

Should Scientists Ignore Philosophical Theories of Evidence?

An Appraisal of Achinstein

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Why do scientists and others want evidence for their theories? What does evidence that h give you? My answer is that it gives you a good reason to believe h. Not necessarily a conclusive one, or the best possible one, but a good one nonetheless.

—Peter Achinstein, “Why Philosophical Theories of Evidence Are (and Ought to Be) Ignored by Scientists,” p. S183

1. *Introduction*

In his article “Why Philosophical Theories of Evidence Are (and Ought to Be) Ignored by Scientists,” Peter Achinstein argues that philosophical theories of evidence are ignored by scientists because they rest on assumptions which make their concepts of evidence too weak for scientists to work with, or which entail that the truth or falsity of evidential statements can be determined a priori. Given that, as Achinstein argues, the truth of many evidential statements can only be determined empirically, this “a priorist” assumption makes scientists consider philosophical accounts of evidence irrelevant to their work.

In what follows I will examine the value of evidence, its nature, and its relation to science. I hope to show that, while Achinstein’s conclusions are mostly right, the arguments and examples he gives to support them are flawed in some of their details. Specifically, I propose an account of evidence according to which, though evidential claims are objective to a large extent, something counts as evidence only if, ultimately, it has a relation to beings *for whom* it counts as evidence. On this view something’s status as evidence does not derive merely from people’s beliefs, but from shared practices that are embodied in what I call *contexts of inquiry*. I also propose that this concept of evidence is one according to which evidential claims, though defeasible, are in one respect a priori. I argue that this account of evidence is one that should be of interest to scientists.

2. The Value of Evidence

All people by nature desire to have evidence for their beliefs, though regrettably not always as strongly as they should. Nevertheless, we do seek evidence for our beliefs most of the time. Why do we value evidence so highly? It is not because evidence is rare: Almost anything you can think of is evidence for something or other. Artifacts—things like telephones, watches, cars, and computers—are evidence of intelligent (human) design; living things are evidence of the local presence of water, energy and nutrients; rocks are evidence of certain geological processes, and so on. Nor do we seek evidence because we regard it as intrinsically valuable. As we have just seen, evidence is everywhere, but we don't typically seek evidence for claims that are not relevant to our survival or our day to day interests.

The answer, I think, is that we seek evidence because we have to in order to survive. If we did not seek evidence for our beliefs they would float free from reality; we could neither make accurate predictions about the future course of our experience nor behave in ways appropriate to our environment, and we would be unable to live successfully in the world. Thus one reason people seek evidence is to anchor their beliefs to a bedrock of facts.

However, I believe there is another, related reason, which is to get groups of people to *reach a consensus* on what they believe to be true. Of course there is room for disagreement about a great many issues, but without a minimum amount of common convictions groups could not agree on policies, coordinate their actions, or preserve themselves as a group. Without consensus, people could not enjoy the benefits that being part of a community makes possible. And without evidence of some kind, there is, short of coercion, no feasible way to get people to reach a consensus on what to believe. For these reasons evidence is highly important to communities, especially those who collectively participate in what I call "contexts of inquiry", which I will discuss below.

Now that we know enough about what evidence *does* for us, we can move on. In the remainder of this article I will address the issue of what evidence *is*.

3. Achinstein versus Philosophical Theories of Evidence

At the beginning of his paper Achinstein gives two examples to show that scientists can disagree about what counts as evidence for what even when they agree about the facts established in an experiment, their description, and the meaning of the hypothesis being tested (p. S180). The first example is of two scientists, Heinrich Hertz and J. J. Thomson, who both conducted experiments to determine whether cathode rays are electrically charged (pp. S180—1). In one of his experiments, Hertz found that cathode rays were not deflected by the electrified plates he had put in the cathode tube, and so he thought this was conclusive evidence that cathode rays are not electrically charged. Some years later, Thomson showed that Hertz was wrong, at least insofar as Hertz thought he had *conclusive* evidence. Thomson conjectured that the reason why the cathode rays had not been deflected by the plates could be that, if the rays *were* charged, they would ionize the gas in the cathode tube, which would neutralize the effect of the electrified plates. After evacuating a sufficient amount of the gas, Thomson found that the rays were deflected, and hence charged after all.

On p. S181 Achinstein says, “Thomson did not dispute that Hertz obtained the results he did, viz., no electrical deflection of the cathode rays. Indeed, Thomson obtained the same results in initial experiments. What he challenged was the claim that these results were evidence that cathode rays are electrically neutral.” This passage is ambiguous: It could be read as saying that Thomson’s results challenged the claim that Hertz’s results were evidence *at the time Hertz obtained them*, or that Thomson’s results challenged the claim that Hertz’s results were *still* evidence *at the time Thomson obtained his own results*. From what he says later in the article Achinstein seems to have had the first reading in mind, but for all he says the example of Hertz and Thomson is also consistent with the second reading. This is an important point, and I will return to it later.

The second example Achinstein gives concerns archaeology (p. S181). For a long time it was thought that campfires originated around 200,000 to 500,000 years ago, because in China burned animal bones were found in the same layer of dirt as stone tools and what looked like wood ash. Subsequently it was determined that what seemed to be wood ash was really minerals and clay. Thus the claim that the “wood ash” was evidence of campfires was falsified, for “These scientists claimed that the burned animal bones by themselves do not constitute very good evidence that a fire was started by humans” (p. S181).

Achinstein says that he has given these examples because philosophers of science have developed theories of evidence that have two goals, "...first, to clarify what it means to speak of confirming evidence; and second, and relatedly, to help scientists determine whether, and to what extent, putative evidence supports an hypothesis" (p. S182). In spite of that, scientists have persistently ignored these theories.

Achinstein believes this is because philosophical theories of evidence commonly make two flawed assumptions. First, the concepts of evidence that have been devised by philosophers have often been very weak. He outlines three standard kinds of philosophical theories of evidence: Bayesian theories, hypothetico-deductive theories, and satisfaction theories. On the first kind of theory, something—call it 'e'—can count as evidence for a hypothesis—call it 'h'—if and only if e makes h's probability higher than what it was before. "So, e.g., since my buying 1 ticket in a million ticket lottery increases the probability that I will win, this fact is evidence that I will. To be sure, it is not a lot of evidence—it's certainly not decisive—but it is *some*" (pp. S182-3). On the second kind, e is evidence for h if and only if h entails e: "So, e.g., since the rectilinear propagation of light is derivable from the classical wave theory of light it is evidence for that theory" (p. S183). On the third kind, where e is an observation report, e confirms h if h is satisfied by the class of individuals mentioned in e. "To use Hempel's famous example, an observation report that a particular raven observed is black is evidence that all ravens are black" (p. S183).

On all three kinds of theory, the concept of evidence in play is weak. Bayesian views are weak because (a) e counts as evidence for *any* hypothesis that it raises the probability of, even if it only raises it by a very small amount, and (b), because of (a), e can confirm hypotheses that are mutually inconsistent. Hypothetico-deductive views also allow something to be evidence for mutually inconsistent hypotheses. In addition to being evidence for the classical wave theory of light, "...since the rectilinear propagation of light is also derivable from the classical particle theory, it is evidence for that theory as well" (p. S183). Finally, the satisfaction theory is weak because it doesn't give you a good reason to believe a hypothesis:

...the fact that the hypothesis that all ravens are black is satisfied by the one black raven that I have observed is not by itself a good reason to believe that hypothesis. Surely I need a bigger sample. Even more importantly, it depends crucially on how I selected the raven for observation. If, e.g., I purposely selected it from a cage marked "black birds" then the result does not provide a good reason at all for believing that all ravens are black (p. S186).

Achinstein sums up his case against these kinds of philosophical theories of evidence as follows: “This, then, is the first reason scientists don’t and shouldn’t take such philosophical accounts of evidence seriously: they are too weak to be taken seriously. They don’t give scientists what they want, or enough of what they want, when they want evidence” (p. S186).

The second flawed assumption is that, on many philosophical theories, evidential claims are a priori: Statements of the form “e is evidence for h” can be known without having to resort to any empirical investigation:

I will illustrate this idea with brief references to some philosophical theories, the first one being Carnap’s. [...] ...for Carnap the probability relation is entirely a priori. What h’s probability is on e is settleable a priori, by reference to the rules of the “linguistic framework” (as Carnap calls it). The h-d [hypothetico-deductive] view of evidence also makes the evidential relation a priori, since whether h entails e is a priori. [...] Finally, Hempel’s satisfaction and Glymour’s bootstrapping criteria yield concepts in accordance with which one calculates a priori whether e is evidence that h (p. S187).

In opposition to this, Achinstein says that many evidential claims can be confirmed or refuted by experience. The example of Hertz and Thomson, and the example of the archaeological discovery show, in his opinion, that the a priorist assumption is false (p. S187). He concludes that some evidential claims are empirically falsifiable (p. S188).

4. Evidence and Contexts of Inquiry

A priorists could try to salvage the notion that all evidential statements are a priori from Achinstein’s counterexamples by restricting evidential claims to a context, so that the same thing might count as evidence for one person but not for another, or for the same person in one context but not in a different context (p. S189). When discussing this possible response, Achinstein argues that this would make evidential claims too specific to be useful to scientists:

To begin with, using such a concept, you can’t ask a question such as “Were Hertz’s experimental results evidence that cathode rays are electrically neutral?” You need to ask whether they were evidence for Hertz, or for Thomson, or for someone in either of their situations, or for someone else. [...] Now even if scientists were to have some interest in answering this question, I think they are much more interested in answering the unrelativized question “Are (or were) Hertz’s results evidence that cathode rays are neutral?” [...] They want to know something more general that transcends particular or types of persons. [...]

Second, to answer the Carnapian evidential question and produce an evidential claim that is true, and a priori, and that will justify one’s beliefs, one needs to include a lot of facts about the particular situation to which it is relativized. [...] Such facts about an individual’s situation are often difficult to ascertain, and scientists are not usually in a position to know them, and hence to produce true a priori evidence claims of the sort in question. (p. S190)

In this response Achinstein fails to consider that there can be a contextualized concept of evidence that is not limited to lone individuals in a particular (type of) situation. I will now briefly sketch such a concept.

It may well be that there are multiple concepts of evidence which can serve different functions. On p. S182 Achinstein says, "...the notion of evidence I am concerned with is an objective, not a subjective one: whether e is evidence for h, and how strong that evidence is, does not depend on what anyone thinks about e, h, or their relationship." I think the concept I propose constitutes a *via media* between the extremes of objectivity and subjectivity. While it might not be the *only* important concept of evidence, I maintain that it is *an* important concept of evidence. This concept is one member of a family of concepts on which evidence is ultimately *evidence for*. It subsumes various more specific concepts of evidence, some of which hold that evidence is ultimately evidence for an individual; others, that it is evidence for a community; and still others, that it is evidence for an individual in the context of a community. On the specific concept being considered here, evidence involves individuals *qua* members of a community that participates in what I will call a *context of inquiry*.

A context of inquiry involves agreed upon standards for observing phenomena, for reasoning, for theorizing, for rationally resolving disputes, and suchlike. Whether something counts as evidence in favor a hypothesis or theory for a given individual is determined by which community the individual is a member of and by the extent to which they abide by these standards. On this view evidence is *intersubjective* (which, it is important to note, does *not* mean it isn't sometimes, or even often, *objective* as well): Whether e is evidence for h, and how strong that evidence is, *does* depend on something besides e, h, and their relationship. However, it depends, not on the opinions of single individuals, but on certain shared standards that regulate how people find things out. Given that claims about evidential relationships are bound up with a community of inquirers who know what their community's standards are, these claims are not "swimming in specificity" (p. S189) in any objectionable sense.

What is the rationale behind a notion of "evidence for"? Why not rest content with a purely objective concept of evidence? I don't deny that there are such purely objective concepts of evidence, but I think that they are *useful* only to the extent that we—that is, epistemic agents—can *determine* what is objective evidence for what. I think that while many objective

concepts of evidence meet this requirement, some do not. For those that do, I think the concept of evidence for that I propose can do just as much. Furthermore, on my proposal the participants in a context of inquiry can always determine, in principle, what counts as evidence for what, because what counts as evidence for what is (partially) determined by a community's standards.

5. Evidence and Defeasibilism

Let us return to Achinstein's discussion of the falsification of evidential statements. I think Achinstein's conclusion that evidential claims are falsifiable, interpreted in the sense that further evidence can show them to have been false *when they were made*, does not follow from the examples he gives. On the view I'm presenting, evidence is *defeasible*: A piece of evidence can confirm a hypothesis *unless or until it is defeated by further evidence*. In Achinstein's examples, the evidential claims might have confirmed their corresponding hypotheses at one time, but not later on. On this view it is not true that these claims were falsified. Consider an analogy: The fact that someone is now an adult does not falsify the claim that they were a child, although the claim that they *are* a child was true of them in the past and is false of them in the present. Similarly, the fact that e is not evidence for h *now* does not falsify the claim that e *was* evidence for h, although the claim that e *is* evidence for h was true of e in the past and is false of it in the present. These evidential claims really did confirm their corresponding hypotheses, but not after further evidence caused them to lose their status as evidence. We can call the view that some evidential claims are defeasible *defeasibilism*. Not the prettiest name, I know, but it conveys the right idea.

If defeasibilism is true, it follows that some evidential claims are empirical claims while others are not. This is due to the fact that on our contextualized understanding, something's status as evidence is bound up with the standards of a community. If those standards are not met, it will not count as evidence in that context of inquiry, and if they are met, it will.¹ Because of that, the members of that community know independently of experience that something will have the status of being evidence *if those standards are met*, for those standards are what determine

¹ Does this mean that "anything goes"? No. On the view I'm presenting, while it *is* in a sense community agreement that determines what counts as evidence and what it is evidence for, there are constraints on what standards and practices communities can adopt, some of these standards and practices being so counterproductive that they could not be adopted by *any* community.

what being evidence comes to in that context. In that case claims of the qualified form “e is evidence for h in context c *unless e is defeated in c*” are a priori. In spite of that, *unqualified* evidential claims of the form “e is evidence for h in context c” are still defeasible. In a great many cases a community’s standards need to make room for evidence that is not conclusive, and that means that that evidence can lose its evidential status as more evidence is acquired. For such *prima facie* evidence empirical inquiry is needed to discern whether e has actually been defeated in context c or not. So unqualified evidential claims are empirical while qualified ones are a priori.

6. A Connection to Science

Why should scientists pay any attention to this contextualized account of evidence? I think they should because it (mostly) conforms to the criteria for a good account of evidence that Achinstein gives at the end of his article (pp. S191—2): First, it is *empirical*. Scientific investigation is needed to tell whether unqualified evidential claims have been defeated or not. Second, it is *robust* in the sense of being a “*strong*” account of evidence. A community of inquirers who have agreed upon standards for observing phenomena, reasoning, theorizing, rationally resolving disputes, and so on is not going to be content with a weak concept of evidence, because on weak accounts the same body of evidence can count as evidence for mutually inconsistent hypotheses, and such an account will not suit their needs because it will not suffice to tell them which of these hypotheses are really true. Finally, it is also robust in the sense of having a concept of evidence that “...yields a good general reason to believe something, rather than one that must be tied to specific epistemic situations” (p. S191). While this account *is* contextualized, it is not tied to “specific epistemic situations,” but to the standards and practices of entire communities. Contextualizing “reasons to believe” to individuals is problematic because it is hard to for others to know everything about another’s background knowledge, beliefs, and experiences that would be necessary, according to such a solipsistic concept of evidence, to determine what they are (or are not) justified in believing. Contextualizing reasons to communities is relatively unproblematic because a community’s background knowledge, beliefs, and experiences are largely public, and so accessible to its members.

7. Conclusion

By way of conclusion, I would like to briefly address one final question: “Why,” to paraphrase the opening quote, “do philosophers and others want theories of evidence? What does a philosophical theory of evidence give you?” My answer is that it gives you a good reason to believe that your standards of inquiry, and the beliefs that you base on them, are for the most part reliable. In this article I hope to have made a case for a rough sketch of such a theory. Not necessarily a conclusive case, or the best possible one, but a good one nonetheless.

References

Achinstein, Peter. “Why Philosophical Theories of Evidence Are (and Ought to Be) Ignored by Scientists,” *Philosophy of science*, 67 (Proceedings) pp. S180-S192. Philosophy of Science Association, 2000.