems inescapably circular, since any such argument inevitably appeals to the fact that our experience up to the present moment has usually vindicated our reliance on that belief.¹

One solution to the problem has been to deny its existence. A major advocate of this "dissolution solution" was Popper, who either denied the existence of induction² or said that if there is such a thing, it is both unnecessary and unproductive in the scientific enterprise.³ Popper proposed, as the criterion for distinguishing science from nonscience, the principle of falsification: an account of the world is scientific just in case it affirms or entails any statement that could be proven false by some observation. Schematically, any scientific theory *T* must imply that some phenomenon *P* will never be observed, or $T \rightarrow \sim P$, and so if *P* is observed, then we deduce $\sim T$. But how do we get *T* to start with? That, according to Popper, is logically beside the point:

¹ David Hume, An Enquiry Concerning Human Understanding, online version, ed. Jonathan Bennett. (2008), 16-17. http://www.earlymoderntexts.com/pdf /humeenqu.pdf.

² Karl Popper, *The Logic of Scientific Discovery* (London: Routledge, 2002), 18.

³ Popper, 31.

The initial stage, the act of conceiving or inventing a theory, seems to me neither to call for logical analysis nor to be susceptible to it. The question of how it happens that a new idea occurs to a man—whether it is a musical theme, a dramatic conflict, or a scientific discovery—may be of great interest to empirical psychology; but it is irrelevant to the logical analysis of scientific knowledge.⁴

Observational confirmation thus does not prove a theory true, but only fails to prove it false. Besides observational confirmation, Popper suggests four tests that a theory should pass—internal consistency, logical form (non-tautologousness), compatibility with other theories, and consistency of derived conclusions with empirical applications⁵—but all involve the application of classical logic, and so long as a theory passes all the tests, we are justified in continuing to accept it.

It is not clear, though, that this addresses Hume's primary concern. Taken purely as a statement about the methodology of science, Popper's analysis seems unobjectionable, assuming that we have confirmed by observation that this is how scientists actually do their jobs. Observation also suggests, though, that scientists tend to believe, pending falsification, that their theories are true, and that nonscientists have the same tendency, and Hume wanted to know how we could justify this belief. We give much lip service to disclaimers such as "Of course, science never really proves anything" or "All scientific theories are only tentative or provisional," but to affirm these things sincerely is just to affirm, in most cases, that we are prepared to change our minds if confronted with sufficient contrary evidence. What is there to change our minds about, though, if not a belief that well-tested theories are probably true? It is not at all apparent what we might mean if we were to say, "Pending falsification, we're not saying it's true, we're just not saying it's false." Notwithstanding anything Popper might have said or meant to imply, we are powerfully inclined to suppose that a theory is probably true if it has withstood severe testing, and philosophers must then confront the question of

⁴ Popper, 7.

⁵ Popper, 9.

whether we have any good reason, beyond the brute facts of our psychology and beyond any pragmatic imperatives, to be so inclined. Hume argued that we don't have a good reason, and Popper did not prove otherwise.

An inductive argument is usually defined as one that is claimed to establish a high probability that its conclusion is true, given the truth of its premises, and it is called a strong argument to the degree that it actually establishes such a probability. Any defense of induction depends on a satisfactory construal or interpretation of probability, and a proper defense of any proposed construal would far exceed the constraints of this assignment. In what follows I intend probability to mean some version of epistemic probability, construed as a measure of our justification in believing a proposition on the basis of available evidence.

The archetypal deductive argument purports to prove that Socrates is mortal. It is valid because the conclusion cannot be denied without contracting at least one premise, and it is sound because the premises are true in fact. We must believe the conclusion if we believe the premises, but why believe the premises? One of them asserts that all men are mortal, and if the problem of induction really is insoluble, then we have no good reason to believe that. The mother all deductive arguments turns out to be just another inductive argument. We have no reason to think all men are mortal except that, so far as we know, all men have always been mortal. Even so, if it happens to be a fact that all men are mortal, then by the rules of logic it is a fact that Socrates is mortal (if it is also a fact that he is a man, a question we can bracket for now).

Well, just how big is that "if"? An intuitive response might be, "Too small to worry about," but what does intuition know? Intuition seems to have been wrong about lots of things. Didn't intuition used to say the earth was flat?

One problem with intuition is the vagueness of the very concept. It is not always obvious what we mean when we talk about it, but we at least mean some kind of prelogical cognition.⁶ If I intuit some proposition *P*, then *P* occurs to me spontaneously, not by consciousness inference nor by observation. I believe it for no reason that I can think of—at least, no reason that occurs to me at the moment I realize that I believe *P*. The important point is that I do believe it. In contrast to mere speculation, an intuition, this context, is a spontaneous belief regarded, at least initially, as certainly or very probably true but lacking obvious rational justification. A common alternative locution is "selfevident." To call some proposition self-evident is often to say that it is intuitive, or intuitively obvious, or intuitively true: We know it because our intuition tells us so. Often, too, the assertion "It is just obvious" is another way of appealing to intuition.

Our intellectual history has not been entirely kind to intuition, but has not exactly beaten her into submission, either. It used to be thought as certain as death and taxes that the interior angles of a triangle always summed to two right angles. Non-Euclidean geometry came along and said "No, not always," and intuition had a hissy fit. But the calculus still makes extensive use of the Pythagorean theorem, which is purely Euclidean, and intuition gloatingly says, "Told you so." What we learned from this episode in the history of mathematics, reinforced by discoveries in modern physics, is that intuition is not infallible but nonetheless must be paid attention to. We cannot believe everything she says, but we cannot ignore her, either. We need intuition-friendly Newtonian mechanics when we build rockets for sending satellites into orbit, but if the satellite is a GPS transmitter, it has to have been designed using counterintuitive relativity theory. It is tempting to find in history a lesson that in a given field of inquiry, we should believe what intuition says until such time as we find a reason not to, but this would be just another exercise of induction.

In an effort to break the circle, let us ask: Why do we make arguments in the first place? Why do we even care about deductive validity or inductive strength? Several reasons may be adduced, but the one pertinent to this discussion is: to justify our belief

⁶ It can also mean the result of that kind of cognition: An intuition is something believed as a result of intuition. I shall try hard not to introduce any confusion while using both senses of the word.

in the argument's conclusion. The rules of deductive logic may be construed as establishing that, if we follow those rules in our reasoning from the premises to the conclusion, then, to whatever extent we are justified in believing the premises, to that same extent we are justified in believing the conclusion. In that case, if we are at all justified in regarding the premises as true in fact, then we are equally justified in regarding the conclusion as true in fact. This, in a sense, is just what we mean by logical validity. But logic alone has nothing to say about whether or to what extent we are justified in believing any of the premises. Any premise may be the conclusion of another argument, but at some point, as Euclid reminds us, we reach a set of premises for which we have no justification except that they seem impossible to doubt—or are "selfevident." We cannot prove them, but we have a spontaneous belief that they cannot be false. We may also say that we intuitively know these things, but to say we know them— whatever we credit as the source of our knowledge—is to beg the question of their truth.

We might take another look at geometry. An isosceles triangle, by definition, has two equal sides. If we look at several of them, we notice that invariably the angles opposite the equal sides appear also to be equal, and a moment's reflection will lead us to think it intuitively obvious that it could not be otherwise. We could just declare this to be another axiom, but we don't have to. Using the axioms already adopted, we can prove that any triangle with two equal sides must have equal angles opposite those sides. Thus, in this instance, we can check our intuition, and we find that in this instance our intuition was correct.

The question "Is Euclid's parallel postulate⁷ true or false?" seems to be the wrong one to ask until we've answered another question: "Why do we want to know?" In many contexts, we get useful answers if we assume it is true and no answers at all if we assume it is false. In other contexts, we get useful answers only by assuming it is false. And, it is from the context that we get our reason for asking. We can assume the postulate is true

⁷ Euclid's distinction between axioms and postulates need not concern us here. I am taking them to be interchangeable labels for a proposition that we think we can treat as certainly true even though we cannot prove it by inference from other propositions.

when it is useful to do so and assume otherwise when it is not useful. Whichever assumption we make is justified, if at all, by its epistemological utility. The same applies to Euclid's other postulates, most of which seem to have universal utility and so are always justified.

This suggests an alternative view of axioms. Conventionally, they are regarded as propositions we know to be true but cannot prove. We occasionally discover that some proposition we so regarded is actually not necessarily true. In contexts where it does not work,⁸ we say it is not true and therefore is not an axiom, but in contexts where it continues to work, we say it is true and thus, in those contexts, is still an axiom. Simply to call something an axiom, then, is not to endorse it as a necessary truth. It is simply to accept it as if it were true, pending discovery of a good reason to doubt it, and subject to contextual constraints that are demonstrably relevant. And, our only reason for accepting it under those conditions is that our intuition compels us to. We would not call it an axiom if we had any other reason to believe it; we would instead call it an observation or a deliverance of reason.

What we need, then, to justify our inferences about the regularities of nature, is an axiom of nature's constancy, suitably qualified. We know by observation that nature has been constant, in certain respects, for as long as we have been observing it up to the present moment. We have observed that certain properties of the natural world have been, until now, invariant with respect to time and place. Intuition compels us to believe that this is because those properties actually are invariant with respect to all time and place, including future times and unobserved places, as well as past times when we were not around to do any observing. Absent a clear and compelling reason to doubt this intuition, we are justified in accepting it as a premise in our reasoning about the natural world. The skeptical claim that it could be false for all we know may be dismissed as

⁸ A digression to rigorously define "work" would tax the reader's patience beyond conscionable limits. A hint of my meaning would be "fulfill the purpose of the argument for which the axiom is a premise."

carrying no more epistemological weight than speculations about the nonexistence of an external world, and perhaps rebutted with something like a Moorean shift.

The mortality of all humans provides an illustration. According to philosophical convention, there is no deductively valid argument to the conclusion that every human now alive is going to die except from premises that can only be established by the kind of induction that was bothering Hume.⁹ But, we are nonetheless compelled to believe it. Something about that compulsion justifies our belief, and we may use that compulsion in formulating a valid argument along the following lines.

Besides nature's constancy, let us consider it another axiom that our intuitive sense of epistemic probability, when functioning properly, corresponds well with reality. We are thus justified in believing any proposition to whatever degree we correctly assess its probability of being true. For any deductively valid argument, then, we are justified in believing its conclusion just to the extent that we are justified in believing its premises. There is no philosophical bar to including in our premises statements such as "We are justified to degree *m* in believing *P*," and so if other undisputed premises demonstrate *P* $\rightarrow Q$, we can rationally conclude that we are justified to degree *m* in believing *Q*. Thus,

for instance, to say it is probable to a degree approaching certainty that all humans are mortal is to say that we are justified in believing, to a degree approaching certainty, that all humans are mortal, notwithstanding that the statement "I will live forever" contradicts nothing that we know with absolute certainty.

⁹ The argument "All humans are animals; all animals die; therefore, all humans die" is obviously valid. However, it adds nothing to whatever logical justification we ever had for believing in Socrates' mortality, even if it might augment our subjective confidence in that conclusion.

References

Hume, David. *An Enquiry Concerning Human Understanding*, edited by Jonathan Bennett, 2008. Online version. <u>http://www.earlymoderntexts.com/pdf</u>/humeenqu.pdf.

Popper, Karl. *The Logic of Scientific Discovery*. London: Routledge, 2002.

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