The Illusion of Scientific Realism: An Argument for Scientific Soft Antirealism

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Introduction

Throughout the history of science, arguments have emerged about science's ability or non-ability to actually describe reality. Some may be tempted to think from the outset that this is a trivial matter and therefore should not be discussed as it would be a waste of time. Additionally, some may think that this controversy is really not a problem and is therefore easy to decide that the conclusions of science do in fact reflect reality. However, these two separate sentiments are not rationally or historically well grounded. The heated arguments in regards to scientific realism are "centrally connected to almost everything else in the philosophy of science, for they concern the very nature of scientific knowledge."[1] Scientific realism could be defined as a positive epistemological attitude towards the content of our best theories and models, advocating beliefs in both observable and non-observable aspects of the world described by the individual branches of science. This epistemic approach has far reaching metaphysical and semantic implications. Consequently, these various commitments are challenged by a number of rival epistemologies and theories of science, known today collectively as forms of scientific antirealism.[2]

Thesis

During the course of the development of science and the resulting technology, many have claimed that their findings reflect, correlate, and demonstrate the way the world actually is. Science has now moved into the realm of ontology. This is a bold and powerful assertion. Hence, it is the aim of this essay to evaluate whether or not these claims (and others like it) are well founded or rationally justified.

The Three Pillars of Scientific Realism

Scientific realism could be said to be a positive outlook about the realistic nature of our best scientific theories. But, one may ask, what does that actually mean? In order to be explicit about what realism is in regards to science, it is helpful to think of it in terms of three different categories: a metaphysical category, a semantic category, and an epistemological category.

1 Chakravartty, Anjan. "Scientific Realism." The Stanford Encyclopedia of Philosophy. Spring ed. 2014.

2 This is a summary taken from: Hear, Anthony. "2." In Introduction to the Philosophy of Science. Oxford: Clarendon Press, 1989.

From the metaphysical viewpoint, one must clearly understand that realism is committed to the 'mind independent' existence of the world (meaning this believes in an external world). Therefore, scientific realists believe that the entities they are studying are actually metaphysical entities outside of one's mind. This is in stark contrast to other metaphysical notions. For instance, this assertion is rejected by any position that falls under 'idealism' (including some forms of phenomenology), which states that there is no external world; everything is thus dependent upon the mind. However, this kind of idealism is rarely encountered within philosophy of science. Yet, there remain other more common views which reject the mind-independence premise that are very prominent in the field of philosophy of science. One such notion is the neo-Kantian view of the nature of scientific knowledge, which wholly denies that the world of our experience is mind-independent. The dispute here is that the world investigated by the sciences (as distinct from the world itself) is in some sense dependent on the ideas one brings to the scientific investigation itself. For realists, objects must be independent of the mind in order for them to do science in the way it is done. However, as it has been argued, the independence and the resulting existence of mind-independent entities is a very controversial philosophical stance. One should not, therefore, assume that realism is on non-controversial ground with the acceptance of this base axiom.

Moving forward, scientific realism (from now on, when I say 'realism' I mean 'scientific realism'), is semantically dedicated to a literal explanation of scientific claims about the world. It is therefore common practice for realists to take hypothetical or theoretical statements at face value. Accordingly, the claims that are made about scientific entities, processes, properties, and relations (whether they be observable or unobservable), should be seen literally as having truth-values, regardless of whether they are true or false.[3] This semantic adherence contrasts mostly with the instrumentalists, who interpret descriptions of the unobservable simply as instruments for the prediction of observable phenomena, or merely for systematizing observation reports. That is all. Generally, instrumentalists maintain that assertions about unobservable things have no actual literal meaning at all. Rather, they are some kind of convenient fiction created by us to explain the data of phenomena. They do not however state that such assertions are therefore meaningless or useless. Accordingly, it is not always apparent whether or not it is a good and rational epistemological criteria to take things at face value in this way.

Lastly, our final category of realism states that, epistemologically, realism is devoted to the idea that theoretical claims can actually create knowledge of the world. This contrasts with many common levels of degrees of skeptical views. These positions advocate to varying degrees of extremes, that:

Even if they were to grant the metaphysical and semantic dimensions of realism, doubt that scientific investigation is epistemologically powerful enough to yield such knowledge, or, as in the case of some antirealist positions, insist that it is only powerful enough to yield knowledge regarding observables.[4]

3 This is a basic summary from: Heller, Micha. Encountering the Universe. Tucson, Ariz.: Pachart Pub. House, 1982. 50.

4 Hacking, Ian. Representing and Intervening: Introductory Topics in the Philosophy of Natural Science. Cambridge Cambridgeshire: Cambridge University Press, 1983. 47.

However, the epistemological category of realism is not always clear on this point. For example, while many realists adhere to the truth (or at minimum, the approximate truth) of theories understood in terms of some version of the correspondence theory of truth, some do not. Nevertheless, a good general stance for realism is widely agreed upon: our best scientific theories give true or approximately true descriptions of observable and unobservable aspects of the existence of a mind-independent world.[5]

Epistemic Achievements versus Epistemic Aims

The most common way realism is understood is in terms of the epistemic achievements established by scientific theories. From this approach, realism is a philosophical position concerning the actual epistemological status of theories, which is described in a variety of ways. For instance, many define scientific realism in terms of the truth or approximate truth of scientific theories (or certain aspects of those theories). Others define it in terms of the successful references it makes of theoretical terms to things in the world, both observable and unobservable. Still other groups define scientific realism not in terms of truth or reference, but in terms of belief in the ontology of scientific theories. What all of these approaches have in common is a commitment to the idea that our best theories have a certain epistemic status: they yield knowledge of aspects of the world, including unobservable aspects.[6]

Additionally, another way to think about realism is in terms of the epistemic aims of scientific methods of inquiry. In other words, there are some that think of the view in terms of what science aims to do: the scientific realist holds that science aims to produce true descriptions of things in the world (or approximately true descriptions).[7] It should be noted here that there is a weak implication that arises from this fact, the effect being that if science aims at truth within scientific practice (and if it is at all successful), the characterization of realism in terms of aims could entail some form of characterization of achievement. However, this is not a necessary implication, because defining realism in terms of aims for truth does not, in and of itself, claim anything about the success of scientific practice in this regard. Consequently, it is important to decide upon what grounds one will characterize realism because it will drastically affect the outcomes of the whole scientific enterprise.

The Miracle Argument

The most powerful insight motivating realism is not a new idea, rather it is a very old one. This idea is commonly known in recent discourse as the miracle argument. It posits that realism "is the only philosophy that doesn't make the success of science a miracle."[8] The argument starts with the widely accepted assumption or premise that our best theories are extremely successful—they enable empirical predictions and explanations of scientific investigations, with the result often marked by incredible accuracy. So, one could ask, what is it that justifies this success? One possible

5 I got some of the general ideas and thoughts from: Blackburn, Simon. "Scientific Realism." Oxford Dictionary of Philosophy. 201st ed. Oxford University Press, 2008. 455-56.

6 I gleaned many ideas for this paragraph from: Chakravartty, Anjan. "Scientific Realism." The Stanford Encyclopedia of Philosophy. Spring ed. 2014.

7 Fraassen, Bas C. "Introduction." In The Scientific Image, 8. Oxford: Clarendon Press, 1980.

8 Putnam, Hilary. Mind, Language, and Reality. Cambridge England: Cambridge University Press, 1975. 73.

explanation often used by realists, is that our best theories are in fact true (or at the very least approximately true). It is clear, the realists argue, that if these theories were not close to the truth, the fact that they are so successful would be a miracle. But, since they are obviously not a miracle, one can infer rationally that they must be true instead (or approximately true). This is the crux of their argument.

Critique of the Miracle Argument

Even though this is a powerful common-sense argument, it is not without fault. The miracle argument could be critiqued in a number of ways. First, one could use a skeptical line of reasoning to question the very need for an explanation of the success of science. For instance, van Fraassen states:

Successful theories are analogous to well-adapted organisms—since only successful theories (organisms) survive, it is hardly surprising that our theories are successful, and therefore, there is no demand here for an explanation of success...[One] might wonder, for instance, why a particular theory is successful (as opposed to why theories in general are successful), and the explanation sought may turn on specific features of the theory itself, including its descriptions of unobservables.[9]

Whether such explanations need be true, though, is a matter of debate. While most theories of explanation require that "the explanans be true, pragmatic theories of explanation do not"[10] however. More generally, any epistemology of science that does not accept one or more of the three dimensions of realism (commitment to a mind-independent world, literal semantics, and epistemic access to unobservables) will thereby present a strong reason for resisting the miracle argument. On the other hand, one does not have to merely disagree with the foundational axioms of realism in order to disbelieve or find the miracle argument unsatisfactory.

Some philosophers suggest that the miracle argument itself is an instance of fallacious reasoning, in particular committing the base rate fallacy.[11] So, consider the following demonstration given by Peter Lipton:

There is a test for a disease for which the rate of false negatives (negative results in cases where the disease is present) is zero, and the rate of false positives (positive results in cases where the disease is absent) is one in ten (that is, disease-free individuals test positive 10% of the time). If one tests positive, what are the chances that one has the disease? It would be a mistake to conclude that, based on the rate of false positives, the probability is 90%, for the actual probability depends on some further, crucial information: the base rate of the disease in the population (the proportion of people having it). The lower the incidence of the disease at large, the lower the probability that a positive result signals the presence of the disease. By analogy, using the success of a scientific theory as an indicator of its approximate truth (assuming a low rate of false positives—cases in which theories far from the truth are nonetheless successful) is arguably, likewise, an instance of the base rate fallacy.[12]

9 Fraassen, Bas C. "3." In Images of Science: Essays on Realism and Empiricism, with a Reply from Bas C. Van Fraassen, 51. Chicago: University of Chicago Press, 1985.
10 Fraassen, Bas C. "3." In Images of Science: Essays on Realism and Empiricism, with a Reply from Bas C. Van Fraassen, 55. Chicago: University of Chicago Press, 1985.
11 Howson, Colin. "Chapter 3." In Induction: Hume's Problem. Oxford: Clarendon, 2000.
12 Lipton, Peter. Inference to the Best Explanation. 2nd ed. London: Routledge/Taylor and Francis Group, 2004. 196-197.

Therefore, the success of a theory does not by itself reasonably posit that it is likely approximately true, and since there is no independent way of knowing the base rate of approximately true theories, the chances of it being approximately true cannot be assessed. I contend that this line of reasoning is cogent, and thus overcomes the objections the realists employ against the anti-realists' reply to the miracle argument.

The Argument from Corroboration

In the scientific world, there are many methods that scientists employ to make sure their proposed theories are true, correct, and adequate. One fact that lends credence to the realist interpretation of science is the existence of corroboration. If a theory can produce more than one distinct type of evidence (normally through instrumentation) of a proposed entity, then the combined verification adds to the probability of it really existing. For instance, Ian Hacking gives the example of:

[Dense] bodies in red blood platelets that are detected by using different forms of microscopy. Different techniques of detection, such as those employed in light microscopy and transmission electron microscopy, make use of very different sorts of physical processes, and these operations are described theoretically in terms of correspondingly different causal mechanisms.[13]

Thus, the argument from corroboration can be outlined as follows:

- If an entity can be detected by some kind of method, technique, or instrument then it is most likely real.
- If that same entity can be detected by a different kind of apparatus in addition to the original, then it is highly unlikely that this is just a mere coincidence.
- Therefore, if some kind of entity can be detected by two or more methods, techniques, and instruments (or a combination of any of those listed), then that entity can be reasonably believed in.

This argument brings to light one of realism's greatest appeals—the supposed common sense of its position. For most things in life, the fact of corroboration would be a sufficient criterion to establish one's belief. However, 'science' is not most things, nor does it claim to be like other methods, disciplines, or pursuits. Science likes to distinguish itself, and in a round-about way (although it doesn't always) prides itself as the standard of rationality. Therefore, not just any kind of common-sense appeal will suffice.

Critique of the Argument from Corroboration

As appealing as the above argument is to mankind's common reason, common sense does not always serve as a reliable guide to truth. In fact, it is extremely difficult to determine philosophically what qualifies something to be common sense in the first place. Further, why does some argument, idea, or theory gain respect and adherents for the mere fact of its basic explanatory nature? Often, many (or most) theories that are accepted as true in science today are not intuitively apparent or easy to understand in the first place. For instance, the biological theory of evolution is not in the least congruent to one's base intuitions. Or consider the heliocentric cosmology model proposed by science. This model does not in the least seem to play by

13 Hacking, Ian. Representing and Intervening: Introductory Topics in the Philosophy of Natural Science. Cambridge Cambridgeshire: Cambridge University Press, 1983. 201.

the rules of common sense (which historically was one of the major reasons why it was rejected or resisted for so long). Additionally, our current modern theories of optics are far beyond and incompatible with foundational assumptions, thoughts or ideas of how vision should work based off of our phenomenal experience. The list could go on and on, illustrating how the best theories of modern science in every branch, often defy all of the unspoken laws of common sense. So, if one were to claim that science follows the common intuitions of humanity, one would be very wrong indeed. Therefore, the mere ability of a theory to appeal to common sense really does not do much for that theory in reality. Nor does it thereby guarantee that the proposed theory is more real or more probable. Things are not always what they seem.

A further objection could be stated against the corroboration argument specifically. Often, techniques are developed because one suspects there might be some kind of entity to be detected. Methods of detection are therefore constructed directly for the purpose or the intention of reproducing these postulated outputs (entities). This means that the discovery of such entities come forth because of "theory-laden observations" rather than by actual discovery. Anyone can theoretically posit some kind of an entity (such as an atom) which then is substituted into a working model that can explain the supposed phenomena being observed. As a result, the discovery only exists within the model itself, not necessarily (both in the scientific and the logical meaning) in the external world. This is not to say that all theories fall under this criticism. However, if atoms, neutrons, or protons only exist inside a computer-generated model (or any kind of model) then it is highly dubious whether or not they exist outside the asserted model. Consequently, it does not matter how many instances of corroboration one can demonstrate for the existence of a said entity, because if that entity can't be demonstrated outside of the instruments developed for the direct purpose of its detection, then it is not objectively decidable whether or not the entity exists.

Conclusion

Science is important, no doubt about it. One would be silly and naïve to assert that science is not useful and has not accomplished many great achievements that have helped mankind immeasurably with their day-to-day lives. Yet it seems because of the apparent success and power that comes from science, humanity has been seduced into thinking that it can or should be able to answer all of their problems. Science today by the general public and by some scientists has become almost deified. It is the authority of the authorities. It has become the uncontested pillar of what it means to be rational, consistent, and respectable. Its methods, theories, and findings are close to the realm of complete impeccability. However, science is problematic (along with many other things). The foundations and the axioms of science are not on any stronger ground than any other form or method of inquiry. There is good cause to be careful, and exercise a healthy dose of skepticism about its methods, theories, and results. It is not as black and white as science and the world want us to believe. It has been the intent of this essay to call into question, highlight, and evaluate some of the basic axioms one must follow in order to adhere to the commonly accepted form of science—realism. This essay is not meant to be a skeptical downer

of science. Rather, it is to merely demonstrate that scientific realism is not squeaky clean from its own problems and paradoxes. Therefore, we need to be more humble about our claims in life (of all kinds, not just scientific). Thus, I assert that a better more tenable position should be endorsed in science—that is, soft antirealism. This term means that we can know with a reliable level of certainty phenomena that are observable. (What is observable and what is not observable is beyond the scope of this essay.) Furthermore, for phenomena that we cannot observe, we might (or we might not) be able to know if they exist objectively; however, we need to realize that we ought to be humble and less dogmatic about their existence. In conclusion, I assert that this paper provides reasonable (but not exhaustive) evidence for accepting this suggested philosophical stance towards the fundamental nature of science.