

## **Virtues of ‘values’ and ‘virtues’: on theoretical virtues and the aim of science**

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Mousa Mohammadian

[mousa.mohammadian@ahduni.edu.in](mailto:mousa.mohammadian@ahduni.edu.in)

School of Arts and Sciences

Ahmedabad University

Ahmedabad, India

Consider the following list: empirical fit with available evidence, accuracy, explanatory power, unification, internal consistency, external consistency with well-established scientific theories, simplicity, broad scope, and non-ad hocness. Normally, I tend to call the items on this list ‘theoretical virtues’. They are also known as ‘epistemic values’ or ‘epistemic virtues’. For now, however, let us just call them ‘Items’. There is a wide consensus among scientists and philosophers of science that Items are good and desirable characteristics for a scientific theory.

John Norton's *The Material Theory of Induction* is a fantastic book, covering a wide range of topics each worthy of extensive discussions. One of them is Norton's account of Items which has two major components. First, a positive component in which he shows how his material theory of induction accommodates Items such as simplicity (Chapters 6 and 7) and explanatory power (Chapters 8 and 9). Second, a negative component in which he lays out his arguments against calling Items 'virtues' or 'values' (Chapter 5). Although Norton structures his arguments primarily around (Kuhn 1977), as we shall see his criticism goes well beyond it. This negative component is the focus of this paper.

Norton's critique of calling Items 'values' or 'virtues' might look like a mere verbal disagreement. But if the history of analytic philosophy has taught us two lessons, one is that misusing words results in misunderstanding. The other lesson is "Make the right distinctions!" By making two important distinctions, Norton argues that calling Items 'values' and 'virtues' has indeed resulted in misunderstandings about their role in inductive reasoning in science.

First, Norton mentions the distinction between an aim and a means. This important distinction is the foundation of instrumental rationality which is the framework in which scientific rationality is generally understood (Hempel 1979; Newton-Smith 1981; Thagard 2004). According to Norton's first argument:

- P1 An aim is wanted for its own sake but a means is wanted for the sake of achieving or getting closer to the aim.
- P2 Items are not wanted for their own sake but they are wanted for the sake of getting closer to truth, which is the aim of inductive inference in science.
- P3 Values and virtues are wanted for their own sake.
- C1 Therefore, Items are not values or virtues.

Second, Norton makes a distinction between what is imposed on a community from outside and what is freely chosen by a community. Based on this distinction, he offers his second argument:

P4 Whether something is an Item or not is *not* a matter of free choice.

P5 Values and virtues are freely chosen.

C2 Therefore, Items are not values or virtues.

Instead of ‘values’ or ‘virtues’, Norton suggests that we should call Items ‘criteria’ because, first, unlike aims and like means, criteria are wanted for the sake of something else, namely, for the sake of what they are the criteria *for*. Moreover, criteria cannot be freely chosen. They are dictated by what they are the criteria *for*.

My discussion of Norton’s first argument focuses on *P2*. Norton claims that the aim of inductive inference in science is getting closer to the truth because, apparently, he believes that the only other option is something very unappealing and deeply problematic, namely, *skeptical relativism*. I share Norton’s dislike of skeptical relativism. But to oppose relativism, one does not have to admit that the aim of inductive inference in science (or, henceforth, simply ‘the aim of science’) is truth and the Items cannot be constitutive of the aim of science. One can be an antirealist and deny that the aim of science is truth and reject relativism at the same time. For instance, instrumentalists deny that truth is the aim of science and do not even accept that the claims of our best scientific theories about unobservable entities are true. Yet, many of them do not subscribe to any form of skeptical relativism. Prominent figures in science and philosophy of science like Duhem, Poincaré, Mach, Bridgman (not to mention logical empiricists) were instrumentalist but not skeptical relativists. More recently, philosophers like Stanford (2006) and Rowbottom (2019) have defended instrumentalist accounts that are not relativistic at all. The distinction between

antirealism versus realism does not coincide with the distinction between relativism versus anti-relativism.

So, we might dispense with truth as the aim of science without falling for skeptical relativism. Furthermore, I argue that a viable formulation for the aim of science in terms of the Items is possible, has some important merits, and will not make us susceptible to skeptical relativism. This will show that Norton's first argument is unsound.

I lay the foundation of my proposal on Hempel's "avowedly oversimplified construal" of the aim of science: "science aims at establishing a sequence of increasingly comprehensive and accurate systems of empirical knowledge" (1979, 51). This account of the aim of science can be easily rephrased in terms of some Items. Accuracy and empirical fit are quite clear. Increasing comprehensiveness of the systems of empirical knowledge can also be understood in terms of some Items. For Hempel, such systems consist in sets of propositions. One obvious way to make such systems more comprehensive is increasing their scope by adding new propositions that cover new phenomena. The less obvious but more interesting way of making the system more comprehensive is increasing its explanatory power. After all, according to Hempel's deductive-nomological account of scientific explanations, increasing comprehensiveness and increasing explanatory power are two sides of the same coin. A system becomes more comprehensive and achieves more explanatory power for the same reason, namely, containing more general or more fundamental laws of nature so that propositions covering a broader range of phenomena can be deduced from it.

For "a fuller characterization of the goals of scientific theorizing" (Hempel 1979, 52), Hempel basically adds more Items to his formulation. There are only two exceptions. Hempel considers simplicity and internal consistency not as constituents of the aim of science, but as mere means of achieving it. I disagree. I have argued elsewhere (Mohammadian 2021) that if some Items are the constituents of the aim of science, then simplicity cannot be a mere

means. I will not repeat my arguments here. However, it is worth mentioning that I will not be surprised if Norton's account of simplicity (especially in Chapter 6) can be used to argue against an instrumentalist view of simplicity. Apparently, Hempel's main motivation for defending this view is that unlike accuracy or scope, he considers simplicity a *nonempirical* Item that is independent of empirical facts. But for Norton, simplicity used properly is a "surrogate for background facts or assumptions whose content functions to license the relevant inductive inference" (173). If simplicity is related to facts, even indirectly, Hempel loses a major motivation to think of it as a mere means for achieving other Items.

Now let us build on the foundation provided by Hempel. I propose that *all* Items are constitutive of the aim of science. That is,

P6 Science aims at producing theories with the highest possible degrees of all Items.

Some clarifications: first, Items can be exemplified in different degrees. A theory can achieve higher and higher degrees of explanatory power by suggesting more and more fundamental laws, causes, and mechanisms. Similarly, a theory can instantiate greater or lesser degrees of accuracy, simplicity, scope, etc. So we can say that theory *T1* instantiates some Items "better" than theory *T2* does when *T1* instantiates *more* Items than *T2* does and/or it instantiates *higher degrees* of Items than *T2* does.

Second, probably under the influence of Kuhn and the problem of underdetermination, most discussions in the literature about comparing theories' exemplifications of Items pertain to comparing *rival* theories such as heliocentric versus geocentric systems. But mostly scientific theorizing is not about "theory choice" in this sense. Rather, it is about "theory development" or making an already selected theory better. In this case, the object of comparison is one theory at different stages of its development.

Third, both in theory choice and in theory development there might be trade-offs between Items. For instance, a theory might be less simple but broader in scope than a rival. Or, in the course of its development, a theory might get less simple but more accurate. Should we select the theory that is less simple but broader in scope or its rival? Is it justifiable to develop a theory in such a way that it becomes far more complex but a little bit more accurate? In many such trade-offs, there is no algorithmic or formal procedure to follow. This is one point on which Norton agrees with Kuhn. Kuhn stops with this negative answer but Norton offers a solution as part of his material theory of induction: in many cases, facts do dictate the right decision (see, for instance, Norton's discussion of the heliocentric versus geocentric systems (156-158)).

I discuss two important merits of *P6* here. First, it is more complete and, crucially, more telling than the puzzle-solving or problem-solving accounts of the aim of science suggested by Kuhn and Laudan. More complete because it includes *all* Items and more telling because it does not disguise the important role of Items in scientific theorizing behind obscure terms like 'puzzle' or 'problem'. When Laudan clarifies what he means by 'problem' (1981; 1984), or when Hacking (2012) clarifies what Kuhn means by 'puzzle', it becomes clear that an increase in the problem-solving or puzzle-solving ability of a theory is nothing but an improvement in its Items.

An objection might be raised here. Kuhn and Laudan are not realists. If van Fraassen's (1980) formulation of the realism versus antirealism debate is correct, these two camps disagree about the aim of science. Antirealists like Kuhn and Laudan might be fine with *P6* but realists want *truth*. Here comes the second merit of *P6*. Despite some appearances, it is fully consistent with scientific realism.

Realists concede that a theory is true only if it is *mature* and *successful*. And once we demand realists to clarify what they mean by 'mature' and 'successful', their answer usually

boils down to instantiating impressive degrees of many Items. A theory is deemed to be true if it is very accurate, explanatorily powerful, internally consistent, externally consistent with well-established scientific theories, unifying, etc. This is just the gist of the no-miracle argument: if a theory instantiates impressive degrees of many Items, it should be true. Otherwise, it would be a miracle.

So, according to realists, truth *explains* a theory's instantiation of impressive degrees of many Items. Interestingly, however, if we ask a realist "Why do you think that this theory is true?" their answer is "*Because* the theory instantiates impressive degrees of many Items." Are we in a vicious circle here? Why truth? Because impressive degrees of many Items. Why impressive degrees of many Items? Because truth. I do not think so. Here we are talking about two different kinds of explanations. When we say that a theory is true *because* it instantiates impressive degrees of many Items, we are providing an *epistemological* explanation or a justification for *our belief* in the theory's truth. But when we say that a theory instantiates impressive degrees of many Items *because* it is true, we provide a *metaphysical* explanation for the theory's success. We are saying that the theory succeeds in instantiating impressive degrees of many Items *because* the world really is like what the theory describes. This provides a neat formulation for the relation between the Items and the truth. Impressive degrees of many Items form the epistemological justification for truth, truth is the metaphysical explanation for impressive degrees of many Items. Realism is not denying *P6*, it is committing to a metaphysical explanation for achieving it.

In summary, to avoid skeptical relativism, one need not think that the aim of science must be truth. And to be a realist, one need not deny that the Items are constitutive of the aim of science. If my arguments are sound, then instantiating higher degrees of Items can be esteemed for its own sake in the same way that becoming more virtuous can be esteemed for its own sake. Items can be thought of as virtues.

This brings us to Norton's second argument against calling Items 'values' or 'virtues'. My discussion of this argument focuses on *P5*. I agree with Norton that Items cannot be "freely chosen" (154) and the world powerfully constrains them. But Norton also claims that "we are not forced by *reason alone* to the values we adopt. We choose them and enjoy *considerable freedom* in the selection" (167, my emphasis). I am not convinced that values and virtues can be so "freely" chosen that it becomes misleading to call Items 'values' or 'virtues'. Unless one adopts a skeptical relativistic view about values and virtues, I just do not see how reason alone cannot bar them from adopting racism or misogyny as values or injustice and dishonesty as virtues. I would be surprised if Norton endorses skeptical relativism about values and virtues.

Granted that we have a level of freedom in choosing values and virtues that is not present when it comes to Items. But I do not think that the difference is considerable enough to simply make values and virtues matters of free choice. Consider Norton's example about going to war. The pacifists oppose it because according to their value judgment killing is wrong in all circumstances. The militarists support it because according to their value judgment "some killing is warranted to preserve sovereignty" (168). Norton claims that this dispute is irresolvable because the two parties can freely choose their values. But if the two parties are to be deemed *rational* and *reasonable*, their freedom is quite limited. First, even for militarists killing is not *absolutely* warranted. If someone says that we should go to war because killing is just good, we will not say that they have different values. We just consider them irrational or corrupt. Second, we do not expect a *reasonable* militarist to say that to preserve sovereignty, killing the enemy's children and elderly is also warranted. Killing should be limited to the enemy's soldiers and not even all of them. If someone freely chooses to kill an injured soldier who poses no threats, we would not say that what they did is okay because their values might be different. We would say that they are evil and wicked. So if we

want to be moral and virtuous, our ethical values and virtues cannot be as freely chosen as Norton suggests. Therefore, it is not clear that the freedom that we enjoy in selecting values and virtues is considerable enough to make ‘values’ and ‘virtues’ unsuitable for Items.

And finally, Norton’s *The Material Theory of Induction* has many virtues that I could not discuss here. One, however, should be mentioned: as someone who teaches philosophy in a “Global South” country, I hope more scholars follow John Norton in publishing their high-quality books in Open Access series.

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