Scientific Antirealists Have Set Fire to Their Own Houses

Abstract
Scientific antirealists run the argument from underconsideration against scientific realism. I argue that the argument from underconsideration backfires on antirealists' positive philosophical theories, such as the contextual theory of explanation (van Fraassen, 1980), the English model of rationality (van Fraassen, 1989), the evolutionary explanation of the success of science (Wray, 2008; 2012), and explanatory idealism (Khalifa, 2013). Antirealists strengthen the argument from underconsideration with the pessimistic induction against current scientific theories. In response, I construct a pessimistic induction against antirealists that since antirealists generated problematic philosophical theories in the past, they must be generating problematic philosophical theories now.

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1. Introduction

Bas van Fraassen (1989), K. Brad Wray (2008, 2012), and Kareem Khalifa (2010) run the argument from underconsideration against scientific realism. This paper analyzes it and then explores its disastrous implications on antirealists' positive philosophical theories, such as van Fraassen's (1980) contextual theory of explanation, van Fraassen's (1989) English model of rationality, Wray's (2007, 2010) evolutionary explanation of the success of science, and Khalifa's (2013) explanatory idealism. All these positive philosophical theories are unwarranted, if the argument from underconsideration is correct.

Wray (2008, 2012) and Khalifa (2010) strengthen the argument from underconsideration with pessimistic inductions against scientists and scientific theories. In response, I construct a pessimistic induction against antirealists that since antirealists generated problematic philosophical theories in the past, they must be generating problematic philosophical theories now. I present some examples of their philosophical theories that turned out to be problematic and an example that will turn out to be problematic. This paper could be a sobering reminder to antirealists that their criticisms against scientists and their scientific theories can be turned against antirealists and their positive philosophical theories.

2. The Argument from Underconsideration

Suppose that we have two rival scientific theories, T_1 and T_2, that are more or less empirically equivalent but logically inconsistent with each other. We infer that T_1 is true on the grounds that it explains phenomena better than T_2, i.e., it provides the best explanation of the phenomena. Such an inference is called inference to the best explanation (IBE). Scientists use IBE to establish their scientific theories.

Van Fraassen (1989) rejects IBE. His rejection is based on the observation that for any scientific theory, there might be rival theories that we have not yet conceived. In addition to T_1 and T_2, there might be T_3, T_4, and so on. Moreover, truth may lie not in the range of the conceived rival theories but in the range of the unconceived rival theories. So what?

> So our selection may well be the best of a bad lot. … For me to take it that the best of set X will be more likely to be true than not, requires a prior belief that the truth is already more likely to be found in X, than not. (van Fraassen, 1989: 143)

In other words, in order to infer that the best available theory is true, realists first should show that scientists "are by nature predisposed to hit on the right range of hypotheses" (van Fraassen, 1989: 143), or that "none of the possible explanations we have failed to come up with is as good as the best of the ones we have" (Ladyman, Douven, Horsten, and van Fraassen, 1997: 306). The burden of proof is not on van Fraassen but on realists because it is realists who believe that the best available theory is true.

Van Fraassen's argument against IBE above is called the argument from a bad lot or the argument from underconsideration in the literature. The premise of the argument is that the best of the conceived rivals *may* be the best of a bad lot, and the conclusion of the argument is that realists are *unwarranted* in believing that the best of the conceived rivals is true:

> ..the possibility that there may be equally good rival theories to T already suffices to make an ampliative step from the evidence to T unwarranted. (Ladyman, Douven, Horsten, and van Fraassen, 1997: 309)

> That is, though scientists may be reliable in their judgments about the relative superiority of a theory with respect to any theoretical virtue, such judgments do not warrant the conclusion that the superior theory is likely true. (Wray, 2008: 321)

The argument from underconsideration amounts to the request to justify the thesis of epistemic privilege that scientists are prone to hit upon true theories. If scientists have such a privilege, truth would be more likely be found in the set of conceived rivals than in the set of unconceived rivals, i.e., the best of the conceived rivals would be likely to be better than all the unconceived rivals, so we would be warranted in believing that the best explanation is true.

3. Epistemic Privilege
Psillos argues that scientists have epistemic privilege in that they use background theories to "drastically narrow down the space in which hypotheses can provide a potential explanation of the evidence at hand" (1999: 218-219). In other words, the theories that conflict with the background theories are eliminated, so the theories that are compatible with background theories are more likely to be true than false. Therefore, the best of the conceived rival theories is apt to be true.

Similarly, Lipton (2004: 151) argues that scientists rank T_1 and T_2, conceived rivals, in the light of background theories. Antirealists admit that scientists' evaluative judgment of T_1 and T_2 is trustworthy, so they should also admit that background theories are true. After all, if

background theories are false, how can scientists rank T_1 and T_2 properly? The true background theories endow scientists with the epistemic privilege to conceive of a set of rival theories that includes a true theory.

Wray replies that we do not have good reason to believe that background theories are true in the first place, and that all that we know about those theories is that "they save the phenomena and are superior to the theories with which they were compared" (2008: 321). Scientists can know that T_1 is predictively more accurate than T_2 even when background theories are false but empirically adequate. The evaluation of the conceived rivals does not require that background theories be true. It requires only that they be empirically adequate. Furthermore, given that background theories might be false, they "are as likely to be an impediment to developing a true theory as they are likely to be an asset to developing a true theory" (Wray, 2012: 379).

Khalifa (2010: 95) forms an alliance with Wray. He says that scientists can evaluate T_1 as better than T_2 on the grounds that T_1 is simpler than T_2, and that T_1 explains more diverse phenomena than T_2. This comparative judgment, however, can be made even when background theories are false. Furthermore, Albert Einstein rejected classical mechanics when he developed the theory of relativity. If he had used classical mechanics as a background theory, he could not have developed the theory of relativity. Therefore, using background theories as a guide to develop a theory does not entail "that the latter must be true" (Khalifa, 2010: 96). Thus, background theories do not yield the epistemic privilege that scientists have the proclivity to produce true theories.

Wray and Khalifa go further than diffusing Psillos and Lipton's appeal to background theories. They reinforce the argument from underconsideration with pessimistic inductions:

> There is a good reason why Lipton did not attempt to argue directly against the no-privilege premise. The bulk of evidence seems to suggest it is true. I have in mind here the arguments developed by Larry Laudan, Martin Carrier, P. Kyle Stanford, and others. (Wray, 2008: 322)

> ..while background theories certainly narrow the space of potential explanations, there appears to be a compelling pessimistic induction that raises serious questions about the *reliability* of this process. (Khalifa, 2010: 97)

Larry Laudan (1977: 126) and P. Kyle Stanford (2006) run different pessimistic inductions. Laudan's pessimistic induction is against scientific theories, saying that since successful past scientific theories turned out to be false, successful present scientific theories will also turn out to be false. In contrast, Stanford's pessimistic induction is against scientists, saying that science past scientists could not conceive of present theories, present scientists cannot conceive of future theories. The difference between the two pessimistic inductions, however, is not important in this paper. What is important for the purpose of this paper is that if they are correct, present theories are false, and that using such theories as background theories is more likely to generate false theories than true theories.

4. Antirealist Theories

In my view, the argument from underconsideration backfires on antirealists' positive philosophical theories. Consider that van Fraassen (1989) distinguishes between the Prussian model and the English model of rationality. On the Prussian model, "what it is rational to believe is exactly what one is rationally compelled to believe," whereas on the English model, "what it is rational to believe includes anything that one is not rationally compelled to disbelieve" (van Fraassen, 1989: 171-172). He chooses the English model over the Prussian model. A problem is that in order to choose the English model, he should first show that it is

better than the Prussian model, and that the true model of rationality is more likely to fall in the range of the two conceived models than in the range of unconceived models. The burden of proof is not on realists but on van Fraassen because it is he, not realists, who opts for the English model over the Prussian model.

The English model of rationality is not the only antirealist theory that falls prey to the argument from underconsideration. Van Fraassen (1980, Chapter 5) argues that his contextual theory of explanation is true because it can account for rejections and asymmetries while the rival theories proposed by Carl G. Hempel (1966), Wesley C. Salmon (1971), and Michael Friedman (1974) cannot. Wray (2007, 2010) appeals to Darwin's evolutionary theory to explain the success of science, arguing that his evolutionary explanation is better than the realist explanation because the evolutionary explanation can accommodate failures and competitions of scientific theories while the realist explanation cannot. Khalifa defends explanatory idealism according to which understanding ought to be evaluated by how well it replicates "the understanding provided by knowledge of a good and correct explanation" (2013: 162). All these antirealists' positive philosophical theories are unwarranted because antirealists have not yet shown that they have the propensity to generate true philosophical theories.

In response, antirealists might point out differences between scientific theories and philosophical theories. For example, scientific theories are tested against observations, whereas philosophical theories are tested against intuitions. It follows that scientific theories are susceptible to the argument from underconsideration, whereas philosophical theories are not. On this account, unlike scientists, antirealists are epistemically privileged to develop true theories.

This move to insulate philosophical theories from the backfire, however, is incompatible with what antirealists say about Putnam's (1975: 73) no-miracles argument for scientific realism. Putnam argues that a scientific theory is successful because it is approximately true. It would be a miracle if a successful theory is not even approximately true. The explanation invoking approximate truth is better than the explanation invoking a miracle. Therefore, realism provides the best explanation of the success of science. Note that Putnam is using IBE to establish realism. Laudan objects that the no-miracles argument "is a monumental case of begging the question" (1981: 45). Arthur Fine also objects that the no-miracles argument is "a paradigm case of begging the question" (1991: 82). Their idea is that from the antirealist perspective, IBE is a deplorable rule of inference, so it is of no use for Putnam to use it to justify realism. An interesting implication of Laudan and Fine's criticism against Putnam's no-miracles argument is that the philosophical use of IBE is no different from the scientific use of IBE. It follows that the argument from underconsideration applies no less to antirealists' philosophical theories. Antirealists cannot say that their philosophical theories are immune to the argument from underconsideration, while scientific theories are not. Antirealists have fallen into a quagmire that they created for realists.

Regarding the quagmire, realists are better off than antirealists. Suppose that both realists and antirealists use IBE to establish each of their positive philosophical theories. Realists are begging the question against antirealists, so realists' theories do not sound plausible to antirealists. It should, however, sound plausible to realists themselves and to other realists because they all accept IBE as reliable. In contrast, antirealists are begging the question against themselves, so their theories should not sound convincing even to themselves. Thus, they cannot say confidently to their epistemic colleagues that their theories are true. Their epistemic colleagues would rightly dismiss antirealists' theories on the grounds that even the proponents of the theories are not confident that they are true. Thus, if we are

antirealists, we cannot achieve the epistemic goal "to propagate to others our own theories which we are confident about" (Park, 2017).

5. Empirically Adequate?

Antirealists might argue that although we are not justified in believing that their positive philosophical theories are true, we are justified in believing that they are empirically adequate. For example, van Fraassen might say that his contextual theory of explanation is empirically adequate. Given that the contextual theory was proposed to account for explanatory phenomena, such as rejections and asymmetries, the empirical adequacy of the theory means that explanatory phenomena occurred, occur, and will occur in science, i.e., the contextual theory of explanation saves explanatory phenomena in science.

There are two problems with settling for the empirical adequacy of a philosophical theory. First, we expect our philosophical theory of science to give us an insight into the deep underlying structure of science. Such an insight, however, can be derived from the belief that it is true, but not from the belief that it is merely empirically adequate. For example, explanatory phenomena occur in science. We wonder why they occur. The contextual theory of explanation says that they occur because an explanation is an answer to a why-question, and appropriateness of an answer to the question depends on context. But if we believe that it is merely empirically adequate, we can only believe that explanatory phenomena occur in science, and we would still be puzzled over why they occur.

Second, as Psillos (1997: 370) observes, the antirealist quest for empirical adequacy requires epistemic privilege just like the realist quest for truth. Suppose that T_1 and T_2 compete with each other, and that T_1 explains phenomena better than T_2. It does not follow that T_1 is empirically adequate. After all, both T_1 and T_2 might be far less than empirically adequate. In order to infer that T_1 is empirically adequate, antirealists should show beforehand that empirical adequacy is more likely to fall in the set of the conceived theories than in the set of unconceived theories.

In response to Psillos's observation, Wray claims that constructive empiricism is not committed to the position that a successful theory is empirically adequate:

> But, the constructive empiricist is not committed to claiming that our best theories are in fact empirically adequate. What van Fraassen claims is that science *aims* for empirically adequate theories (see van Fraassen 1980, 12). (Wray, 2012: 378)

The suggestion that science aims for empirically adequate theories is compatible with the belief that successful current theories are empirically inadequate. Since constructive empiricism is neutral as to whether successful current theories are empirically adequate or inadequate, van Fraassen does not have the burden to show that empirical adequacy is more likely to exist in the range of conceived theories than in the range of unconceived theories.

In my view, however, Wray's interpretation of constructive empiricism here conflicts with what he says elsewhere about antirealism and van Fraassen's position. He writes as if antirealists, including van Fraassen, believe that a successful theory is empirically adequate:

> The only thing anti-realists are sceptical about are the claims (i) that what our theories say about unobservable entities and processes is true (see, for example, van Fraassen 1980), and (ii) that we have good reason to believe that the true theory is amongst those we are choosing between (see, for example, Stanford 2006). (Wray, 2008: 320)

> Hence, strictly speaking, all that scientists can claim to know about their background theories is that they save the phenomena and are superior to the theories with which they were compared.

(Wray, 2008: 321)

> Neither realist nor anti-realist denies that the claims that successful scientific theories make about *observable phenomena* are true. (Wray, 2012: 376)

These writings indicate that Wray understands van Fraassen to be claiming that a successful theory is empirically adequate. For example, Wray claims that scientists can claim to know that background theories save phenomena. To say that a theory saves phenomena means that the theory explains past, present, and future phenomena in its domain, i.e., that the theory is empirically adequate (van Fraassen, 1980: 12).

Suppose, however, that Wray is right that constructive empiricism is neutral as to whether successful current theories are empirically adequate or inadequate. Wray faces the following challenge. Antirealism is an interesting philosophical position because it is in the middle between realism and skepticism. It becomes an uninteresting position once it collapses into skepticism. Not surprisingly, some antirealists resist skepticism:

> Skepticism is an ugly threat; a philosophical position which leads to skepticism reduces itself to absurdity. (Ladyman, Douven, Horsten, and van Fraassen, 1997: 317)

If antirealists resist skepticism, they need to tell us what they think we are justified in inferring from the fact that a theory is successful, and what they think we are rationally compelled to believe on the basis of the fact that a theory is successful.

Moreover, it does not matter whether or not van Fraassen is committed to the position that a successful theory is empirically adequate. What is important is that the quest for empirical adequacy requires epistemic privilege. Anyone who believes that a successful theory is empirically adequate should first show that scientists have the proclivity to generate empirically adequate theories as opposed to empirically inadequate theories. In a nutshell, Psillos's observation stands that the argument from underconsideration undercuts the position that a successful theory is empirically adequate.

6. Strengthening

So far I have exposed the disastrous implications of the argument from underconsideration on antirealists' positive philosophical theories. I now argue that it has inherent problems. The first intrinsic problem is that it is self-defeating. The concept of warrant figures in the conclusion of the argument, so in order for the argument to work, proponents of the argument should first offer a plausible theory of warrant. Suppose that they offer a theory of warrant to complement the deficiency of the argument. After proposing the theory, however, they should show that their theory of warrant is better than the rival theories of warrant that already exist in the epistemology literature. Notably, they are foundationalism (Alston, 1976), coherentism (Bonjour, 1985), and reliabilism (Goldman, 1979, 1992). Next, they should show that the true theory of warrant is more likely to be found in the set of the conceived theories of warrant than in the set of unconceived theories of warrant.

The second inherent problem with the argument from underconsideration is that the conclusion does not follow from the premise. Recall that the premise of the argument is that the best of the conceived rivals *may* be the best of a bad lot, and that the conclusion is that it is *unwarranted* to believe that the best of the conceived rivals is true. Note that the premise is a *possibility* statement whereas the conclusion is a *normative* statement. David Hume famously argued that there is a gap between a descriptive statement and a normative statement. Thus, he would say that there is a much wider gap between the possibility statement and the normative statement of the argument from underconsideration.

Antirealists might reply that there is a *significant* possibility that our best conceived theories may be the best of a bad lot, and the significant possibility is enough to justify the normative statement. To use an analogy, if there is a significant possibility that it will rain today, I should take an umbrella with me when I leave for the office in the morning. Analogously, if there is a significant possibility that our best theories are false, realists should show beforehand that scientists are more apt to construct true theories than false theories. The history of science indicates that successful past theories have turned out to be false, so successful present theories will also turn out to be false. As previously mentioned, Wray and Khafila boost the argument from underconsideration with the pessimistic inductions.

Wray and Khafila's appeal to the pessimistic inductions invites me to briefly summarize what realists have said in the literature to refute them. They have said as follows: The samples of past theories are biased (Ruhmkorff, 2011; Park, 2011a). Present theories are more successful than past theories (Doppelt, 2007; Devitt, 2011; Fahrbach, 2011; Park, 2011a). Unlike past theories, some present theories make novel predictions (Leplin, 1997; Saatsi, 2009). Unlike past theories, some present theories are not only successful but also cohere with one another (Park, 2011b). Successful past theories are approximately true because their working components are true (Kitcher, 1993: 140-149; Psillos, 1999 Chapters 5 and 6). Mathematical structures (Worrall, 1989) and Ramsey sentences (Cruse and Papineau, 2002) are carried over through scientific revolutions. The (approximate) truth of our best theories explains not only their own success but also the success of their predecessors (Doppelt, 2014).

Set aside these realist responses to the pessimistic inductions. My reaction to them in this paper is to construct a pessimistic induction against antirealists that antirealists have made philosophical mistakes in the past, so they must be making philosophical mistakes now. On this account, antirealists' past theories were disclosed to be problematic, so their present theories will also be disclosed to be problematic. Their present theories are such theories as Khalifa's explanatory idealism (2013). For now, Khalifa's explanatory idealism appears to be unproblematic, but the problems with it will be conceived and exposed in the future. It does not matter what it says and what argument is advanced in defense of it. What matters for the pessimistic induction to work is the fact that it is constructed by an antirealist, and the fact that antirealists generated problematic philosophical theories in the past. These two facts constitute an inductive rationale for thinking that it has hitherto hidden problems.

What philosophical errors did antirealists make in the past? I can only summarize their past mistakes in the interest of saving space. As noted earlier, van Fraassen, Wray, and Khalifa produced positive philosophical theories without being aware that their criticisms against realism backfire on their theories. There are other antirealist blunders. Laudan claims that science is successful "because scientific theories result from a winnowing process" (1984: 101). Clearly, he is using IBE, so his aforementioned criticism against Putnam's no-miracles argument applies no less to his own explanation of the success of science. Ladyman et al. (1997: 308) claim that approximate truth is harder to come by than empirical adequacy. But empirical adequacy is harder to come by than approximate truth in light of the pessimistic induction (Park, 2014a). Wray (2007, 2010) defends the evolutionary explanation of the success of science. But it is inconsistent for Wray to defend the evolutionary explanation and to wield the pessimistic induction against realism because the pessimistic induction indicates that the evolutionary explanation is neither true nor empirically adequate (Park, 2014b). The list of antirealists' past blunders can be extended *at nauseam*. The list is an inductive rationale for thinking that antirealists lack the epistemic privilege to generate true philosophical theories.

This pessimistic induction against antirealists is different from the pessimistic induction which I (2014c) have constructed. I (2014c) have exposed intrinsic problems with eight antirealist explanations of the success of science in the literature, and then predicted that the latest one (Lyons, 2003) will turn out to be problematic. While the pessimistic induction in my (2014c) paper is over the antirealist explanations of the success of science, the pessimistic induction in the present paper is over antirealists. The latter concerns antirealists' abilities to construct philosophical theories in general, encompassing not only their abilities to construct antirealist explanations of the success of science but also their abilities to construct other positive philosophical theories, whatever they might be. So the latter has a much broader scope than the former.

Khalifa might protest that his philosophical theory can account for its explananda, and it was constructed in light of background philosophical theories, so his theory is true. Let me remind him, however, that he earlier rejected our best scientific theories, although they are successful and although they were constructed in light of background scientific theories. His rejection of our best theories is based on the historical fact that successful past theories were revealed to be false. My rejection of his philosophical theory is on a par with his rejection of scientific theories. I am rejecting his theory simply because antirealists' past theories turned out to be problematic.

Khalifa might retort that he did not collaborate with other antirealists, such as Ladyman et al. (1997), with the view to making mistakes together. Nor were *blunder genes* transmitted from Ladyman et al. to him. It follows that there is no causal link between Ladyman et al.'s mistake and his theorizing. It is wrong to think that Ladyman et al.'s mistake denigrates his theorizing, and that he inherits Ladyman et al.'s problems simply because he belongs to the same species as they, Homo sapiens.

Realists, however, would make similar points about the relationship between past and present scientists. Present scientists did not collaborate with past scientists with the purpose to make mistakes together. Nor did blunder genes propagate from past scientists to present scientists. It follows that past scientists' mistakes do not stand in a causal relation to present scientists' theorizing. It is wrong to think that past scientists' mistakes denigrate present scientific theories, and that present scientists inherit past scientists' problems simply because present scientists belong to the same species as past scientists, Homo sapiens.

Khalifa might insist that there is no relevant difference between past and present scientists, or between past and present theories, so present theories will be abandoned as were past ones. In response, I say the same thing about antirealists and antirealist philosophical theories. There is no relevant difference between Ladyman et al. and Khalifa, and between the former's philosophical view and the latter's philosophical view. Therefore, Khalifa's view will become outdated as did Ladyman et al.'s.

Henri Poincaré (1905/1952: 160), Mary Hesse (1976: 266), Laudan (1977: 126), Stanford (2006), Wray (2007, 2010), and Khalifa (2010) run pessimistic inductions against scientists and scientific theories. They all agree that past mistakes constitute an inductive rationale for thinking that current scientific theories are false. In my view, if their pessimistic inductions are correct, so is my pessimistic induction against antirealists. Their pessimistic inductions and my pessimistic induction rise or fall together. Stanford claims that past and present scientists are similar in that they are all "creatures whose cognitive constitutions are not well suited to the task of exhausting the kinds of spaces of serious candidate theoretical explanations from which our scientific theories are drawn" (2006: 45). If Stanford is right, there is no relevant cognitive difference either between Ladyman et al. and Khalifa that would save Khalifa's explanatory idealism from my pessimistic induction.

In order to diffuse my pessimistic induction against antirealists, antirealists might tap into the aforementioned realist responses to the pessimistic inductions against scientists and scientific theories. For example, they might take issue with the sample of my pessimistic induction, arguing that it is not representative of the general population of past philosophical theories generated by antirealists, which mirrors the observation made by Ruhmkorff (2011) and me (2011a) that the samples of the pessimistic inductions are biased. Or antirealists might argue that the problems with their past philosophical theories are not serious but moderate, which echoes the contention made by Kitcher (1993) and Psillos (1999) that successful past scientific theories are not completely false but approximately true.

I welcome this antirealist move because it amounts to admitting that the realist responses to the pessimistic inductions against realism are on the right track and because new fields of debate might open over whose sample is better, and over whether the problems with antirealists' past philosophical theories are serious or moderate. In any event, what is at stake in this possible future debate is whether antirealists' present philosophical theories are tenable or not. They have hidden serious problems, if it transpires that my sample is fair, and that antirealists' past philosophical theories are seriously problematic.

7. Conclusion

The argument from underconsideration is a challenge to show that scientists are predisposed to generate true theories. The pessimistic inductions against scientists and scientific theories, if correct, show that scientists are prone to produce false theories. These antirealist criticisms against realism are forceful and admirable. The brilliant criticisms, however, can be turned against antirealists' own positive philosophical theories. Antirealists have the burden to show that they have the proclivity to develop true philosophical theories. My pessimistic induction against antirealists, if correct, shows that antirealists have the tendency to generate problematic philosophical theories.

The antirealism program is different from the strong program in the sociology of scientific knowledge. The strong program aims to provide sociological explanations of how scientific knowledge is produced. It adheres to the reflexivity tenet that "its patterns of explanations must be applicable to sociology itself" (Bloor, 1991: 7). The reflexivity tenet ensures that the explanatory scheme of the strong program is applicable to sociology of knowledge itself. There is no analogous tenet in the antirealist program. The presence of such a tenet would have brought down the chance that antirealists wield the argument from underconsideration and the pessimistic inductions against scientists and scientific theories without being aware that their critiques backfire on their own positive philosophical theories. In any event, this paper can be summed up in a simple sentence: antirealists have set fire to their own houses.

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