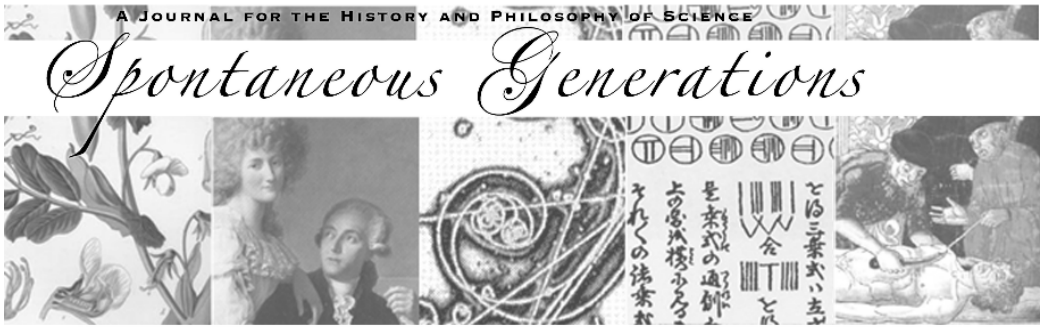

Motives for Research

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Focused Discussion Invited Paper

Motives for Research*

Arthur Fine†,‡

Some facts on which we can agree: no epistemic argument supports a robust form of realism in general as against an equally robust form of antirealism. For example, none of "provides a better explanation for," or "accounts better for the success of," or "makes more intelligible than" tilts the balance in general one way or another. But are there perhaps heuristic arguments? Einstein, famously, encountered calculations by Lorentz using an auxiliary temporal variable, took them realistically, and so was led to the "proper time" of special relativity. And he did it again, turning Planck's expedient of fictional clumps of emitted energy (which need not "really exist somewhere in nature") into the "light quanta" that account for the photoelectric effect and that we know today as photons. In these circumstances a realist attitude seems to have motivated work that led to significant scientific progress. Exactly the opposite seems to have been true in subsequent developments concerning the quantum theory, where the positivism or instrumentalism of Bohr, Heisenberg, and Pauli marked out progressive paths as against the realist ideas of Schrödinger, de Broglie, or Einstein.[1] So with respect to realism and antirealism there may be times to reap and times to sow. Really?

I don't think so. That is, I do not think there are reliable "best practice" guides that link generic scientific tasks (build theories, measure parameters, look for novel phenomena, etc.) with meta-attitudes like realism, or instrumentalism, or empiricism. Except for the Feyerabendian "anything goes" (or as I prefer "anything might go"), there are no dialectical laws for scientific practice. Just as realism (along with other metaphysical attitudes) fails to be rationally required for understanding science, it also fails in a general or generic way to be required for doing science ("scientific progress").

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‡ This is the title of Einstein's 26 April 1918 address in honor of Max Planck's sixtieth birthday: *Motive des Forschens.*

[1] See Ryckman (2017) for a proper account of these episodes.

Here is why. Suppose that Hendrik proposes a way to calculate the apparent shrinkage that a moving rod seems to undergo in the direction of motion. His calculation uses a certain auxiliary variable t'. Albert, struggling to take in the basis for the novel calculation, thinks (realism) that maybe t'-time with respect to the moving rod really is different from t-time on the stationary reference system. *Voila*! Special relativity. But Mileva, working alongside Albert, notes that doing things Albert's way—including how one might go further (for example by trying to connect energy and rest mass in one nifty equation)—would be just as well motivated by the thought that t'-time is a good (useful, reliable) way of treating time with respect to the moving rod. No further attitude about the "reality" of times yields further dividends in terms of motivation. The same is true with respect to Max and Albert over the quanta of energy. Real? Useful fictions? It does not matter for doing good work.

This line of argument is much the same as the indifference argument of the Natural Ontological Attitude (NOA) that matches realist moves with antirealist moves in their endless *pas de deux* over how best to understand science (Fine 1986). The claim here is that indifference applies to motivation as well as to understanding. Of course Mileva does not deny that in fact Albert's penchant for realism contributed to his pursuit of light quanta. Nor would she deny that it played a role in his later dissent from the quantum theory, where he did not pursue developments. The claim is that other attitudes could have had much the same motivational force. This is like the position of constructive empiricism with respect to explanation: if the search for explanation does generally lead to empirical adequacy, then the constructive empiricist who knows this has as much motivation to pursue explanations as does an explanation-hungry realist. And the point of the claim is to subvert any argument that says if you want progress here it would be better to be a[n] —ist.

In a thoughtful examination of these issues, Robin Hendry (2001) agrees about parity in the arguments over how "best" to understand science but denies that this parity entails indifference of motivation. Curtis Forbes (2016) makes a similar move, supporting it with a perceptive study of how different meta-attitudes affected nineteenth century electrodynamics (in the cases of Weber, Helmholtz, and Maxwell). The parity in arguments over understanding scientific practice, they think, does not extend to motivations because there are practices that may involve beliefs and inferences only available to one party (say realists, or instrumentalists) and hence could not be motivated otherwise. Hendry concentrates his argument on two practices: conjoining theories and accepting multiple incompatible models. The idea is that only realists will want to conjoin theories and only antirealists will want to work with incompatible models. So where these practices occur they

point differentially, either to realism or to antirealism, in terms of motivation. But do they? Take conjunction first. The instrumentalist wants theories that work, not just in terms of predicting the phenomena (or empirical adequacy) but also in terms of other virtues, like fruitfulness, for example, in connecting usefully with other theories or models. I call theories with the desired virtues "reliable" (Fine 2001). It follows that an instrumentalist who looks to each of theories X and Y as being reliable has reason to think that connecting them will be reliable as well, and so to pursue the conjunction. As for incompatible models, the realist of course cannot accept incompatibles as true. The instrumentalist is in a similar boat since incompatibles cannot both be reliable. But both realists and instrumentalists can expect to learn from incompatibles how to pursue their respective goals (truth, reliability) better, and meanwhile they can make the best (in their own terms) of what they have. There are no compelling arguments here, as elsewhere, that show important general differences between decent realist or antirealist attitudes either in understanding or in motivating practice.

What then of beliefs and inferences that might make a difference? Certainly if I believe that there are nano-widgets and that they are important scientifically, I (may) have good reason to try to find and measure them. (I say "may" since I might be engaged elsewhere.) If I don't believe in nano-anythings, you might think I have no reason to search for nano-widgets, surely not in order to measure them. But suppose I believe that searching for nano-widgets and their measures could be scientifically useful. Maybe the experimental techniques themselves would be valuable in developing new tools of research. Maybe the search seems likely to turn up important, reliable information (though probably not about nano-widgets). Maybe, an excellent way to understand the big-widgets all around us is to model them using the fiction of nano-widgets, and the search will help to improve the model. John Dewey, in the course of a spirited rejection of what we call the "pessimistic meta-induction," highlights just such considerations:

> But the very putting of the question ... induces modification of existing intellectual habits, standpoints, and aims. Wrestling with the problem, there is evolution of new technique to control inquiry, there is search for new facts, institution of new types of experimentation; there is gain in the methodic control of experience. And all this is progress. (Dewey 1916, 101)[2]

[2] Dewey continues, "It is only the worn-out cynic, the devitalized sensualist, and the fanatical dogmatist who interpret the continuous change of science as proving that, since each successive statement is wrong, the whole record is error and folly; and that the present truth is only the error not yet found out." (Dewey 1916, 101)

In line with Dewey, I see no practice motivated by a search for truth that could not be motivated just as strongly in a quest for reliability. Parity between truth and reliability marks a permanent impasse in arguments between realists and instrumentalists. The impasse does not disappear when it comes to motivations.

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