

Norms for Values in Scientific Belief Acceptance

Heather Douglas
Department of Philosophy
University of Tennessee

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Abstract: Although a strict dichotomy between facts and values is no longer accepted, less attention has been paid to the roles values should play in our acceptance of factual statements, or scientific descriptive claims. This paper argues that values, whether cognitive or ethical, should never preclude or direct belief on their own. Our wanting something to be true will not make it so. Instead, values should only be used to consider whether the available evidence provides sufficient warrant for a claim. This argument is made for all relevant values, including cognitive, ethical, and social values. The rational integrity of science depends not on excluding some values and including others in the reasoning process, but of constraining all values to their proper role in belief acceptance.

Much has been written on the distinction between facts and values.¹ The literature is replete with arguments for why facts and values should not be considered completely distinct entities. There are arguments for the importance of facts in the formation of values, and arguments for the importance of values in the formation of facts. However, a perhaps more interesting question requires closer attention in the philosophy of science: what are the norms for the role of values in the acceptance of scientific, descriptive beliefs?

First, it should be noted that values play different roles in the acceptance of beliefs versus actions. In choosing between *actions*, values can legitimately be the reason for their acceptance or rejection.² Certain actions may be unacceptable morally and are thus precluded as an acceptable choice, even in the course of scientific investigations. For example, it may be empirically desirable to deceive human subjects about the risks of medical research in order to increase the pool of subjects in the study, but such empirical desirability pales next to the moral outrage rightly invoked by such a course of action. It is not morally acceptable to force people, or deliberately deceive people, into participating in an empirical study, even if doing so would produce better results. The

¹ E.g., Railton (1986), Doeser and Kray (1986), Putnum (2002).

² See Postow (1999) for a meta-level account of how to evaluate reasons for actions.

values of human dignity and self-determination preclude such an option. This outright preclusion reflects the limits we place on the value of scientific knowledge, that some courses of action are too morally heinous to be justified by the knowledge they may produce, regardless of the quality of that knowledge.

Beliefs, on the other hand, have a more complex relationship with values than actions. I focus here only descriptive beliefs rather than normative or ethical beliefs (which may be synonymous with values). There can be difficulties *in practice* distinguishing between descriptive and normative beliefs. For example, some language terms carry implicit normative connotations with their descriptive content, thus blurring the line between the two.³ Suppose a social scientist says that a particular behavior is normal. Within his field, he simply means that the average person in the data sample exhibits this behavior. However, “normal” famously carries with it a normative dimension as well—that of being acceptable. Anyone hearing the social scientist’s statement could easily confuse the two. It would behoove us all to be clearer about the use of such terms, or to make clearer the meaning of terms so that the descriptive and normative aspects are more distinct. But the work to be done here is at the level of particular cases, rather than at the level of general norms for scientific reasoning.

The philosophical problem on which I want to focus concerns the role of values in our reasoning for accepting descriptive, scientific belief claims. It has been widely held in the past century that values have no place in reasoning about descriptive beliefs. By the 1960s, important caveats had been added to this view. First, epistemic or cognitive values were declared acceptable in the reasoning process, but social and ethical values were declared unacceptable.⁴ It was also noted that social and ethical values were acceptable in limiting choices for actions in science, for example in restricting methods by which we test descriptive claims, in directing how results were used, or even in deciding which descriptive claims were investigated. However, once an investigation

³ See Longino (1990) pp. 131-132 for a discussion of “tomboy” as a normative and a descriptive term. She suggests there that greater care with terms can help avoid the blurring between normative and descriptive connotations.

⁴ This caveat, and the ideal for value-free science that resulted, seems to have originated with the work of Isaac Levi (1960, 1962).

was underway, a sphere of purity descended (or should descend) around the investigation, keeping out the taint of social or ethical values. This view of “value-free” science was recently defended by Sandra Mitchell, when she wrote: “The values appropriate to generating *the belief* and the values appropriate to generating *the action* are different.” (Mitchell 2004, 250-251, emphasis hers) The sphere of purity should occur when one was deciding what to believe, not when deciding how to act. When deciding what to accept as properly warranted scientific belief, only proper values, *i.e.* cognitive values, should be considered.

Although this ideal for value-free science has been defended recently,⁵ epistemology proper does not seem to support the idea that some values, and not others, are legitimate when accepting what to believe. Instead, what role the values play, rather than the type of value, is more important. As John Heil pointed out in his 1983 essay “Believing What One Ought,” motives or incentives for accepting empirical claims should not be conflated with reasons that provide “epistemic *support*” for those claims. (Heil 1983, 755, emphasis his) While values may provide a motivation to believe a claim, motivational values should not be construed as providing epistemic support for a claim. Values are not the same kind of thing as evidence, and thus do not provide warrant.

Yet, as Heil suggested, we can and do have legitimate motives for shifting what counts as *sufficient* warrant for an empirical claim. Even as Heil warned against the self-deceptive, motive-driven use of values in support of empirical claims, he noted that:

There are many ways in which moral or prudential considerations can play a role in the factual conclusions one is likely to draw or the scientific pronouncements one may feel entitled to issue. We regard it as reasonable to require that a drug possessing an undetermined potential for harm pass rather more stringent tests than, for example, a new variety of hair tonic, before it is unleashed on the public. In such cases, however, we seem not be tampering with ordinary evidential norms, but simply exercising reasonable caution in issuing judgments of safety. (Heil 1983, p. 761)

A footnote in Heil’s essay elaborates this point:

⁵ In addition to Mitchell (2004), see Lacey (1999).

One checks the oil and water in one's automobile with special care before setting out on a long journey. This is not because one needs more evidence about one's automobile in such cases than in cases in which one is merely driving across town. It is rather that there is a vast difference in the consequences of one's being wrong. (ibid.)

Thus, while values cannot provide warrant for an empirical claim, values can play a legitimate role in establishing what constitutes sufficient warrant in a particular case, in determining what level of uncertainty is acceptable in that case, given concerns over the consequences of error. It is in weighing the importance of uncertainty that values have a legitimate role to play in shaping our beliefs. In sum, a distinction can be made between a direct role for values, where values provide warrant, and an indirect role, where values set the standard for the sufficiency of warrant.

It is widely chronicled that scientists must assess the sufficiency of warrant, i.e. that there is endemic uncertainty in empirical investigations, and that this uncertainty drives a chronic need for judgment in science.⁶ *Which* values are needed to help determine sufficient warrant, and how they do this, becomes then the central issue. I will argue today that the traditional answer of cognitive values only is no longer adequate. First, it must be emphasized that cognitive values cannot provide warrant in themselves, even to fill in the uncertainty gap. Consider some of the classic cognitive values, such as explanatory power, scope, or simplicity. Do they provide epistemic support for a scientific belief? Stated so baldly, it seems a poor way to proceed. A theory being simple or having explanatory power, in itself, is a dubious source of warrant. To grant such warrant would pit the cognitive values against the evidence itself. Should we discard evidence or reject a theory because it does not help, or even works against, explanatory power? To accept a theory because it is simple or has broad scope seems just as delusional, as improperly driven by motivation, as accepting a theory because one likes it better.

What of such values as empirical adequacy or internal consistency? Should not the presence of these values provide warrant? To answer this, we should consider a distinction among the traditional cognitive values suggested recently by Larry Laudan.

⁶ See Kuhn (1977) and Douglas (2000) for two different perspectives.

(Laudan 2004, 18-19) In his 2004 paper, he argues that some values have epistemic portent (they are indicative of truth-preservation) and other values do not. Truth-preserving values, Laudan suggests, include empirical adequacy and internal consistency. I want to suggest that these values are best construed as *necessary* aspects of scientific theories than as merely desirable attributes. If a theory does not meet the basic requirements of epistemic values (e.g. empirical adequacy, predictive competency, internal consistency), it is doubtful one has met the basic requirements for any scientific theory. Theories that obviously fail to match with evidence, or contain inconsistencies that allow one to predict anything from the theory, are not a good basis for empirical belief. For this reason, these values are more accurately described as baseline epistemic *criteria* for science than *values*. If a theory does not meet these criteria, it should be rejected or held in abeyance until made adequate.

With this distinction between epistemic criteria and cognitive values in hand, we can return to the issue of how *cognitive* values should play a role in scientific reasoning. If they are not reasons in themselves to accept a theory, what function do they serve? It would be naive to think that simple theories are more likely to be true than complex ones.⁷ It is not at all clear how simple the world is. Simple theories are, however, easier to work with, and easier to expound upon, being applicable to new areas more readily. Thus, if one is concerned about the acceptability of uncertainty given the evidence for a simple theory, the simplicity can be considered a *hedge* against the uncertainty—any flaws in the theory are more likely to be found sooner rather than later because the theory is easier to think with, and the theory is easier to expand into new areas. Similar reasoning can be applied to theories with broad scope or high explanatory power. Explanatory power or scope should enable scientists to make interesting new predictions—which can then be used to test the theory, hopefully reducing the uncertainty of the theory. The limitations of and potential errors in theories that exhibit cognitive values are more likely to be found out quickly, and thus a wrong choice in

⁷ It may be that to even have a coherent belief, some evidence must be discarded. In such a case, we cannot fully grapple with the world's full complexity. If this is true, we make the simplification, but we should do so acknowledging that the simplification is merely a reflection of our own limitations, and not a reflection of the way the world is.

theory will be discovered earlier rather than later. In this way, the cognitive values help one determine the sufficiency of warrant needed in a particular case, helping to weigh the acceptability of uncertainty from a disciplinary perspective. Cognitive values can play a useful role in assessing the sufficiency of warrant at a particular time, even if cognitive values cannot provide warrant to a scientific theory.

Are cognitive values sufficient for weighing the acceptability of uncertainty? These values do reflect the disciplinary commitments of scientists, to continually push forward with research, reducing uncertainty as one develops scientific theory. However, science no longer resides solely in the halls of academia, as even Heil's brief discussion above indicates. In an age when scientific knowledge is central to our public decision-making, and thus directs so much of our lives, the consequences of erroneous scientific belief extend beyond disciplinary concerns. There are real consequences to scientific error in the world, consequences from accepting false claims as sufficiently warranted, or from failing to accept true claims as sufficiently warranted. The needs of the users of scientific knowledge should have some impact on the weighing of the acceptability of uncertainties endemic to that knowledge. If so, then ethical and social values are needed throughout a scientific investigation, not just in the beginning to direct the conduct of research.

The need for ethical and social values arises from both the social use of science and from the lack of completeness of merely considering cognitive values. In some cases, cognitive values are simply irrelevant or unilluminating for the choices scientists face. Consider, for example, the judgment over how to interpret data in toxicology studies. Should one fit the data to a dose-response curve that incorporates a threshold, or should one assume a linear, non-threshold model? Cognitive values are of little help here. Neither curve clearly has more simplicity, explanatory power, or scope than the other. Both models are simple—one having a cut-off below which no adverse effects are expected, and one having a straight line through the origin of the graph. Both curves can be motivated by biochemical explanations. On the one hand, the idea of a threshold has a long tradition in toxicology, as exemplified by the old saying “the dose determines the poison.” The body has various defense mechanisms, which can protect against toxic

insults to a certain point, but beyond that point these mechanisms will be overwhelmed, producing the threshold. The linear model, on the other hand, has other biochemical explanatory underpinnings, arising from the natural variability among exposed individuals, the mixtures of stressors various individuals are under, and the awareness that it takes just one hit of a toxin under certain adverse conditions to produce illness. Cognitive values don't differentiate between these two models. Neither has more explanatory power or scope than the other. However, social and ethical values can differentiate between the two. In the face of substantial uncertainty, the linear extrapolation model is generally more protective of public health than the threshold model, while the threshold model generally protects against overregulation. If data cannot decide between the two, our concerns about the acceptability of uncertainty, and the consequences of error, can. And where cognitive values do not illuminate, social and ethical concerns do.

Although it is clear from this example that social and ethical values can be rationally, epistemically relevant to the scientific acceptance of empirical claims, it is still not clear that they are desirable, that is that we should want ethical or social values to help determine what evidence would be sufficient for the acceptance of a scientific belief. To argue this point requires the consideration of the role of the scientist in public life, and whether an adherence to a narrow construal of disciplinary considerations (*i.e.* cognitive values) would be sufficient. It seems doubtful that a narrow construal view could be defended. Scientists are taken as expert authorities on numerous topics, and rightly so (when within their area of expertise). Taking them as expert authorities is necessary because few outside of the scientific arena can understand the full nature of the complexities with which the scientist grapples and the uncertainties that lurk under scientific judgments. How is the general public to assess whether the scientist, considering only cognitive values in his work, would thereby be accurately capturing the public's concern about sufficiency of evidence given the broader consequences of error?⁸ It seems highly unlikely that traditional disciplinary concerns about sufficiency of

⁸ Cranor (1993) painstakingly makes this point, contrasting traditional scientific conservatism with public concerns about false positives versus false negatives.

warrant would act as an adequate surrogate for the public's concerns about sufficiency of warrant, when the consequences of error and the values used to weigh them are so different within and without disciplinary boundaries. Thus, we need scientists to help us consider the social and ethical consequences of error, and ultimately whether a body of evidence provides sufficient warrant given these considerations. Science should not be free of social and ethical values after all.

Arguing against the value-free ideal for science is bound to create some anxiety about the integrity of science. However, the distinction between the *roles* for values in science is what is crucial for the integrity of science as an epistemic practice. Including social and ethical values in one's determination of what counts as sufficient warrant (in determining the acceptability of uncertainty) should not be conflated with the use of values as a source of warrant. It is in this latter role that values preclude (or direct) a descriptive belief, a role that is not acceptable scientific reasoning. Although we may wish the world was not the way the evidence suggests it is, that is no reason to ignore the evidence. The values we have cannot themselves demand acceptance or rejection of the descriptive belief. Our wishing or wanting won't make it so. The evidence may challenge deeply held beliefs, but our desire to believe otherwise should have no direct role in the acceptance or rejection of that belief. As a corollary, we should not discard evidence just because we don't like it. Empirical investigations and their results must be faced squarely and honestly. We cannot hide behind our values, be they cognitive, ethical, or social.

So no values should preclude or require scientific belief, but values do help us decide what counts as sufficient warrant, in the face of uncertainty. In making these difficult judgments, values play a crucial role. Cognitive values push us towards creating theoretical systems that aid our thinking processes, and that will produce more readily testable theories. When faced with uncertainties in descriptive accounts, we can prefer accounts that exemplify cognitive values over other empirically adequate accounts, knowing that doing so will help reduce error in the long run. We don't get to reject beliefs just because our results would be, for example, simpler if we did. Instead,

cognitive values help us hedge our bets, giving preference to the more fruitful theories, theories with which it is easier to find the potential flaws.

Ethical and social values operate similarly. If we have two competing theories, we should hedge our bets, and select the one with the less harmful consequences if the theory is wrong.⁹ To elaborate on Heil's example, suppose two theories of drug toxicity are both empirically adequate and internally consistent. One suggests that the drug is safe for general use; the other that children would be at higher risk for complications when taking the drug. If there are treatment alternatives available, we could legitimately select the latter theory (until more evidence is produced) just because of our concerns about selecting the former theory and being wrong. If we have concerns of this kind, we may demand more evidence before accepting a certain belief, or demand greater care in the conducting of studies on the topic, or point to confounding factors that must be removed before we will accept a descriptive causal account. Ethical values help weigh the broad social consequences of error that would result with mistaken theory acceptance (or rejection), thus determining the sufficiency of evidence.

In sum, values can only weigh the acceptability of uncertainties when choosing descriptive belief. Neither ethical nor cognitive values are reasons in themselves for the acceptance of a scientific belief, and they should only shape what counts as sufficient warrant for such acceptance. Both values are useful in determining what happens if we choose wrong—and whether we are willing to accept the risks. What must be the case if this norm is to hold is that consequences of the belief being true, even if harmful, are no reason to not accept the belief. To explore the implications of these norms, consider some examples.

⁹ It is quite clear that all kinds of undesirable consequences can arise from the acceptance of a false belief (e.g., the belief that girls aren't as good at math as boys, or the belief that a chemical is more-- or less, alternatively-- dangerous than it really is, or that DES will help produce healthier babies). In many of these cases it is quite clear what harmful consequences will result if we get something wrong, and so, weighing those potential harms, we may reasonably decide to proceed with greater caution in the formation of our beliefs.

Example 1: Consider the issue of global climate change. If the anthropogenic theory of climate change and its attendant predictions are accurate, then humans are altering the climate of the planet. While the alterations may be beneficial to some, they will happen too rapidly for most of the human population and particularly for the natural resources and ecosystems on which they depend. Many people will be harmed, as will many species of plants and animals, greatly impoverishing the planet. In millions of years, this damage can be undone, but it is likely that in the next thousand years, climate change would on balance increase human suffering. The consequences of believing this to be true may include depression at man's fate, frustration with the world's governments, distress at the idea that humans can mess up the entire planet, and so forth. None of these harmful consequences are relevant, however, as to whether or not one should accept the belief that humans are altering the global climate. The theory may also be very complex and hard to test. If the theory is true, however, its complexity is no reason to reject it. (Similar reasoning would apply to scope or explanatory power, although worries about these values do not seem applicable for this case.)

But if the theory of anthropogenic climate change is false, its complexity may make testing more difficult, and this may be a reason to consider simpler alternative theories first (if any simpler, empirically adequate theories are available). In addition, if we act on the basis of the theory and it is false, we may be unnecessarily restricting the use of fossil fuels. On the other hand, if we reject the theory of anthropogenic climate change on the basis that the currently available evidence provides insufficient warrant, and the theory is true, we doom humanity to the suffering sketched above. Given the uncertainties of the theory, which values should have more weight should be central to the debate over climate change. In addition, as more evidence develops, which competitor theories remain empirically adequate is central to the choice of descriptive belief. Valuation of the consequences of accepting a true theory (or rejecting a false one) are irrelevant; valuation of the consequences of accepting a false theory (or rejecting a true one) for scientists and society as a whole are not.

Example 2: Consider a more nefarious example, that of genetically engineered infectious diseases designed to target ethnic groups. As our understanding of the human genome develops, and ethnologists conduct studies to map human genetic variation and to track the history of human development, the possibility of uncovering genetic markers for various ethnic groups increases. If these markers are clearly isolated and accepted as reliable, one possible consequence of this acceptance of belief in such markers is the possibility of someone using them to construct bioterror weapons that could target various ethnic groups. Designer bugs created to wipe out hated ethnic groups is an ugly and frightening way to produce genocides. But this is only a possible consequence if we accept the evidence for the ethnic markers as reliable, if we believe in the existence of these markers. Should this nightmarish scenario dissuade us from such belief in ethnic markers? It seems not. We may decide not to develop the expertise or knowledge needed to create such weapons, but refusing to pursue a course of research because of the risks of such knowledge is not equivalent to refusing to believe in the possibility of such knowledge because of the implications if the claim is accepted as true. The harmful consequences of the knowledge if true are not relevant to the acceptance of the knowledge. However, the harmful consequences of specific pieces of knowledge may be a good reason not to pursue the *action* of a particular research program that would develop that knowledge. Valuation of consequences can preclude action, but not belief.

Example 3: Suppose evidence was gathered that suggested that humans have no free will, that our sense of self-determination was an electrochemical sham, and that in fact strict determinism unrelated to human choice ruled human action. Would this be a case where the consequences of accepting a belief when it is true are so horrible that we should avoid the belief? Even in this case, no. If it is true that humans have no free will, then the loss of belief in such a world would have no effect on our choices. We don't *have* any choices, in such a world. The worry with this belief is rather if it is accepted and proves false. That would indeed be disastrous, and thus places a high burden of proof on anyone who would try to convince us of such a view. But there are no consequences of adopting the belief if it is true, for if it is true, there are no human

choices to be made. Once again, the consequences of the acceptance of a true belief are irrelevant to whether we should accept the belief.

In all of these cases, valuation of the consequences that follow from accepting a belief that proves true are not relevant to the decision of whether to accept the belief. Such consequences may be motives, as Heil noted, but they are not reasons. Valuation of the consequences that follow from accepting a belief that proves false (or rejecting a belief that proves true) are relevant. This fundamental asymmetry allows (and sometimes requires) that we consider values of all kinds when choosing our beliefs. But those values can never preclude our scientific beliefs outright. Valuing the consequences of being right are irrelevant to the choice of belief. Only valuing the consequences of being wrong are relevant.

If social and ethical values are needed to make responsible scientific judgments, one might worry that an inclusion of these values could devastate the epistemic integrity of science. However, constraining values to evaluating the sufficiency of warrant, rather than acting as a source of warrant, protects the needed epistemic integrity. The boundary that protects science is thus not a boundary about the kinds of values in science, but a boundary about what role these values play in our reasoning. We do not need to strictly sort the cognitive from the ethical. We need, rather, to keep clear the distinction between beliefs and actions, and the distinction between values as reasons in themselves and values for weighing the sufficiency of evidence. This means that reducing uncertainty reduces the role for values (both ethical and cognitive) in scientific reasoning. But because uncertainty in science is ineliminable, so to are the values needed to weigh the sufficiency of evidence.

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