

On Treating Past and Present Scientific Theories Differently

Abstract

Scientific realists argue that present theories are more successful than past theories, so present theories will not be superseded by alternatives, even though past theories were superseded by alternatives. Alai (2016) objects that although present theories are more successful than past theories, they will be replaced by future theories, just as past theories were replaced by present theories. He contends, however, that past theories were partly true, and that present theories are largely true. I argue that Alai's discrimination between past and present theories is subject to his own criticism against realists' discriminations between past and present theories, and also subject to other criticisms that philosophers have raised against scientific realism and pessimism.

Keywords

Large Truth, Partial Truth, Past Theory, Pessimistic Induction, Present Theory

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Seungbae Park
Ulsan National Institute of Science and Technology
Republic of Korea
nature@unist.ac.kr

1. Introduction

Rival participants in the scientific realism debate agree that present theories, such as the oxygen theory and the kinetic theory, are more successful than past theories, such as the phlogiston theory and the caloric theory, i.e., that present theories explain and predict more phenomena than past theories. They disagree, however, over whether we should treat past and present theories differently, and if so, over exactly how differently we should treat them.

Some treat past and present theories differently. For example, Jarrett Leplin (1997: 141), Gerald Doppelt (2007; 2011; 2013; 2014), Juha Saatsi (2009: 358), Michael Devitt (2011: 292), Ludwig Fahrback (2011a; 2011b), and Seungbae Park (2011) argue that present theories are more successful than past theories, so present theories will not be superseded by alternatives, even though past theories were superseded by alternatives. Thus, they take past and present theories to be on different footings.

Others, however, treat past and present theories similarly. For example, P. Kyle Stanford (2006: 45) and K. Brad Wray (2013: 4327) argue that present theories will be overthrown, just as past theories were overthrown, even if present theories are more successful than past theories. These philosophers make sophisticated arguments to show that the superiority of present theories does not make any difference to their fate.¹ The focus of

¹ See Park (2016a) for the critical examinations of their arguments.

this paper, however, is not their arguments but Mario Alai's (2016) position.

Alai (2016) contends that present theories will be replaced by future theories, just as past theories were replaced by present theories. He, however, treats past and present theories differently, claiming that present theories are *largely* true whereas past theories were *partly* true. He raises brilliant objections to scientific realists' discriminatory treatment of past and present theories. I reply that his brilliant criticisms also apply to his own position, and that his position is also vulnerable to criticisms that other philosophers have raised against scientific realism and pessimism. Thus, this paper aims to raise difficulties against Alai's position, without committing either to scientific realism or antirealism.

2. Discriminatory Treatment

Doppelt asserts that the (approximate) truth of a present theory explains the success of a past theory. His idea is that by assuming that a present theory is true, we can understand how a past theory was successful. For example, by assuming that the theory of relativity is true, we can understand how Newtonian mechanics was successful:

On the realist assumption that our best current theory – relativity physics – is true, we get a natural and realist explanation of the success of Newtonian mechanics, whether or not we identify true components or accurate mathematical structure in it. (Doppelt, 2011: 310)

Doppelt explicitly states that we do not need to invoke the truth of some theoretical assumptions of past theories to explain how they were successful:

We can draw on our best current theories in order to explain what outdated theories got right, and why they succeeded, without asserting the truth of any of their theoretical components, supposedly preserved in successful superseding theories. (Doppelt, 2013: 47-47)

Doppelt makes the same claim in other papers (2011: 297; 2014: 274). In short, he remains neutral as to whether some theoretical assumptions of past theories were true, refusing to invoke their truth to explain how past theories were successful.

Alai agrees with Doppelt, saying that "current physics explains Newton's predictive successes" (2016: 12). He, however, disagrees with Doppelt on the following two counts. First, while Doppelt does not make a doxastic commitment to past theories, Alai does, asserting that they were partly true. In this regard, Alai follows selectivism, maintaining that some theoretical components of past theories were true, while Doppelt does not. Second, while Doppelt claims that there will, at most, be minor revisions to present theories, Alai claims that present theories will be "displaced by others" (2016: 20). In this regard, Alai also follows selectivism, arguing that scientific revolutions will drive out present theories, while Doppelt does not.

Selectivism and pessimism are similar in that they both embed the uniformity principle (Hume, 1978: 89) that the future will resemble the past. The uniformity principle indicates that scientific revolutions will occur as they have in the past. The two doctrines are dissimilar in that selectivism takes it to be significant, while pessimism does not, that some theoretical constituents of past theories have been preserved in present theories. Thus, the distance between the two doctrines depends on how rich the preserved theoretical constituents are. The distance is short, if the preserved contents are slender.

While Doppelt claims that present theories are approximately true, Alai claims that they are largely true. Unfortunately, Alai does not define 'largely true,' which is a new and important predicate. Nor does he say anything about how it relates to the old realist predicate 'approximately true.' He, however, does say something about how it relates to another

predicate ‘partly true.’ He says that “past theories were partly but not completely true, and our theories are largely true, and to a larger degree, but still not completely true” (Alai, 2016: 18). This sentence indicates that Alai takes the concept of large truth to be stronger than the concept of partial truth, i.e., he believes that a largely true statement is closer to the truth than a partly true statement.

Alai grants that present theories are more successful than past theories, but claims that their superiority does not justify Doppelt’s assertion that present theories are approximately true, although it justifies his assertion that present theories are largely true. Is Alai right? My answer is that he is wrong. If the superiority of present theories does not justify Doppelt’s position, it does not justify Alai’s position either. There is no reason for thinking that it justifies the inference from the partial truth of past theories to the large truth of present theories, but that it does not justify the inference from no commitment of past theories to the approximate truth of present theories, or the inference from the partial truth of past theories to the approximate truth of present theories. This point will become clearer, once we consider how Florian Müller (2015), Wray (2008), and Mizrahi (2013) criticize realism.

Müller (2015) claims that it is one thing for present theories to be more successful than past theories, but it is quite another for present theories to be true. Present theories, although more successful than past theories, might not have reached the level of success that warrants the realist belief that they are true. He says that it “is not at all obvious why science, or at least our current best theories, should have achieved a degree of success that warrants their truth” (2015: 406). Müller’s criticism can be recast to apply to Alai’s position: It is not clear whether present theories, although more successful than past theories, have reached the level of success that warrants Alai’s belief that they are largely true. It is one thing for present theories to be more successful than past theories; it is quite another for present theories to be largely true.

Wray (2008: 323) and Mizrahi (2013) point out that there is a tremendous difference between being close to truth and being closer to truth than a competitor. Admittedly, the fact that present theories are more successful than past theories shows that present theories are more likely to be true than past theories, and/or that present theories are closer to truths than past theories. It does not show, however, that present theories are likely to be true, and/or that present theories are close to truths. To use an analogy, even if you are closer to Berlin than I am on a marathon race from Paris to Berlin, it does not follow that you are close to Berlin. After all, it might be that you are only a step ahead of me, and that both you and I are far from Berlin. Similarly, it is one thing for a present theory to be closer to the truth than a past theory; it is quite another for the present theory to be close to the truth. As a result, the realist inference from the falsity of past theories to the truth of present theories requires more than merely saying that present theories are more successful than past theories. Wray and Mizrahi’s criticism of realism can be reformulated so that it applies to Alai’s position: It is one thing for present theories to be closer to truths than past theories; it is quite another for them to be largely true. A leap is required to move from the partial truth of past theories to the large truth of present theories, just as a leap is required to move from no commitment of past theories to the (approximate) truth of present theories, or to move from the partial truth of past theories to the (approximate) truth of present theories. Alai’s leap, thus, requires doing more than merely saying that present theories are more successful than past theories, just as the realist leaps do.

Let me now turn to Alai’s criticism against the realists’ inference that since present theories are more successful than past theories, present theories will not be abandoned, even though past theories were abandoned. Alai puts forward the following original argument against the realist inference:

The history of science witnessed many ruptures, or “revolutions”, and this is because nature itself, contrary to an ancient proverb, makes leaps and has ruptures: its workings are not the same at different scales or different locations in space or time. For instance, it is (roughly) deterministic at large scales, but indeterministic at small scales; the physical laws today are probably different from those a few instants after the Big Bang; entropy increases over time in the universe as a whole, but it may decrease in local areas or over short time spans. (2016: 16).

In short, scientific revolutions will occur as they did due to the way the world is. Inherent in this pessimistic argument is the uniformity principle indicating that science will develop in the way it has developed. Without the uniformity principle, Alai’s pessimistic argument cannot get off the ground.

Since Alai endorses the uniformity principle, however, he should believe that scientific revolutions will reveal that present theories are only partly true, not largely true, just as scientific revolutions revealed that past theories were only partly true. It is illegitimate to believe that present theories are largely true, although past theories were partly true, while at the same time embracing the uniformity principle. Alai might reply that science has been improving, so it is reasonable to believe that present theories are largely true, although past theories were partly true. This reply, however, would invite immediate objections from Doppelt and other realists. Doppelt would say that since science has been improving, present theories are (approximately) true, although past theories do not call for our doxastic commitment. Other realists would say that since science has been improving, present theories will not be thrown out, although past theories were thrown out, so present theories are (approximately) true. It is not clear on what grounds Alai could contend that the improvement of present theories over past theories justifies his inference, but not Doppelt’s inference or the other realists’ inference.

3. Objections and Replies

Alai might suggest that a largely true statement is close to a partly true statement and distant from an approximately true statement. In other words, there is only a small gap between partial and large truths, but a wide gap between large and approximate truths. So the superiority of present theories over past theories justifies his inference from the partial truth of past theories to the large truth of present theories, but does not justify the inference from no commitment of past theories to the approximate truth of present theories, nor the inference from the partial truth of past theories to the approximate truth of present theories.

This semantic move to avoid my previous objections, however, would only aggravate Alai’s position. His new position would inherit all the problems of his old position. For example, even if there is only a small gap between partial and large truths, Alai still has the burden to show that unlike past theories, present theories have reached the degree of success that warrants his belief that they are largely true. It is still one thing for present theories to be more successful than past theories; it is quite another for them to be largely true. In short, Alai’s discriminatory treatment of past and present theories still cries out for justification.

Alai might propose that present theories are largely true by the definition of ‘largely true,’ provided that past theories are partly true, and that present theories are more successful than past theories. That is, once these two conditions are met, the meaning of ‘largely true’ entitles us to assert that present theories are largely true.

Such a semantic move, however, would only prod Doppelt and the other realists to make a similar move, i.e., to propose that present theories are approximately true by the definition of ‘approximately true,’ once the same two conditions are met.

Moreover, if there is a wide gap between large and approximate truths, there would

also be a wide gap between Alai's new position and realism. Thus, saying that present theories are largely true would amount to advancing a position that is close to pessimism and distant from realism. As a result, Alai's new position would be coveted by pessimists, but not by realists.

It is useful in this context to consider Stanford's (2015: 876) objection to selectivism. He agrees with selectivists that some theoretical assumptions of past theories were true, but insists that past theories are radically distinct from present theories, so they do not deserve the realist predicate 'approximately true.' The disagreement between selectivists and pessimists "is simply a difference of style or taste in applying the expression 'approximately true' rather than a substantive disagreement between them" (Stanford, 2015: 876). In other words, no rational argumentation can resolve the dispute over whether we can attribute 'approximately true' to past theories. In Stanford's vein, we can also say that there is only a terminological difference between the position that present theories are partly true and the position that they are largely true, if there is a small gap between partial and large truths.

Alai might also suggest that we should resist the realist belief that present theories are approximately true because "the history of science shows that sooner or later all theories are displaced by others" (Alai, 2016: 20). For this reason, we can believe that present theories are largely true, but not that they are approximately true. On this suggestion, the downfall of present theories is compatible with the position that they are largely true, but incompatible with the position that they are approximately true.

This suggestion, however, faces the following two objections. First, Alai believes that past theories were partly true, but not largely true, because they were supplanted by present theories. It follows that he should also believe that present theories are partly true, but not largely true, because they will be supplanted by future theories. Why take different epistemic attitudes towards past and present theories? Thus, he again faces the burden of justifying his discriminatory treatment of past and present theories.

Second, Alai's bleak outlook on the history of science conflicts with some other philosophers' bright outlook on the same history. Fahrback (2011a: 148), Park (2011: 79), and Mizrahi (2013: 3220; 2015; forthcoming) observe that there are far more recent past theories than distant past theories. Distant past theories are such theories as the phlogiston theory, the caloric theory, and the ether theory. They were both accepted and rejected before the twentieth century. By contrast, recent past theories are such theories as the oxygen theory, the kinetic theory, and the special theory of relativity. They were accepted in the twentieth century and are still accepted in the early twenty-first century, so they are present theories as well as recent past theories. Given that the number of recent past theories is far greater than the number of distant past theories, a random selection of past theories should include mostly recent past theories. Mizrahi (2013: 3219-3220) executes random sampling on the population of past theories, demonstrating that *most* of the sample theories are recent past theories. Since most recent past theories are also present theories, most past theories have been stable in the history of science, contrary to what Alai contends.

Even if we granted for the sake of argument that all past theories were refuted, we could still argue that it is entirely a separate issue whether present theories will be refuted. As Park (2016b; 2016c) argues at length, it is problematic to infer the demise of present theories from the demise of past theories. In this paper, I will only summarize how he criticizes the pessimistic induction.

The pessimistic induction is built upon what Park (2016b) calls proportional pessimism, according to which the more past theories were discarded, the more likely it is that present theories will also be discarded, i.e., the strength of the pessimistic induction is directly proportional to the number of past theories. So the germ theory is more likely to be

abandoned than the miasma theory, which in turn was more likely to be abandoned than the humoral theory. But the germ theory is more successful than the miasma theory, which was in turn more successful than the humoral theory. How can T_1 be more likely to be rejected than T_2 when T_1 is more successful than T_2 ? The pessimistic induction collapses along with proportional pessimism.

In addition, Park (2016c) argues that the pessimistic induction clashes with some scientific practices. In certain cases, scientists believe that they will succeed although they have failed repeatedly. Thomas Edison tried out different filament and gas combinations to get a working incandescent light. He is reputed to have said, "I have not failed. I've just found 10,000 ways that won't work." Implicit in his thinking was the disuniformity principle that the future will differ from the past. Scientists are invoking the disuniformity principle, whenever they try again after trials and errors. It follows that pessimists need to justify, rather than merely assume, the inference from the premise to the conclusion of the pessimistic induction.

A referee suggests that Alai's position is a plausible compromise between Doppelt's position and pessimism, because it incorporates both past scientific revolutions and subsequent improvements to scientific theories. Alai is more cautious than Doppelt, but more optimistic than pessimists.

The referee is right to say that Alai's position lies in the middle between Doppelt's position and pessimism. The referee's observation, however, does not undermine my objection that Alai's criticism against Doppelt's position applies no less to his own position. Specifically, if the superiority of present theories over past theories does not entitle us to infer that present theories are approximately true, neither does it entitle us to infer that they are largely true.

Another referee advances the following defense of Alai's position. Alai rejects Doppelt's discontinuity view that we are justified in believing that present theories are approximately true while making no doxastic commitment to past theories. Doppelt's position cannot accommodate the fact that some theoretical posits of past theories have been preserved in present theories.

Consider, however, that Alai treats past and present theories differently, taking the former and the latter to be partly and largely true, respectively. He believes that present theories are not partly true, but largely true, on the grounds that they are more successful than past theories. Doppelt and the other realists would retort that present theories are not largely true, but approximately true, because they are more successful than past theories. In addition, Alai's observation that some posits of past theories were carried over to present theories can be accommodated not only by his position, but also by the alternative positions that both past and present theories are partly true, and that past and present theories are partly and approximately true, respectively.

The referee also suggests that I should respond to Alai's contention that "Doppelt's proposal is a dead end: his discrimination between past and present theories is implausibly radical and running counter both the ideas of cumulativeness of science and fallibilism; it cannot account for the success of past theories, nor for the failures of current theories; and rather than shutting the door to the PMI and MMT, it opens it wide" (Alai, 2016: 6).

I disagree with Alai that Doppelt's position runs counter to the idea of fallibilism. Given that no philosopher today embraces infallibilism on any matter of fact, we should interpret Doppelt's position not as saying that present theories are definitely approximately true, but as saying that they are likely to be approximately true. It is uncharitable to interpret his position as implying that there is no possibility at all that present theories will turn out to be not even approximately true. The principle of charity applies not only to our interpretation

of Doppelt's position, but also to our interpretation of Alai's position. We should interpret Alai's position not as saying that present theories are largely true, but as saying that they are likely to be largely true. It is uncharitable to interpret his position as implying that there is no possibility at all that present theories will turn out to be not even largely true.

The referee also suggests that I should respond to Alai's contention that "our evidence is not that our theories are the most successful in the whole history, but only in the whole history up to now; and part of this evidence is also that many past theories were the most successful in the whole history up to their time, and yet later recognized as false; so, the best global explanation of our evidence is rather that past theories were partly but not completely true, and our theories are largely true, and to a larger degree, but still not completely true" (Alai, 2016: 18).

Let me make two critical comments on this sophisticated pessimistic induction. First, realism is compatible with Alai's contention that *many* successful past theories were later recognized as false. After all, scientific realism does not assert that *all* successful present theories are true. It rather asserts that *most* successful present theories are true (Putnam, 1975: 73; Devitt, 2011: 286). Consequently, pessimists need to show not that *some* successful present theories will be abandoned, but that *all* or *most* successful present theories will be abandoned. As mentioned in Section 3, however, Fahrbach, Park, and Mizrahi argue that *most* successful past theories have not yet been recognized as false. As a result, pessimists cannot say that since most successful past theories turned out to be false, most successful present theories will also turn out to be false.

Second, suppose for the sake of argument that Fahrbach, Park, and Mizrahi are wrong about the history of science, i.e., that all or most successful past theories were later recognized as false. It is still a dubious hypothesis that successful past and present theories are partly and largely true, respectively, for there are alternative hypotheses that both successful past and present theories are partly true, and that they are partly and approximately true, respectively. As noted earlier, Alai needs to present reasons for thinking that while it is legitimate to infer that present theories are largely true, it is illegitimate to infer that they are approximately true.

4. Conclusion

Alai states that past and present theories are partly and largely true, respectively. His position is built upon the assumptions that all or most past theories were overthrown, and that present theories will be overturned, just as past theories were overturned. These two assumptions, however, are dubious in light of realists' critical responses to the pessimistic induction. Obviously, Alai did not take these realist responses into account when he formulated his position. Moreover, he tries to eat the cake and have it at the same time, i.e., he accuses Doppelt and other realists of treating past and present theories differently, while he himself treats them differently. Therefore, it is not clear why we should choose his position over other positions.

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