When It Comes to the Future, Realism and Antirealism Do Make a Difference

Abstract

In this paper, I argue that scientific realism and antirealism lead to different scenarios of the future. I discuss a recent line of arguments in the scientific realism debate that concerns the consequences of scientific realism for our understanding of the future. I point out where recent works on the topic have seemingly reached a stalemate. I solve the stalemate by focusing on the scenarios of the future that realism and antirealism imply. I argue that focusing on the probability, possibility, desirability, and especially trackability of the scenarios can help us see systematic differences between the positions.

Scientific Realism – Antirealism – The Future of Science – Pessimistic Induction – History of Science – Conservatism in Science

1. Introduction

It has become more and more difficult to tell what considerations can decide between scientific realism and antirealism. Already in 1989, Stein argued that there is "no difference that makes a difference" between realism and antirealism (1989, 61; see also Fine 1986; Blackburn 2002) and it seems that the situation has not improved much. Despite the great number of argumentatively and historically sophisticated works on the issue, it seems more difficult than ever to distinguish between realist and antirealist commitments – something that Ishida calls "the distinguishability problem" (2020). Most of the argumentative lines between realism and its alternatives seem to end up in a stalemate.

In a relatively new area of debate, there have been attempts to resolve this stalemate by analyzing whether the positions are committed to different futures of science and whether they make different

recommendations regarding which scientific research programs to pursue. The debate centers around whether scientific realism is more conservative in its position towards science than antirealism. The question in this debate is whether realism implies that we should not expect radical changes in the future of science and whether it encourages us to dismiss radical alternatives to current best scientific theories.[1] *Prima facie*, it seems that realism leads us to expect continuity. As Shaw argues, "since realists argue that approximate truth can be inferred from empirical success, they are committed to the view that approximately true theories will be successful in the future" (2018, 86). Moreover, Wray has suggested that "radical changes of theory [--] are irreconcilable with many forms of scientific realism" (2018, 1). However, the new line in the debate involves arguments that question this assumption.

In this paper, I go through the new argumentative line and point out that, while the arguments within it have provided additional understanding about the issues and dimensions of the scientific realism debate, it seems that the debate has reached another stalemate. Several authors have argued that realism and antirealism can lead us to expect and value the same futures. If this is really the case, then there does not appear to be a significant difference between realism and antirealism, at least in terms of the future.

However, I argue that, while it is true that realism and antirealism can sometimes commit to and desire the same possible futures, this does not mean that the positions cannot be distinguished from each other by using future-oriented considerations. This is where the contemporary debate has gone astray. The arguments show that there are some similarities between how realists and antirealists

[1] Notice that this question is independent of the arguments that aim to show that radical changes will happen (see e.g., Wray 2018). Only if realism implies that there should not be radical changes in the future, these arguments work against scientific realism. However, our very question is whether scientific realism implies this.

see the future. This establishes the indistinguishability only if we assume a very simplified picture of how the future is though. I argue that when we map spaces of possible futures, there are interesting and non-trivial differences between realism and antirealism. I show that the positions differ in what they tell us about the possibility, desirability, and trackability of scenarios of the future. To be more specific, I argue that *even in the weak formulations of realism and antirealism in the recent line of the debate, there are differences between how the positions see the space of possible futures.*[2] Given these differences in the weak positions, one can only imagine how rich differences there exists between stronger formulations of realism and antirealism.

In my discussion, I point out that the philosophers involved in the future-oriented debate have been correct to a great extent in their analysis but have not been able to cash out the consequences of their arguments in full. I point out that there are both similarities and differences between how realism and antirealism understand different scenarios of the future of science, and I do this by collecting together insights from previous discussions. The basic idea that realism implies more continuity than antirealism (see Shaw 2018 and Wray 2018 above) is somewhat correct but needs elaboration. The differences between the subtle forms of continuities and discontinuities on the table in the current debate can be magnified when we look towards the future. I show that realism and antirealism often disagree in their implications by conducting an analysis of scenarios in terms of the degrees of possibility, desirability, and trackability. Possibility, desirability, and trackability of scenarios are pivotal to futures thinking because assessing whether scenarios have these features enables comprehensive mapping of potential trajectories and rigorous evaluation of our own

[2] It worth pressing that I focus on the arguments and formulations in this particular line of debate and I do not suggest that different forms of realism and antirealism do not say different things about science.

assumptions. As I point out, there is a lively field of research, futures research, that is based on such nuances. The nuances, therefore, cannot be overlooked in philosophy.[3]

It must be made clear from the outset that I am not suggesting that we can establish realism or antirealism on the basis of their predictions about the future. To claim that realism/antirealism is true because it posits certain things about the future would require us to already know the future. My argument is simply that there are differences in these positions' predictions about the future, and therefore, the positions do not overlap entirely in this regard. It also follows that the acceptance of realism or antirealism (regardless of the reasons) has implications for how one envisions the scope of future possibilities.

I proceed as follows. In §2, I present the outline of the scientific realism debate and the realists' positions within it. As I expect the reader to be familiar with the debate, I mainly summarize the outline of the debate that is relevant to this paper. In §3, I discuss the recent attempts to distinguish between realism and antirealism on the basis of their consequences for the future. I also discuss how this debate may seem to have reached another stalemate. In §4, I introduce basic tenets of *futures research*, a field dedicated to the study of possible futures and our ideas about them, and show how we can see systematic differences in the future-related issues between realism and antirealism. In §5, I discuss what we should infer from §4 with regard to philosophical positions. I argue that, given that even the weakest formulations of scientific realism and antirealism do not imply the same futures, the stronger formulations probably give significantly diverging accounts of how the future

[3] Surely, one can argue that the nuances does not answer this or that clear-cut future-oriented question one would like to have insights on. However, the inability to do that hardly implies that realism and antirealism are indistinguishable in general. There is certain logic in thinking about the future and, from the perspective of this logic, the positions are different.

of science should be thought of. This makes the formulations useful tools in mapping the possibilities for science. I conclude that the debate shows how valuable philosophy of science can be for understanding the futures of science.

2. The Scientific Realism Debate

In this section, I will provide an overall view of the realism debate in philosophy of science and characterize the strategies used in it. I will also point out where the seeming stalemates are located. Obviously, it is impossible to do justice to all nuances of the debate in this brief space. However, I characterize those aspects that are relevant to the recent debate over the relationship between realism and the future and indicate how subtle the debate is.

Scientific realism can be characterized in three theses:

> *The Metaphysical Thesis*: The world has a definite and mind-independent structure.
>
> *The Semantic Thesis*: Scientific theories should be taken at face value. They are truth-conditioned descriptions of their intended domain, both observable and unobservable. Hence, they are capable of being true or false. The theoretical terms featuring in theories have putative factual reference. So, if scientific theories are true, the unobservable entities they posit populate the world.
>
> *The Epistemic Thesis*: Mature and predictively successful scientific theories are well confirmed and approximately true of the world. So, the entities posited by them, or, at any rate, entities very similar to those posited, inhabit the world. (Psillos 1999, 4).

The central argument for scientific realism, known as the *no miracles argument* (NMA), posits that scientific realism is the only philosophy that can account for the success of science without invoking miracles. According to NMA, mature scientific theories employ terms that refer to real

entities and are approximately true. (Putnam 1975, 73). NMA is a persuasive argument as it suggests that the remarkable success of scientific theories implies their ability to accurately capture the fundamental nature of reality. However, a central argument against NMA is a pessimistic induction. Laudan (1981) argues that there have been successful theories whose terms did not refer to anything that exists (according to our best current theories) and, therefore, were not true of the mind-independent world.

A general line of argument that realists use to counter pessimistic induction is the so-called *divide et impera* strategy. In this strategy, realists identify the theoretical constituents of the past theories that were responsible for their success. "Theoretical constituents which make essential contributions to successes are those that have an indispensable role in their generation" (Psillos 1999, 10). It is then argued, case-by-case, that these constituents are preserved through theory-change in science. The *divide et impera* move leads to *selective realism* that characterizes most scientific realists these days. According to selective realism, certain parts or aspects of our current best theories should be taken as at least approximately true.

Currently, most of the debate surrounding scientific realism is characterized by arguments for and against the form and historical substance of the main arguments in the debate. For example, there are debates about inference to the best explanation (e.g., Psillos 2007; Douven 2002; Khalifa 2010); there are debates about the formal quality of historical considerations (do they involve issues such as base rate fallacies [see Menke 2014]); and there are historical investigations that attempt to attack either the pessimistic induction or *divide et impera* or in some other way contribute to the debate.

Given the state of the debate, it seems difficult to tell what type of considerations could enable us to prefer realism or antirealism. It seems that both realists and antirealists can have historical cases in their support and provide plausible interpretations of the same cases in their own terms; both can accept that there are continuities in science but interpret them in somewhat different ways (see

Stanford 2021, 218-219; see discussion below); and both can accept the legitimacy of different types of inferences in science (see Psillos 1999, 162-169; Stanford 2006 9-16). Moreover, realism and antirealism seem to form a spectrum of positions that may not be all that far away from each other. Dellsén has suggested that

> "the available positions in this debate would fall on a spectrum from greater to lesser probability that the relevant theory-part is at least approximately true, with 'realism' vaguely referring to positions that fall somewhere on the greater-probability side of the spectrum and 'anti-realism' vaguely referring to those on the opposite side" (2019, 32).

It is interesting to notice that, while the historical considerations in the debate are highly nuanced and multilayered, the same kind of subtlety has not yet characterized the future-oriented debate to the same extent. Next, I introduce the debate and, after that, I attempt to insert the subtleties to the debate. I begin with one more historical argument in the debate as it reveals one more possible stalemate and sets the stage for the future-oriented discussions.

3. Realism, Antirealism, and Conservatism

The more recent debate about the relationship between realism, antirealism, and the future of science starts from the so-called *New Induction* against realism. In this argument, Stanford has put some historical flesh on the logical bones of underdetermination. Stanford argues that the problem of underdetermination is not solved by noting that empirically well-supported alternatives have not actually been present in the history of science. The problem remains as long as we have reasons to believe that there exist well-supported alternatives to our best scientific theories that are presently unconceived by us. This is the problem of *unconceived alternatives*. On the basis of the history of science, he performs what he calls the New Induction which suggests that throughout history, we have often found ourselves in a situation where only one or a few theories seem well-confirmed by the existing evidence. However, subsequent investigations regularly uncover further, radically

distinct theories that are just as well-supported by the same evidence. This is illustrated by the historical progression from Aristotelian to Cartesian to Newtonian to contemporary mechanical theories, where each preceding theory received as strong support from the available evidence as its then-unimagined successors. (2006, 19.)

It follows that there seem to be historical reasons to believe that there exist alternatives to the current science but we are not able to conceive those alternatives. These alternatives are not trivial or benign variations of the current science but fundamentally different ways of understanding the universe. There are several things that can be said about Stanford's line of argument.

First, because the argument is not based on mere skeptical fantasies but on the historical record, the evidence supporting the argument is (explicitly) fallible. While it seems an undeniable fact that there have been unconceived alternatives, the implications of this fact can be debated on historical grounds. For example, Psillos argues that the historical record shows enough theoretical continuity to not challenge scientific realism (2009, 70-72). Thus, the unconceived alternatives might not be as radically different from the known ones as Stanford suggests. However, we saw, in the previous section, that such historical considerations easily lead to stalemates in the realism debate.

A related issue is whether past science is a sufficient base for the induction. Psillos has pointed out that as science advances, its theories become more precise, rigorously tested, and interrelated, making them less susceptible to inductive pessimism and limiting the scope of unconceived alternative theories (2009, 73).

As a reply, Stanford (2015; 2019) has argued that the modern trends in science have, in fact, made it more vulnerable to the problem of unconceived alternatives. These trends include "the professionalization of science in the middle decades of the nineteenth century, the shift to peer-reviewed funding of academic science by the state following World War II, and the ongoing expansion of so-called big science" (2015, 868). Given these trends, it has become increasingly

difficult for new research programs to disrupt the existing programs and, therefore, the development of radically different theories is also more difficult. According to Stanford, *science has become more conservative*.

This is where things get interesting, as the conservativeness of science is an important issue in the philosophy of science independently of its role in the problem of unconceived alternatives. It is here that the recent line of the realism debate we are focusing on takes a future-oriented tone.

This conservativeness is widely considered a problem. Stanford argues that there is a growing belief within scientific communities that current institutional structures are hindering revolutionary or unorthodox scientific theories, with many science policy writers also expressing concerns about increasing intellectual and theoretical conservatism. (Stanford 2019, see citations in the paper). However, Stanford suggests that scientific realists see current theories as largely accurate and are not worried by less change in science. (2015, 873-874). On the other hand, historicist critics of realism argue that science's chief aim should be to uncover and cultivate revolutionary theories to supersede our current understanding (2015, 874-875).

Similar conclusion has been made by Fine:

> "Suppose that the already existing theories are themselves approximately true descriptions of the domain under consideration. Then surely it is reasonable to restrict one's search for successor theories to those whose ontologies and laws resemble what we already have especially where what we already have is well-confirmed. And if these earlier theories were approximately true, then so will be such conservative successors." (1984, 87.)

It seems that there might be a difference between realism and antirealism that can be made visible in their verdicts concerning how the future of science could develop and what we should do in science. However, the issue is not quite so simple. Stanford's notion of *the classical realist* should

be read in contrast to *the selective realist* (see §1) who accepts that important parts of current theories may be overthrown in the future. Stanford argues that the selective realists and their historicist critics have a "shared vision of the future of science" where both continuities and discontinuities characterize the development of science (2015, 875). It seems that another stalemate has been reached.

Stanford goes on to suggest that the locus of disagreement can be understood along the lines of the clash between *catastrophism* and *uniformitarianism* in nineteenth-century geology:

> "Uniformitarians argued that the broad topographic and geographic features of the Earth were produced by [--] natural causes acting consistently over long periods of time at the same frequencies and magnitudes we now observe. By contrast, their catastrophist opponents held instead that such causes had operated in considerably stronger degrees in the past [--] and that the earth has steadily and progressively quieted down over the course of its history" (Stanford 2015, 876).

In the case of science, uniformitarians would argue that the future of science resembles its past when it comes to theory-change, while catastrophists would argue that all the major upheavals are in the past and our current theories will not face equally fundamental and radical changes as the past theories. In short, catastrophists think that the future of science is different from its past, while uniformitarians think that the future of science is similar to its past.

Stanford goes on to suggest that scientific realism should be associated with catastrophism in order to maintain coherence (2015, 876-877). Stanford adds that catastrophists do not need to worry about conservatism in science because fundamental changes is theories are not to be excepted (2015, 877). Given this, realism and antirealism differ in practice: Realism endorses the conservative approach in science while antirealism opposes it.

In a later work, Stanford revises his argument to propose that both realists and antirealists can acknowledge the constant, albeit not radical, theory-changes in the future. However, selective uniformitarian realists, who, according to Stanford, expect continuity in "whatever it is that they are realists about" (Stanford 2021, 224), are inclined towards conservatism. For instance, a structural realist, like Worrall (1989), would commit to the mathematical or structural content of our theories, thereby expecting the structure to be preserved through theory-change. This sentiment is echoed by Shaw: “Clearly the kind of continuity we are seeking will differ depending on which [type of realism] is adopted” (2018, 88). On the other hand, antirealists do not deny continuity but maintain we are not generally able to predict which parts of the theories persist, as they claim different aspects of theories are preserved in different instances of theory-change. Antirealism, Stanford argues, if it denies all prospects of continuity, would face the problem of “absurd permissiveness with respect to the alternative theoretical possibilities” (Stanford 2021, 226).

While Stanford’s analysis of the relationships between realism, the future of science, and conservatism are highly nuanced, the overall lesson it has been taken to indicate is that realism and conservatism are closely connected and that realists and antirealists have different expectations towards the future. These different expectations have different consequences for how to select research programs. The recent critiques of Stanford have argued against this association between realism and conservatism.

Dellsén argues that, while Stanford is right in claiming that realists have reasons to believe that radical theory-changes are less probable, “Stanford's analysis overlooks the impact one's stance in the debate over scientific realism will have on the value of different outcomes of the relevant type of search” (2019, 33). If we wish to decide what to do, we cannot only focus on the probability of different outcomes but we also have to take into account the value of different outcomes. Dellsén uses *expected utility theory* to show how Stanford’s considerations are lacking in this regard. The crux of Dellsén’s argument is that, while realists assign a lower probability to the finding of a

radical theoretical alternative than antirealists, they value the outcomes of the search for such alternatives more:

First, realists value the finding of a radical theoretical alternative more:

> "According to the realist, having identified and developed a radically distinct alternative that is in fact epistemically superior to currently accepted theories has clear scientific value in that it makes it much more probable that what we end up with is a theory or theory-part that is at least approximately true." (Dellsén 2019, 35).

In contrast "the anti-realist should be even more pessimistic at that point than she was before about the prospects of a given accepted theory being approximately true" (Dellsén 2019, 35). Given that realists find the radical alternative as more likely to be true than antirealists (given the success of the theory), they also find the theory-change as more valuable because it promotes the goal of science, discovering truths. I return to this argument in the next section.

Second, realists value more a failed search for radical theoretical alternatives. Dellsén argues that, from the perspective of realists, the failures provide evidence for the approximate truth of the accepted theories (2019, 36). Since antirealists believe that the current theories are less likely to be true than realists, this type of evidence is not as convincing to them as it is for the realists. Again, the outcome of searching for radical alternatives is valued more by realists.

Given that realists place greater value on the potential outcomes of the search for radical alternatives, assigning a lower probability to finding such alternatives does not determine what one should do in science. Both realism and antirealism can be motivated to oppose conservatism in science.

Tambolo and Cevolani (2023) have also resisted Stanford arguments. They challenge the "natural pairing thesis," which suggests a direct correlation between realism/antirealism and theoretical

conservatism/openness to radical theoretical novelty. They argue that the decision to pursue a radically different theoretical conception (T*) should be based on whether the scientific community believes T* could surpass the existing theory (T) in realizing a given aim (A), regardless of what A represents. They argue that the level of conservatism in a community should be proportional to how demanding it is to achieve A, and that antirealists' objectives, like empirical adequacy, are not necessarily easier to accomplish than realists' goals.[4]

Tambolo and Cevolani argue that, because the difference between realism and antirealism cannot be in how demanding their respective goals are, Stanford has to be interpreted as arguing that historical considerations lead realists to assign a higher probability to the truth of the current theories. However, Tambolo and Cevolani argue that this does not do justice to a sophisticated realist position:

> "In short, sophisticated realists claim that our best theories are the best relative to our current knowledge, but do not need to be the best in some absolute sense. This makes them reasonably well-equipped with a sophisticated assessment of the historical track record of science: nothing, in their position, implies that theories, or parts of them, are 'untouchable' in the sense that they cannot be improved even in a radical way. Also on this count, then, we fail to see the essential difference between realists and antirealists that Stanford's account seems to imply." (2023, 11.)

In other words, sophisticated realists believe our current best theories are the most accurate according to what we know now but acknowledge they can be significantly improved or changed over time, which does not seem to make them that different from antirealists, contrary to what Stanford suggest. I return to this argument in §5.

[4] See van Fraassen (1980) on empirical adequacy.

Before I go on to argue that, despite the considerations above, there are differences in how realism and antirealism orient us towards the future, we need to notice that the question of whether realism or antirealism better supports scientific development is somewhat different from the question of whether there is some difference in what realism and antirealism tell us about the future. As Wray points out, "it is an empirical question whether or not realism is better for scientific progress (2015, 76). Moreover, even if realism and antirealism told the exactly same things about the future (assuming this for the sake of argument), there might be some independent mechanism that makes a commitment to one of the positions more fruitful. In this paper, we attempt to find differences between realism and antirealism with respect to what they say about the future. We do not have to take a stance on whether realism or antirealism is better for scientific conduct.

In general, there seems to be a tendency to oppose/support the idea that realism is more conservative on the basis of whether one accepts realism and whether one thinks that conservatism in science is harmful. Those who accept that conservatism is harmful but support scientific realism tend to argue that realism and antirealism are equally conservative. For example, Dellsén argues that realists may "seem to make the wrong normative recommendation … Perhaps, then, this would give those of us who were never quite convinced by classic anti-realist arguments a different kind of reason to move towards some form of anti-realism. (2019, 31). My concern is that this type of reasoning puts the cart before the horse and narrows our understanding about the future. We cannot tell whether conservatism is harmful without having some conception about what could happen in the future. Stanford's claim that conservatism is nothing to worry about *if there is no reason to expect or value radical future changes* is not controversial. If we build on the assumption that conservatism is harmful, we might load the dice against certain ideas about the possible futures. Moreover, there might be ways of conducting transformative research while remaining conservative with respect to certain aspects of mature science. It is not quite clear whether National Science Foundation (NSF) and the European Research Council (ERC) mean by harmful conservatism the

same conservatism that a realist might be committed to. It might be the case that "conservative realism" can very well create scenarios of the future that are transformative in the required sense. To solve this issue we would need further research on what the guidelines of NSF, ERC, etc. say from the perspective of realism – obviously this cannot be done within the limits of this paper. Due to these reasons, I suggest that we leave aside, at least for a moment, our judgements about the harmfulness of conservatism in science. Instead, we shall calmly study the question of what realism and antirealism tell us about the future.

4. Realism, Antirealism, and Possible Futures

In the previous section, we have seen how a line in the scientific realism debate focuses on what futures are possible, probable, and desirable from the perspective of (different forms of) scientific realism and antirealism. The overall consensus appears to be that, in many cases, realism and antirealism allow and value the same future possibilities, contrary to what Stanford (2015) initially suggested. In what follows, I agree with this conclusion but I argue that there are also important differences in how the positions see the future and how they allow us to track scenarios of the future. Moreover, I point out that when realism and antirealism agree on some future scenario, this is an important insight in its own right.

We may begin by noticing that there is a field that focuses on the questions about possible and desirable futures. In *futures research*, possible, probable, and desirable futures are studied (Amara 1974; Bell, 2009). An essential component in the mapping of futures is the critical study of our own conceptions that ground different scenarios of the future (Bell, 2009; Inayatullah, 1998). The interplay between understanding possible futures and the critical study of our conceptions about the future is captured best by the notion of *alternative futures* that has been a guiding concept in futures research (see Slaughter, 2020). The critical study of the conceptions that guide our views on the future means that the future scenarios should be varied and that we should also create scenarios that

challenge the ones that we take to be most natural or plausible. This idea is captured by the notion of *alternative futures*. The notion also suggests why futures research is not essentially concerned with prediction or likely futures. Rather than approximating a likely future outcome, the attempt is to increase awareness of possible futures and thus allow us to prepare for a variety of outcomes.

Futures research can be understood as centering around *scenarios of the future*:

> "The goal of scenario writing is not to predict the one path the future will follow but to discern the possible states toward which the future might be 'attracted.' [–] If a prediction is a definitive statement of what the future will be, then scenarios are heuristic statements that explore the plausibilities of what might be." (Staley, 2002, 78).

While there are different definitions of a scenario and subtle differences between the definitions, in this paper, we can consider a scenario simply as a "*description of a future situation and the course of events which allows one to move forward from the actual to the future situation*" (Amer et al., 2013, 23 emphasis added).

While there are several methods to create scenarios, in order to achieve the goals of the paper, we can focus merely on certain overall features that scenarios can have. For the purpose of distinguishing between scientific realism and antirealism in terms of scenarios of the future, it is enough that we identify the following aspects of a scenario:

1. Is the scenario a probable, possible, or alternative future? These are vague notions but, roughly, a probable future is a future that we consider as likely above a certain threshold; a possible future is a future that can happen, given what we believe about a domain; and an alternative future is a future

that follows when we question our assumptions about some issue in the domain (Inayatullah 1998) for some understandable reason.[5]

2. Is the scenario a desirable future? In other words, do we find the future ethically sound and in accordance with our values and goals? (See Bell 1997.) Values and goals are the main dimensions that matter in our analysis below.

3. Is the scenario trackable, i.e., can we form a path to the scenario and can we continue further into the future from the scenario? In other words, does the description of the scenario imply that we cannot know or explain happened before or after?

4. Why do we answer questions 1-3 in a certain manner with respect to the scenario, or why we cannot explain our answer?

There are several other features that we can use to characterize a scenario, but the four features above are general enough to be widely applicable and they are also sufficient for the modest purpose of this paper: I am not attempting to exhaust all the scenarios that realism and antirealism create. Rather, I show that there are differences in how realism and antirealism understand the scenarios, and this is enough to show that realism and antirealism can be distinguished on the basis of their implications for the future.

[5] We do not wish to allow alternative futures to involve futures that are extremely far-fetched and based on some deep and systematic error in our epistemic underpinnings. To take a toy-example, scientific realists can accept that a future where our theories turn out to be wrong due to the fact that there is a fundamental error in calculations is an alternative future, but realists cannot accept the idea that an evil demon deceives us as an alternative future – it is simply irrelevant and too far-fetched.

There are several ways of formulating scenarios of the future on the basis of scientific realism and antirealism (see Virmajoki 2023). However, given the focus on the issue of conservatism in science in the recent debate, we may take it as a starting point. We begin by creating two scenarios:

1. Scientists follow a research program that is not radically distinct from the current empirically successful and mature program.

2. Scientists follow a research program that is radically distinct from the current empirically successful and mature program.

That both realists and antirealists equally accept these scenarios as possible/probable is not controversial. We need to elaborate. Consider two further scenarios that build on Scenario 1:

1.1 The program leads to empirical success.

1.2 The program is not empirically successful.

Within this step, there are some differences. First, realists will take 1.1 as more probable than antirealists, and antirealists will take 1.2 as more probable than realists. After all, antirealists can more readily allow that the current science will face a crisis as far as they are not committed to the approximate truth of our theories. These different judgments of probability are widely shared and, for example, Dellsén's (2019) argument takes them for granted. Yet, there is no controversy about whether it is a possible – or at least an alternative – future where success is no longer achieved. Both realists and antirealists can accept this. In general, realism is not committed to an infallibilist position (Psillos 1999, 78). Moreover, both realists and antirealists can agree that 1.1 is a scenario of a desirable future, at least for the instrumental success that follows. Yet, one might argue that it is somewhat more desirable for realism, as the realists take the success to indicate also the truth of the current theories. Not only would we be able to use our current theories to guarantee instrumental success but, according to realists, we would also be able to consider their truth as more likely.

In 1.1, realists have an explanation for the success: it is due to the parts that were preserved in the choice of the research program. More importantly, this enables realists to infer that, in scenarios that go further in time, these parts will be preserved. *Scenario* 1.1 *is trackable to the realists*. Realists can follow the scenario further into the future because they can identify which parts of theories will be preserved in these further futures. Of course, different types of realists will make different conclusions about which parts or aspects of theory will be preserved, but this does not alter the fact that the scenario is trackable for all types of realists, as they all will find some part or aspect that they can project onto the future. In contrast, even the most sophisticated antirealist á la Stanford cannot track the scenario. Remember that this sophisticated antirealist can accept that parts or aspects of a theory are preserved but it changes from case to case which parts or aspects are preserved (Stanford 2021, 227; see the previous section for discussion). Given that the antirealist does not have the general categories that realists can use to track the scenario, *the scenario is untrackable to the antirealist*. To put it bluntly, when it comes to trackability of 1.1, the difference between realists and antirealists is that realists can tell which parts of current theories are preserved in the scenario while antirealists cannot. Both can give an broad outline of that future, that there are some changes and some continuity, but only realists can be specific about what changes.

In 1.2, realists have two options. Either they claim that the successful parts of the previous theory were abandoned after all, or they claim that the theory was not even partly true. However, the first claim leads to the admission that we are not able to tell which parts of a theory will be preserved and, thereby, lose the ability to track scenarios even on the assumption that current best theories are partly true. The second claim cuts the link between success and truth and our ability to track scenarios further into the future: even if the success was restored in later theoretical developments, there would be gaps between successful theories. In 1.2 we would have a future-centered pessimistic induction that concludes from more close futures a pessimistic attitude to be present in more distant futures.

On the other hand, in 1.2, antirealists can accept the situation and conclude that the future changes cannot be tracked because there are fundamental changes in science. However, a sophisticated antirealist who admits that there are generally continuities in science (see above) is not much better off than realists, as they would need to admit, in 1.2, that no such continuities exist. The reasons are the same as for realists explained above. Yet, even though antirealists could be proud of being right, they do not have any more tools than the realists to track the scenario further in the future. What is worse, some forms of antirealism, such as constructive empiricism, would also lose their explanation for scientific success. The success of the theory before the failure cannot be explained by its "[latching] on to actual regularities in nature" (van Fraassen 1980, 40) because a nonradical further version of the theory is no longer successful.

It is interesting to notice that realism and antirealism face similar challenges when it comes to scenario 1.2. We cannot distinguish between the positions in terms of what they say will happen in the scenario. This is interesting in its own right, as we can see how deeply entrenched the assumption about constant success is when we think about the future of science in cases of nonradical theory-change. Of course, there are positions, such as Kuhn's (1962), that can be used to tell something general about the future in such cases of crises (see Virmajoki 2023), but it is unclear why the realists could not accept the similar position, given that their own position already crumbles with respect to the theory at hand. Everyone can agree that some type of revolution might very well happen in this situation, but the nature of the postrevolutionary science is equally untrackable for everyone. Moreover, there seems to be no difference in the desirability of the scenario for realists and antirealists. Both would regret the acute loss of success and welcome whatever success there will be after a revolution. Of course, it could be argued that the realists would lose more, as they could no longer believe that the postrevolutionary science tells us the truth. However, it is difficult to say why this death of epistemic optimism would be worse than accepting that we never know anything anyway.

Next, take the following scenarios that build on Scenario 2:

2.1 The radically different research program leads to success.

2.2 The radically different research program is unsuccessful.

In this case, realists will take 2.2 as more probable than antirealists, and antirealists will take 2.1 as more probable than realists. Moreover, as we have seen, Dellsén (2019) has argued that realists find both outcomes more desirable than antirealists. According to Dellsén, in 2.1 realists would believe that the new, fundamentally different but superior, theory would be more likely to be true. However, I think we should resist this conclusion. The description of the scenario involves a change that would undermine, in the spirit of pessimistic induction, the realists´ idea of the connection between success and truth. After all, the scenario shows that a successful theory – the current theory that has been replaced in the scenario – can be fundamentally wrong. Even if the realists would hold the new theory as true, they would still lose their ability to track what happens in the future, as there would be no way of excluding futures with radical alternatives by using the existing knowledge at any point in time. History would have shown that radical alternatives can be successful and pursuitworthy. It does not seem that any features of scenario 2.1 enable realists to resist conservatism. Why put effort to pursue a future that is not probable, desirable, or even trackable? Antirealists have at least one reason more reason to pursue the scenario: they consider it more likely. However, the scenario is no more trackable to the antirealists and many versions of antirealism would, again, lose their explanation for the success of a theory. Moreover, a sophisticated antirealist would be equally staggered as the realist. Again, the sophisticated antirealists' claim that there are different types of continuities that hold in different situations of theory-change would be undermined. When the sophisticated antirealist keeps the possibility of scenario 1.1 alive by allowing continuities, this fires back in making scenario 2.2 less likely and more awkward for her. A sophisticated antirealist who wishes to understand futures with

continuities struggles to understand futures with radical alternatives. Softening the antirealist position does not seem to enable the antirealist to orient themselves towards more future possibilities.

In 2.2, realists have a clear path to follow: simply return to the earlier theory. For a realist, scenario 2.2 leads back to scenarios 1.1 and 1.2. In fact, as Dellsén (2019) pointed out, the realist might have even better reasons to believe that the earlier theory is true in this case. If Dellsén is correct in this, scenario 1.1 which is favorable in the trackability for the realist is even more likely, and deserves even more attention according to them.

Scenario 2.2 is desirable for realists both in confirming their convictions and in allowing the realists to navigate the scenarios of the future better. On the other hand, antirealists need to fall back to the earlier theory without the prospects of drawing a lesson about the failure. Moreover, the scenario seems to provide evidence for realism and therefore against antirealism. The so-called put-up-or-shut-up argument (see Soler 2015) becomes even stronger: Either you create a radically different science or you quit claiming that such science is possible.

This brief and crude study of the features of scenarios that antirealism and realism imply shows that, while the positions can agree on many issues about the future of science, there are subtle differences in what they consider likely, possible, desirable, and trackable futures and how they explain their considerations. In fact, the brief survey indicates that while antirealism may have fewer possible surprises in the future, it remains more ambiguous about which futures are desirable. It does not explain (or explain better than realism) why certain futures should be valued beyond improving, maintaining, or restoring empirical and practical success in science. Moreover, antirealism does not seem to have any scenario where it can say, "be aware, if this happens, only I can tell you what will happen," because there does not seem to be any scenario that is more trackable to antirealism than realism. One might even wonder why to keep antirealism on the table

when discussing the future, as it does not enable us to think about the scenarios of the future any further than realism. I think there is a truth in this worry, but we must remind ourselves that adequate futures research remains critical to our conceptions of the world. Moreover, there might be cases where antirealism fares better. Our survey above was anything but exhaustive – it only discussed the weakest forms of realism and antirealism. There are different forms of antirealism, and they may have interesting things to say about the future. I turn to this issue next.

5. Who Cares about Philosophical Positions?

In the previous section, I pointed out that realism and antirealism, even in their sophisticated forms, differ with respect to what they say about the future and what they enable us to infer about the future. Once we evaluate (i) which scenarios are probable, possible, or alternative futures, (ii) which scenarios are desirable futures, (iii) which scenarios are trackable, and (iv) why (or why not) we answer the questions the way we do, then we can see differences between realism and antirealism. One of the main differences between the positions that explain the differences in their scenarios of the future seems to be that realism allows more continuity than antirealism. However, we have seen that it can be denied that realism implies such continuity. As we saw, Tambolo and Cevolani argue that

> "sophisticated realists claim that our best theories are the best relative to our current knowledge, but do not need to be the best in some absolute sense. This makes them reasonably well-equipped with a sophisticated assessment of the historical track record of science: nothing, in their position, implies that theories, or parts of them, are 'untouchable' in the sense that they cannot be improved even in a radical way. Also on this count, then, we fail to see the essential difference between realists and antirealists that Stanford's account seems to imply." (2023, 11.)

It is not quite obvious whether realism can, in fact, fall back to such a position without losing its basic conviction that our best theories are approximately true descriptions of the mind-independent world and that we can trust that certain parts of them are survive theory-changes. However, we can leave that issue aside. Maybe such a position can count as realism, maybe not. The important thing to notice is that, if the notion of continuity is dropped from realism, then Stanford's sophisticated antirealist with the idea that, while there are continuities, we cannot know on a general level which parts of a theory will be preserved, and the sophisticated realist á la Tambolo and Cevolani do come rather close to each other.[6] In this case, the realists´ and antirealists´ futures do come quite close to each other.

However, it seems difficult to understand why there should be any debate about distinguishing between realism and antirealism if their core claims come together. The problem of distinguishing between realism and antirealism was supposed to be that, despite antirealism and realism making fundamentally different claims about science and its achievements, these claims do not seem to make any concrete difference in how we look at the workings of science and its history and future. In a situation where the core claims are almost exactly the same, the problem of distinguishing the positions becomes trivial.

It is interesting in its own right if realism and antirealism have reached such consensus. Given the a consensus, it would become ever more easier to provide scenarios of the future of science – realists and antirealists would agree on everything. Difficult questions concerning which of the two competing sets of scenarios we should commit to would no longer arise. I think this would be a remarkable achievement. Of course, this situation would be bad news to those who commit to either realism or antirealism for some reason that stems from their fundamentally different understandings

[6] Of course, we can ask whether Stanford´s sophisticated antirealism is, in fact, some form of "continuity-blind realism".

of science because such a difference would not exist. I think this is a small price for much easier scenario-work.

But who cares about philosophical positions anyway? Well, we all should. The consensus between realism and antirealism has not been, in fact, reached, and there are several positions in the debate that one can adopt and defend. All these positions do have different things to say about the future. Especially many realists do, in fact, defend the idea that there are identifiable continuities in science. Given the realists' commitment to continuities, there are differences between realists and antirealists that make a difference. The fact that the most watered-down versions of antirealism and realism come together does not change this fact.

To put it simply: If we are interested in the future, then the realism vs. antirealism debate makes a difference, as the positions in the debate have different consequences for the scenarios of the future. On the other hand, if we are interested in sticking with philosophical labels and protecting them from all possible counterarguments, then we might end up in a consensus position that makes no real commitments to anything and, therefore, remains mostly silent about the future. But who cares about the labels? I think the future is by far the more interesting topic, and it is here that realism vs. antirealism makes a great difference, given the richness of positions in the debate. The richness enables us to build a rich set of different future scenarios.

6. Concluding Remarks

In this paper, I have discussed a recent line of the scientific realism debate that centers around the possible differences that realism and antirealism make in how we should understand and approach the future. I have argued that, despite the seeming stalemates in the debate, there are differences between realism and antirealism when we analyze their scenarios of the future.

The discussion points toward the idea that philosophical positions have a high value in our thinking about the future of science. In order to understand possible futures of science, we need deep understanding about the nature and development of science and we have to critically analyze our conceptions of science. Philosophy of science engages with these issues and is, therefore, valuable in the estimating of possible futures of science. One avenue to keep the philosophy of science relevant is to commit to debates about the future. However, this requires that we focus less on labels and more on the differences that can be found in the logical space of positions. I suggest that different possible futures should be the central axis of the realism debate.

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