The Anti-Induction for Scientific Realism

Abstract
The no-miracles argument and the pessimistic induction are currently regarded as the strongest arguments for and against scientific realism, respectively, in philosophy of science. In this paper, I construct a new argument for scientific realism that I call the anti-induction for scientific realism. It holds that since past theories were unwarranted, present theories are warranted. I provide an example from the history of science to show that anti-inductions sometimes work in science. The anti-induction for scientific realism has several advantages over the no-miracles argument as a positive argument for scientific realism.

Keywords
Anti-Induction, No-Miracles Argument, Pessimistic Induction, Scientific Realism

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1. Introduction

The no-miracles argument (Putnam, 1975: 73) and the pessimistic induction (Laudan, 1977: 126; Putnam, 1978: 25) are regarded as the strongest arguments for and against scientific realism, respectively, in philosophy of science. The no-miracles argument holds roughly that the success of a theory would be a miracle if it were false, so successful theories are true.[1] The pessimistic induction holds that since past theories were unwarranted, present theories are also unwarranted. For the past several decades, these two arguments dominated the debate over what epistemic attitude we should take towards our best theories (Worrall, 1989: 101, 2011; Psillos, 1996; Magnus and Callender, 2004: 322; Sankey, 2017: 201).

The aim of this paper is to defend a new argument for realism that I call the anti-induction for realism. It asserts that since past theories were unwarranted, present theories are warranted. I proceed as follows. In Section 2, I provide an example from the history of science to show that anti-inductions sometimes work in science. I also unpack the anti-induction for realism, explicating how it differs from the pessimistic induction against realism, and displaying its several advantages over the no-miracles argument as an alternative positive argument for realism. I also argue that antirealists can construct an anti-induction to circumvent the pessimistic induction against an antirealist position. In Section 3, I reply to two possible objections against the anti-induction for realism. In the end, I will have demonstrated that the anti-induction is a superior argument for realism than the no-miracles argument is.

2. Anti-Inductions

2.1. Historical Episode

[1] This paper drops the qualifiers 'typically' and 'approximately' to save space.

A historical episode recounted by Car Hempel (1966: 3–6) is useful to illustrate that anti-inductions sometimes work in science and to make sharp the opposing views of pessimists and anti-inductivists. A Hungarian physician, Ignaz Semmelweis (1818–1865), was appointed to the medical staff in the Vienna General Hospital in 1846. He was distressed to learn that about 10% of women died of childbed fever in the first maternity division, while about 2% of women died of childbed fever in the second maternity division. He postulated and painstakingly tested one by one the following six hypotheses that could account for the discrepancy: (i) miasmas in the air caused puerperal fever, (ii) the first division was overcrowded, (iii) medical students examined women roughly in the first division, (iv) the sight of a priest and his attendant had a terrifying psychological impact on the women in the first division, (v) the women in the first division delivered lying on their backs while the women in the second division delivered on their sides, and (vi) cadaverous materials on the medical students' hands were responsible for the high mortality rate. He eliminated the first five hypotheses before he arrived at the sixth hypothesis. The sixth hypothesis was successful in dramatically reducing the high mortality rate of the first maternity division.

Imagine that pessimists and anti-inductivists were watching Semmelweis as he was about to put the sixth hypothesis to the test. They would have made opposite predictions about the experimental outcome of the sixth hypothesis. Pessimists would have predicted that since the five previous hypotheses failed their tests, the sixth hypothesis would also fail its test. By contrast, anti-inductivists would have predicted that since the five hypotheses failed their tests, the sixth hypothesis would pass its test. Semmelweis performed the experiment of instituting the hand-washing regimen, thereby confirming the anti-inductivists' prediction and disconfirming pessimists' prediction.

How could the pessimists and anti-inductivists draw opposite conclusions from the same premise that Semmelweis's five hypotheses had failed their tests? The pessimists and anti-inductivists operated on opposite principles. The pessimists operated on what David Hume (1978: 89) called the uniformity principle that an unobserved instance resembles observed instances. Without that principle, the pessimists' conclusion would not follow from the premise. In contrast, the anti-inductivists operated on what Park (2017a: 213) calls the disuniformity principle that an unobserved instance differs from observed instances. Without that principle, the anti-inductivists' conclusion would not follow from the premise.

There are multiple anti-inductions, just as there are multiple pessimistic inductions.[2] Anti-inductivists run different anti-inductions in different contexts, just as pessimists run different pessimistic inductions in different contexts. In the context of predicting the experimental outcome of Semmelweis's sixth hypothesis, anti-inductivists construct the anti-induction that since the five previous hypotheses failed their tests, the sixth hypothesis will pass its test, while pessimists construct the pessimistic induction that since the five previous hypotheses failed their tests, the sixth hypothesis will also fail its test. In the context of predicting the truth-value of Semmelweis's sixth hypothesis, anti-inductivists advance the anti-induction that since the first five hypotheses were false, the sixth hypothesis is true, while pessimists advance the pessimistic induction that since the five hypotheses were false, the sixth hypothesis is also false. Anti-inductivists and pessimists formulate different anti-inductions and different pessimistic inductions, respectively, regarding different targets. The sum and substance, however, is that the disuniformity principle underlies all anti-inductions, whereas the uniformity principle underlies all pessimistic inductions, whatever their targets might be.

[2] See Park (2017a) for the pessimistic inductions against scientific theories, scientists, realists, antirealist theories, antirealists, and pessimists.

Scientific progress requires at least occasional uses of the disuniformity principle (Park, 2017a: 216–217). Suppose that scientists underwent some trials and errors in their attempts to arrive at true hypotheses or successful hypotheses. If they used the uniformity principle, i.e., if they were pessimists, they would believe that nothing would follow but more and more trials and more and more errors. By contrast, if they used the disuniformity principle, i.e., if they were anti-inductivists, they would believe that achievements follow trials and errors. If past scientists had used only the uniformity principle to assess the prospects of their research projects, they would have achieved fewer true or successful hypotheses. As a result, we might still believe that the Earth is at the center of the universe, and we might still use horses instead of cars and airplanes as means of transportation. The list of such examples can be extended *ad nauseam*. Scientists are anti-inductivists when they achieve something after a series of trials and errors, whether those trials and errors concern experimental outcomes or the truth-values of hypotheses. Hence, anti-inductions sometimes work in science.

Pessimists might object that anti-induction is simply absurd. In illustration of their point, suppose that anti-inductivists and inductivists watch a stone be thrown upwards and fall down over and over. Anti-inductivists predict that the stone will float in the sky, and they continue to make false predictions. By contrast, inductivists predict that it will fall to the ground, and they continue to make true predictions. Thus, anti-induction is unreasonable, whereas induction is reasonable. We should use the uniformity principle to predict future events.

The preceding objection, however, commits the straw man fallacy. My position is not that scientists and philosophers should be anti-inductivists in all contexts, but that they should be anti-inductivists in some contexts and inductivists in other contexts. The fact that inductions work in science at some times does not refute my position that anti-inductions work in science at other times.

Pessimists might now object that it was fallacious to reason that since five previous hypotheses failed tests, the sixth hypothesis would pass the test. How could the failures of the five hypotheses be the evidence for expecting the success of the sixth hypothesis? Anti-inductivists should have justified the disuniformity principle independently of anti-induction. In the absence of independent justification, it was merely epistemic luck that anti-inductivists made the true prediction that the sixth hypothesis would be successful. They were not entitled to make the true prediction.

A similar objection, however, can be raised against pessimists. Imagine that Semmelweis was about to test the fifth hypothesis, and that pessimists predicted that it would fail the test because its four forerunners had failed. Their prediction was true. It was, however, merely epistemic luck that they made the true prediction. How could the failures of the four hypotheses be the evidence for expecting the failure of the fifth hypothesis? Pessimists should have justified the uniformity principle independently of induction. In the absence of independent justification, pessimists were not entitled to make the true prediction.

Pessimists might now argue that my foregoing reply is straightforwardly fallacious; it is merely a *tu quoque* argument. That is, they might say that it is wrong for me to argue that an argument is good by saying that it is similar to a bad argument. Let me point out, however, that it is costly for pessimists to accuse me of committing the fallacy of *tu quoque*. The accusation implies that the pessimistic induction is fallacious. And if the pessimistic induction is fallacious, the strongest threat to realism evaporates. It is not clear whether pessimists would be willing to go this far or not. In my view, they would instead stake out the following new position.

The new pessimist position holds that we should be anti-inductivists when predicting experimental outcomes, but should be pessimists when predicting truth-values of hypotheses.

Also, scientists should keep entertaining and testing further hypotheses, despite repeated failures, not with a view to finding true hypotheses but with a view to finding successful hypotheses. Under this new position, pessimists could predict that Semmelweis's sixth hypothesis would pass the test on the grounds that its five predecessors failed, but could also predict that the sixth hypothesis was false on the grounds that its five predecessors were false. Also, pessimists can argue that Semmelweis should have kept ideating and testing further hypotheses until he arrived at a successful hypothesis, one that would help to bring down the high mortality rate of the first maternity division. This new pessimist position comports with the fact that false theories were successful in the history of science.

A double standard, however, inheres in this new pessimist position. Why is it that we should be anti-inductivists when predicting experimental outcomes but should be pessimists when predicting the truth-values of hypotheses? The new pessimist position contrasts with the anti-inductivist position, which is free from any double standard. It maintains that we should consistently use the disuniformity principle to predict both the truth-values and experimental outcomes of hypotheses. The anti-inductivist position is better than the pessimist position, *ceteris paribus*, because the principle of economy favors the former over the latter. It appears that pessimists should consistently use the uniformity principle to predict experimental outcomes as well as truth-values of hypotheses in order to be equal to anti-inductivists in terms of simplicity. Alternatively, they should provide an argument to justify their different predictions of experimental outcomes and truth-values of hypotheses.

Pessimists might try to justify that double standard as follows. There are infinitely many unconceived hypotheses that compete, for example, with Semmelweis's sixth hypothesis. All of them can explain why the mortality rate of the first division was higher than that of the second division. Since the number of such alternatives is infinitely large, scientists can never reach and recognize the true hypothesis, and anti-inductivists will perpetually make only false predictions about the truth-values of successive hypotheses. By contrast, there are only a finite number of experimental failures. Therefore, we should be pessimists when predicting truth-values of hypotheses, but anti-inductivists when predicting experimental outcomes.

The preceding suggestion, however, is problematic. If five eliminated hypotheses constitute an inductive rationale for thinking that there are infinitely many unconceived alternative hypotheses, five corresponding experimental failures also constitute an inductive rationale for thinking that there are infinitely many *unperformed* experimental failures. There is no reason to suppose that the former inductive rationale is stronger than the latter. If it is a hasty generalization to infer that there are infinitely many unperformed experimental failures on the basis of the five experimental failures, so is it a hasty generalization to infer that there are infinitely many unconceived alternative hypotheses on the basis of the five false hypotheses. These two inferences rise or fall together. Consequently, if pessimists predict that the sixth hypothesis will be false on the grounds that there are infinitely many unconceived alternatives, they should also predict that the sixth hypothesis will fail the experimental test on the grounds that there are infinitely many unperformed experimental failures. It follows that pessimists have no good reason to apply the uniformity principle to predict the truth-value of the sixth hypothesis while applying the disuniformity principle to predict the experimental outcome of the sixth hypothesis. The double standard remains unjustified.

Pessimists might now argue that we should use the disuniformity principle when predicting experimental outcomes because they are ascertainable by observation, but that we should use the uniformity principle when predicting the truth-values of hypotheses because they are not ascertainable by observation. On this account, we should be anti-inductivists

when assessing scientists' inferences concerning observables, but we should be pessimists when assessing scientists' inferences concerning unobservables.

The preceding argument, although tempting to pessimists, begs the question against anti-inductivists. It is under dispute between pessimists and anti-inductivists whether we should use the disuniformity principle to assess scientists' inferences about unobservables. Pessimists contend that we should use the uniformity principle, while anti-inductivists contend that we should also use the disuniformity principle. But the pessimists' argument assumes the very point under dispute in order to justify itself, i.e., pessimists state in effect that we should use the uniformity principle to assess scientists' inferences about unobservables because the inferences are about unobservables. Such a circular argument does not adequately answer the question: Why should we use the uniformity principle to assess scientists' inferences about unobservables? Pessimists need to justify the use of the uniformity principle independently of whether scientists' inferences are about observables or unobservables. In the absence of such justification, we should choose the anti-inductivist position over the pessimist position because the principle of economy enjoins us to do so, as noted above.

2.2. The Anti-Induction for Realism and Antirealism

Let me now turn to the pessimistic induction that since past theories were unwarranted, present theories are also unwarranted. The strength of the pessimistic induction is proportional to the number of past theories. The more past theories have been discarded, the stronger the inductive rationale is for thinking that present theories are unwarranted. If and when present theories are discarded in the future, the inductive rationale will become stronger for thinking that future theories will be unwarranted. Thus, the downfall of current theories will only reinforce pessimists' convictions that future theories will be unwarranted.

Let me now turn to the anti-induction that since past theories were unwarranted, present theories are warranted. As with the pessimistic induction, the strength of the anti-induction is proportional to the number of past theories. The more past theories have been abandoned, the stronger the anti-inductive rationale is for thinking that present theories are warranted. What if present theories are abandoned in the future? The anti-inductive rationale will become stronger for thinking that future theories will be warranted. Thus, the demise of present theories will only reinforce anti-inductivists' belief that future theories will be warranted.

As an alternative argument for realism, the anti-induction differs from the no-miracles argument in the following important respect. The no-miracles argument relies on inference to the best explanation (IBE) to justify realism, claiming that realism best explains the success of science. In contrast, the anti-induction does not rely on IBE. It relies instead on the history of science to justify realism. Its premise is that past theories were thrown out. Thus, the no-miracles argument and the anti-induction use radically different methods to arrive at realism.

The anti-induction has several advantages over the no-miracles argument. First, the no-miracles argument is subject to Laudan's (1981: 45) and Arthur Fine's (1991: 82) criticism. They argue that the no-miracles argument begs the question against critics of IBE. The critics do not think that IBE is a reliable rule of inference, but the no-miracles argument uses IBE to justify realism. The critics would not be impressed by such a circular argument. The anti-induction, by contrast, is not susceptible to the objection of circularity because it relies on the history of science rather than on IBE to justify realism.

Second, the no-miracles argument attempts to justify realism by explaining the success of science. Consequently, it is vulnerable to the antirealist critique that the success of science can be explained without invoking truth. There are nine antirealist explanations of the success

of science in the literature (Park, 2014). Proponents of the no-miracles argument bear the burden of showing that the realist explanation is superior to all the antirealist alternatives. In contrast, anti-inductivists bear no such a burden because the anti-induction does not attempt to arrive at realism by explaining the success of science.

Third, Larry Laudan's (1981) list of past theories poses a threat to the no-miracles argument, but not to the anti-induction. The list is as follows:

> Laudan's List
> - the crystalline spheres of ancient and medieval astronomy;
> - the humoral theory of medicine;
> - the effluvial theory of static electricity;
> - "catastrophist" geology, with its commitment to a universal (Noachian) deluge;
> - the phlogiston theory of chemistry;
> - the caloric theory of heat;
> - the vibratory theory of heat;
> - the vital force theories of physiology;
> - the electromagnetic aether;
> - the optical aether;
> - the theory of circular inertia;
> - theories of spontaneous generation. (Laudan, 1981: 33)

The past theories on this list are all counterexamples to the no-miracles argument's conclusion that successful theories are true. By contrast, they are the very fuel for the anti-inductivist conclusion that present theories are warranted. Without the list, the premise of the anti-induction that past theories were unwarranted is merely an unjustified assumption.

Jarrett Leplin (1997) and Juha Saatsi (2009: 358) argue that the past theories on Laudan's list, although successful, did not make novel predictions. Timothy Lyons (2003: 898-899) retorts that "there have been numerous examples of novel success from theories that are clearly false by present lights," providing a list of fourteen such past theories, such as Fresnel's wave theory of light and Bohr's 1913 theory of the atom. Unlike Leplin and Saatsi, anti-inductivists welcome Laudan's and Lyons's lists, taking them as the evidence for the premise of the anti-induction. The longer the lists are, the more convincing the anti-induction is.

The preceding discussion shows that the anti-induction departs radically from the traditional view that the history of science should have been stable in order for realism to be tenable. Under the traditional framework, selectivists made efforts to show that past science was more stable than pessimists depict. They distinguished between stable and unstable parts of a past theory, and argued that the past theories on Laudan's list were not completely false but rather approximately true on the grounds that the stable parts of the past theories are retained in present theories. Selectivism is embraced by many prestigious philosophers, such as John Worrall (1989), Philip Kitcher (1993: 140-149), Stathis Psillos (1999, Chapters 5 and 6), Pierre Cruse and David Papineau (2002), Patrick Enfield (2008), David Harker (2008), Stathis Psillos (2009), Saatsi (2009), and Peter Vickers (2016). Like pessimists, selectivists operate under the uniformity principle, holding that present theories will be discarded just as past theories were discarded (Park, 2017c: 65, 2017d: 102, 2017d: 8–9). Unlike both selectivists and pessimists, however, anti-inductivists operate under the disuniformity principle, asserting that they are not afraid of unstable past science at all. They instead welcome it, taking it as the positive evidence for realism.

Let me now turn to an anti-induction for antirealism. Bas van Fraassen (1985: 294) and K. Brad Wray (2008: 321; 2012: 376) contend that successful theories are empirically

adequate. Park (2001: 78), Marc Lange (2002: 282), and Lyons (2003: 898) point out, however, that the pessimistic induction, if correct, has a devastating consequence on the antirealist position that successful theories are empirically adequate. The successful past theories on Laudan's list turned out to be empirically inadequate. They were successful but clashed with anomalies, phenomena that they could not accommodate. It follows that successful present theories will also turn out to be empirically inadequate. Thus, antirealists who believe successful theories are empirically adequate have every reason to refute the pessimistic induction.

The antirealists can defuse the pessimistic induction by an appeal to the anti-induction that since past theories were empirically inadequate, present theories are empirically adequate. They do not need to give up antirealism, even if it transpires that present theories are empirically inadequate. In such cases, the degree of their belief that future theories will be empirically adequate will only grow stronger, given that the anti-inductive rationale for their position grows stronger. Thus, the anti-induction entitles the antirealists to believe that present theories are empirically adequate.

3. Objections and Replies

I have claimed above that the more theories have been overthrown, the stronger the anti-inductive rationale is for thinking that present theories are warranted. This contention, pessimists might object, presupposes that the number of unconceived alternatives is finite. Suppose, for example, that there are ten unconceived alternatives in the possibility space of alternatives, and that one of them is true. As scientists eliminate more and more alternatives, they get closer and closer to the true theory, and the probability increases that the next theory will be true. But what if the number of unconceived alternatives is infinite? Removing a finite number of alternatives in the possibility space of alternatives will in no way increase the probability of finding the true theory.

This pessimistic objection to the anti-induction, however, has a disastrous consequence on the pessimistic induction. As noted earlier, the pessimistic induction claims that the more theories have been overturned, the stronger the inductive rationale is for thinking that present theories are unwarranted. On this account, present theories are more likely to be overthrown than past theories because present theories are preceded by unwarranted theories whereas past theories were preceded by fewer unwarranted theories. As Park (2016: 840) argues, however, if there are infinitely many unconceived alternatives, past and present theories are all 0% probable, and hence past theories cannot be no more probable than present theories.

Let me turn to another possible objection from pessimists. Wray (2013) explores a way around the realist objection (Leplin, 1997: 141; Doppelt, 2007: 111; Doppelt, 2011; Saatsi, 2009: 358; Devitt, 2011: 292; Fahrbach, 2011a; Fahrbach, 2011b: 1290; Park, 2011: 80; Mizrahi, 2013; Doppelt, 2014) that present theories are more successful than past theories. He asks us to imagine that past realists, who might have existed in, say, the nineteenth century, believed their accepted theories merited their doxastic commitment, although their rejected theories did not, because the former were more successful than the latter. We now know in retrospect, however, that past realists were wrong, i.e., that their retained theories were unwarranted, just as their discarded theories were. We can extrapolate the epistemic fate of present realists from that of past realists. Specifically, present realists believe that their present theories merit their doxastic commitment, although their past theories did not, on the grounds that the former are more successful than the latter, but "our scientific offspring will look back at our theories with the same disdain we have for the theories of our predecessors" (Wray, 2013: 4327).

It is clear how Wray would criticize the anti-induction for realism. Imagine that past anti-inductivists, who might have existed in, say, the nineteenth century, believed that since their discarded theories were not worthy of their beliefs, their retained theories were worthy of their beliefs. We now know in retrospect, however, that the past anti-inductivists were wrong, i.e., that their accepted theories were unwarranted, just as their rejected theories were. Analogously, present anti-inductivists claim that since past theories were untrustworthy, present theories are trustworthy. Our descendants, however, will see in retrospect that present anti-inductivists are wrong, i.e., our present theories are unwarranted, just as our past theories were. Consequently, it does not matter whether present theories are better than past theories. The uniformity principle still applies, and it is wrong for anti-inductivists to say that present theories merit the realist commitment since past theories did not.

It is also clear, however, how present anti-inductivists would reply to the foregoing possible objection from Wray. Present anti-inductivists would insist that precisely because past anti-inductivists were wrong about their retained theories, present anti-inductivists are right about their present theories. The more often past anti-inductivists were wrong, the more likely it is that present anti-inductivists are right about their present theories, i.e., the stronger the anti-inductive rationale becomes for thinking that their present theories are warranted. Thus, past anti-inductivists' mistakes help, rather than hurt, the anti-inductivist position. To emphasize, it is of no use for pessimists to bring up past mistakes. They only stimulate the anti-inductivist spirit.

5. Conclusion

The pessimistic induction against realism holds that since past theories were unwarranted, present theories are also unwarranted. In contrast, the anti-induction for realism says that since past theories were unwarranted, present theories are warranted. The pessimistic induction operates under the uniformity principle, whereas the anti-induction operates under the disuniformity principle. The anti-induction has several advantages over the no-miracles argument as a positive argument for realism, the most important being that it is immune to challenges based upon the history of science.

The anti-induction might still strike many readers as absurd. Let me remind them, however, that scientists are anti-inductivists when they eliminate unsuccessful hypotheses one by one in the hope that they will someday come by a successful hypothesis. You are also an anti-inductivist when you endure present trials and errors in your daily life in the hope that you will someday achieve something after the trials and errors. If you believe that failure is the mother of success, you are an anti-inductivist, relying on the disuniformity principle; if you believe that failure is the mother of more failure, you are a pessimist, relying on the uniformity principle.

Finally, I do not claim that we should always be anti-inductivists. I concede that it is an absurd position to advocate that we should always be anti-inductivist. I insist, however, that it is also an absurd position to advocate that we should always be inductivists, or that we should never be anti-inductivists. Accordingly, I claim instead that we should at some times be anti-inductivists and should at other times be inductivists. It is a matter of future research to provide a philosophical account of when we should be inductivists and when we should be anti-inductivists.

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