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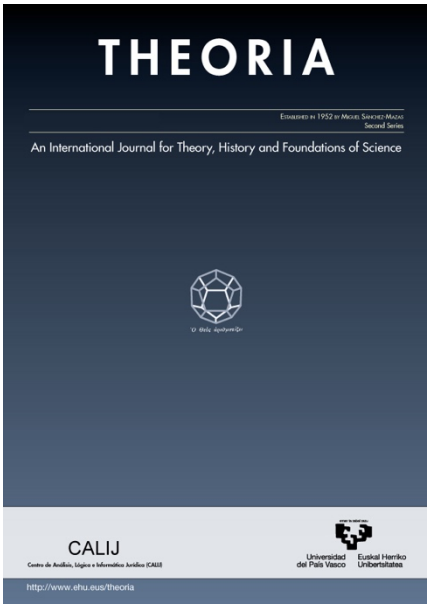

Some reflections on Mitchell's pragmatist variant of scientific realism

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Some reflections on Mitchell's pragmatist variant of scientific realism*

(Algunas reflexiones sobre la variante pragmatista del realismo científico de Mitchell)

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Abstract: This article aims at discussing an interesting variant of scientific realism recently proposed and defended by Sandra Mitchell (forthcoming), namely an affordances-based and pragmatist variant of scientific realism. We firstly place Mitchell's proposal in the context of the current state of the debate over scientific realism. Secondly, we summarize the salient features of Mitchell's proposal. Thirdly, we point out some aspects of that proposal that might require some further refinement and clarification in order to make it less prone to criticisms by both realists and antirealists. More precisely, in this paper we address the following issues: 1) whether Mitchell's proposal can be classified as a genuine form of scientific realism; 2) whether the fact that in Mitchell's proposal figure some variants of the no miracle argument is in tension with some other of its features.

Keywords: Sandra Mitchell, pragmatism, scientific realism, robustness, truth, no miracle argument

Resumen: Este artículo tiene como objetivo discutir una variante interesante del realismo científico recientemente propuesta y defendida por Sandra Mitchell (de próxima aparición), a saber, una variante del realismo científico pragmatista y basada en las affordances. En primer lugar, situamos la propuesta de Mitchell en el contexto del estado actual del debate sobre el realismo científico. En segundo lugar, resumimos las características más destacadas de la propuesta de Mitchell. En tercer lugar, señalamos algunos aspectos de esa propuesta que podrían requerir mayor refinamiento y aclaración para hacerla menos propensa a las críticas tanto de realistas como de antirrealistas. Más precisamente, en este artículo abordamos las siguientes cuestiones: 1) si la propuesta de Mitchell puede clasificarse como una forma genuina de realismo científico; 2) si el hecho de que en la propuesta de Mitchell figuren algunas variantes del argumento del no milagro está en tensión con alguna otra de sus características.

Palabras clave: Sandra Mitchell, pragmatismo, realismo científico, robustez, verdad, argumento del no milagro

Short summary: This article discusses a pragmatist variant of scientific realism recently proposed Sandra Mitchell. Firstly, Mitchell's proposal is put in the context of the current state of the debate over scientific realism. Secondly, the salient features of Mitchell's proposal are summarized. Thirdly, some aspects of Mitchell's proposal that might require some further refinement and clarification are pointed out.

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1. *Introduction: The Current State of the Debate between Realists and Antirealists*

Recently, Sandra Mitchell (forthcoming) introduced in the debate over scientific realism a new variant of realism, namely a pragmatist and affordances-based form of scientific realism. The aim of this paper is twofold: 1) to analyze Mitchell's proposal and assess whether it can be regarded as a genuine variant of scientific realism; 2) to assess whether the fact that in Mitchell's proposal figure some variants of the no miracle argument is in tension with other features of Mitchell's proposal. We attempt to evaluate Mitchell's view in the most objective possible way, i.e., from a non-idiosyncratic point of view. In order to do that, we rely on shared criteria for distinguishing realist positions from non-realist ones that are available in the extant literature. Before describing Mitchell's proposal in some detail (section 2) and illustrating some challenges it might have to face (section 3), it is useful to place Mitchell's proposal in the context of the current state of the debate over scientific realism.

In recent years a sort of new trend in the debate between realists and antirealists emerged. In the last two decades, both realist and antirealist positions became more nuanced and sophisticated, and both sides tried to carefully reformulate the characterizing claims of their positions in order to address the most threatening challenges raised by the opponent side. After Stanford (2006) formulated the so-called 'new induction' against scientific realism, no other genuinely new and significant argument has been proposed by realists or antirealists. It seemed to many that a sort of stalemate has been reached in the debate.[1] Supporters of realism and antirealism alike started refining their favorite views, and, even more importantly, started looking with much more attention than before at both history of science (Lyons, Vickers, 2021) and scientific practice (Gonzalez, 2020). The basic idea behind this new trend was to go local and be extremely precise in discussing in great detail case studies that would be able, at least to some extent, to support at least some aspects of the main claims that characterize one's cautiously refined and extremely weakened variant of realism or antirealism (Stanford, 2021a). In particular, formulations of realism appeared to be less and less metaphysically bold with respect to classical formulations provided, for instance, by Putnam (1975), Boyd (1973), and Smart (1963), i.e., by the fathers of what can be called the "'good old' scientific realism" (Nickles, 2020, p. 107), which can be formulated, in a slogan, as the metaphysical thesis that our best scientific theories are (approximately) true.[2]

The main reason for this reshaping of scientific realism was the necessity, felt by many realists, of avoiding at least the two main challenges raised by antirealists, namely the argument from underdetermination (Duhem, 1906) and the argument from the history of science, i.e., the so-called pessimistic meta-induction (Laudan, 1981). The argument from underdetermination hinges on the idea that it is always possible that different and incompatible theories are able to account for the very same set of phenomena one wishes to explain, and so that we have no principled reason to prefer one over the others and proclaim it the 'true one'. The argument from the history of science hinges on the idea that the history of science provides us with counterexamples to the realist claim that empirical success is a good indicator of truth, since there are plenty of examples of once successful theories that have successively been discarded and deemed false. So, the argument goes, the realist inference from the empirical success to the truth of a theory should be resisted. Different strategies have been elaborated by realists to make their position more sophisticated and defensible in the face of those challenges (for a survey, see Chakravartty, 2017).

Perhaps the most influential strategy elaborated by realists so far has been selectivism, i.e., the idea that one should not commit oneself to the truth of a whole theory, albeit successful, but rather one should limit one's commitment to just some parts or aspects of a given successful theory. Selectivism comes in different forms in its turn. However, two main stripes of selectivism are entity realism (Hacking, 1983) and structural

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[1] On this issue, see Pils (2022), and references there provided. The idea that realists and antirealists reached a stalemate can be traced back at least to Fine (1986).

[2] As regards the ways in which many antirealists reshaped their view, see Stanford (2021a). We focus on scientific realism, since Mitchell is a self-declared scientific realist, and our aim is to analyze her position.

realism (Worrall, 1989). Putting aside the many variants of entity realism and structural realism that have been formulated,[3] it can be said that, according to entity realism, one should commit oneself exclusively to the existence of those unobservable entities that figure in successful theories and for the existence of which we have a huge amount of evidence and causal knowledge, i.e., we know how to reliably interact with those entities, albeit somewhat indirectly. On this view, we should refrain to commit ourselves to the truth of the theories in which those entities figure, since those theories could be incorrect under many respects and be replaced by better theories in the future, as history of science taught us.[4] According to structural realism, one instead should commit oneself exclusively to the reality of the structure[5] of empirically successful theories, since it is that structure that it is most likely retained through theory change, and so it must be that feature of our best theories that it is at least approximately true, and not some of the theoretical claims or unobservable entities that figure in those theories.[6] In other words, structural realists commit themselves to the reality of the "structure of the unobservable realm, as represented by certain relations described by our best theories" (Chakravartty, 2017, section 2.3). Thus, both entity realism and structural realism recognize the challenge from the history of science raised by antirealists as compelling and concede to the antirealist that it is well possible that some part or aspect of an empirically successful theory turns out to be false. However, both entity realism and structural realism maintain the crucial idea behind scientific realism, i.e., that we can perform an inference from (some kind of) success of a given scientific theory to (some sort of commitment to at least) some (kind of) unobservable aspect of reality, of which we can claim to have genuine knowledge. In order to do that, supporters of entity realism and structural realism usually rely on (some form or another of) the no miracle argument.[7] Indeed, the no miracle argument, which is regarded as the ultimate argument for realism (Musgrave, 1988), is based on the so-called 'no miracle intuition' (Worrall, 1989), i.e., the idea that it is not possible to explain the empirical success of our best scientific theories other than in terms of the (approximate) truth of those theories. Supporters of entity realism elaborate a variant of standard no miracle argument that focuses on the impossibility of explaining our acquired ability in reliably manipulating the unobservable entities at stake other than in terms of the existence of those entities. Analogously, supporters of structural realism elaborate a variant of standard no miracle argument that focuses on the impossibility of explaining the retention of some (mathematical) structures through episodes of theory change other than in terms of the truth of those structures, i.e., the idea that those structures correctly represent some deep and unobservable aspect of reality. Since the no miracle argument is usually regarded as an instance of abduction or inference to the best explanation, usually selective realists maintain the standard realist commitment to the acceptability of abduction and inference to the best explanation and regard those inference rules as ampliative and truth-conducive inference rules

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3 For a survey, see Chakravartty (2017).

4 A standard example is that of electrons. According to entity realists, if it is true that many theoretical aspects of the theories in which electrons figure and that account for electrons' behavior changed over time and that it is possible that they will continue to change in the future, it is also true that the causal knowledge and ability to interact with those entities that we acquired over time is such that licenses our belief in the mind-independent existence of those entities and in the idea that the existence of those entities will not be denied by future science.

5 There are several ways to conceive of structures and so to understand what structural aspects of a theory are retained through theory change (for a survey, see Ladyman, 2020). However, the most common way to argue for structural realism is to highlight continuity in the mathematical structures of successive scientific theories.

6 A standard example is the retention of equations from Fresnel's theory to Maxwell's theory. See Worrall (1989), who recognizes Poincaré as a forerunner of his view on structural realism.

7 For classical formulations of the no miracle argument, according to which the truth of our best scientific theories is the only explanation for the empirical success of science that does not make that success a miracle, see Putnam (1975, p. 73) and Smart (1963, p. 39).

(Psillos, 2011).[8] In a nutshell, it is only by relying on some kind of abductive argument that one can connect the empirical success of a theory and the claim that one possesses genuine knowledge of some unobservable features of reality thanks to that theory. And it is only by thus abductively connecting empirical success and knowledge that one can explain the empirical success of science in realist terms, i.e., in terms of truth (Niiniluoto, 2018). As regards underdetermination, the standard realist way to react to that antirealist threat is, again, by reaffirming the realist's commitment to inference to the best explanation. Indeed, if empirical evidence is no more the only criterion for theory choice, it is always possible for the realist, by performing an inference to the best explanation, to select the *best* theory available and claim that that theory is the true one, even if she is presented with several empirically equivalent rival theories that are able to account for the very same set of phenomena she wants to account for.[9]

Now, the fact that realists and antirealists alike tried to formulate more cautiously their view should be welcomed and seen as a step forward in the debate (Stanford, 2021a). Nevertheless, a risk is lurking in the trend just described: the increasing difficulty for an observer to clearly and objectively assess whether a given position should be regarded as a genuine realist or antirealist position, where 'objectively' simply means 'independently from how the proponent of that position regards her position'. The problem is not that it might be more difficult than in the past to locate different authors on one side or another of the debate. The problem is that it might become hard to see what really is at stake in the debate over realism in the philosophy of science, to understand what we are discussing about when we discuss about scientific realism, if realist and antirealist positions are no longer so neatly distinguishable.[10]

However, despite the fact that realist and antirealist positions became closer and closer, there is, in addition to acceptance of abduction and inference to the best explanation already mentioned above, at least another fundamental aspect that still clearly divides the two sides of the debate. It is the idea, shared by all selective realists, that although theory change has to be admitted, one should be confident that knowledge of the unobservable realm provided by our current best scientific theories will not be completely rejected by future science (Stanford, 2021a; Chakravartty, 2021; Alai, 2020; Vickers, 2022). In other terms, selective realists cannot completely renounce defending the idea that the empirical success of science would be unexplainable if at least some parts or aspects of our current best scientific theories do not (at least approximately) correspond to how things really are in the world. And if (at least) some parts or aspects of our current best scientific theories are (at least approximately) correct, i.e., correspond to how things really are in the world, we have to expect that (at least) those parts or aspects of our current best scientific theories will be retained by future theories (Chakravartty, 2021). This means that selective realists commit themselves to the claim that future science will not disproof what they think, on the basis of current science, we should now be realist about. For example, Ruetsche states that "an apt functional characterization of the intended locus of commitment" of selective realists can be formulated, in a slogan, as "What's preserved in all future science" (Ruetsche, 2020, p. 293). Put it another way, if future science could witness revolutionary theory

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[8] For a survey of the different views on how abduction and inference to the best explanation are related, see Mackonis (2013). We will not enter that debate here since it is irrelevant to our purposes. Indeed, whether one thinks that abduction and inference to the best explanation are completely distinct forms of inference or one instead thinks that they are just one and the same, it is irrelevant to the aim of determining whether one embraces a realist position. What is relevant to that aim is whether or not one thinks that abduction or inference to the best explanation are admissible and truth-conducive inference rules. For a criticism of the thesis that abduction can be regarded as an ampliative and truth-conducive inference rule, see Cellucci (2013, chapter 18). For the indispensable role that abduction and the no miracle argument, or some of its variants, are supposed to play in almost any realist view on science, see Niiniluoto (2018, chapter 9).

[9] For the problems the realist has to face in dealing with underdetermination, see Stanford (2021b).

[10] Many realists who subscribe to traditional forms of scientific realism see the more sophisticated views on realism, such as those advocated for by selectivists, as too close to antirealism to be defined as realist. See, e.g., Psillos (1995) and Park (2022).

change even in domains in which realists think that our current best scientific theories provide us with genuine knowledge, how could realists be able to determine what should we now be realist about? Thus, in order to remain realist enough, selective realists have to claim that future science will not witness radical, revolutionary theory change in those domains in which our current best scientific theories provide us with genuine knowledge.[11]

Antirealists usually do not share any such commitment to future science, so realist and antirealist positions can still be neatly distinguished at least under that respect (Stanford, 2021a). To sum up, there is a shared consensus that at least two requirements can allow one to assess whether a given position should be regarded as a selective realist position, i.e.: 1) acceptance of abduction and inference to the best explanation as valid, ampliative and truth-conducive forms of inference, and reliance on some form or another of the no miracle argument (so that one can face the challenges from underdetermination and history of science); 2) commitment to a non-revolutionary view on future of science (so that one can maintain the realist most qualifying intuition about how one should explain empirical success of scientific theories). It is worth noting that 1) and 2) are deeply related, so that it is quite difficult to accept one and deny the other, and that albeit if 1) and 2) are taken in isolation they are not sufficient to assess whether a given position is a realist position, if they are considered together they are quite effective in determining whether a given position is a realist position.[12]

2. *Mitchell's Pragmatist Variant of Scientific Realism*

Mitchell (forthcoming) aims at developing a pragmatist approach to scientific realism. This means that Mitchell's is in some sense a non-standard view on realism. If indeed there are assumptions that scientific realists and pragmatists are usually thought to share, there are also many issues on which pragmatists and realists are usually thought to come apart, such as, for instance, the idea that truth should be understood in terms of correspondence between language and reality.[13] Mitchell's aim is twofold. She aims, on the one

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[11] We do not discuss here, since it is not relevant to our purposes, the crucial problem for selective realism, namely the problem of providing a selection criterion that is able to identify what parts or aspects of a given current scientific theory we should be realist about and expect will be preserved in future science (Stanford, 2003). What is crucial for our argument is that selective realists commit themselves to a non-revolutionary view on future science, while antirealists do not share such commitment. As an anonymous reviewer pointed out, it might be objected that structural realism seems to be compatible with ontological revolutions, and so that it should not be compelling for structural realists to commit themselves to a non-revolutionary view on future science. We think instead that also structural realists should commit themselves to a non-revolutionary view on future science. Indeed, radical change in future science is not restricted to ontological revolutions. Nothing prevents revolutionary changes in structures. Unless the structural realist is able to demonstrate that retention of the very same fundamental structure occurred at any time in the history of science and will occur at any time in the future of science for some principled reason, we have no reason to limit the idea that revolutionary change may occur in science to non-structural components of theories. To the best of our knowledge no structural realist has so far been able to argue for such a claim.

[12] Indeed, there are authors who do not accept abduction or inference to the best explanation as valid and ampliative inference rules but commit themselves to scientific realism (Musgrave, 1988), as well as authors who reject a revolutionary view on future science but do not commit themselves to scientific realism (Stanford, 2021a). So, one cannot take acceptance of abduction or endorsement of a non-revolutionary view on future science as good indicators of whether an author commits herself to scientific realism. On the contrary, when an author both accepts abduction and endorses a non-revolutionary view on future science, it is very likely that she commits herself to scientific realism.

[13] For a brief introduction to what ideas pragmatists and scientific realists share and to what issues instead they disagree upon, see Cherryholmes (1992) and Westphal (2015). On pragmatist views on truth, see Capps (2019).

hand, at reconciling pragmatism and scientific realism, and, on the other hand, at making a step forward in the debate between realists and antirealists by proposing a reasonable form of realism, i.e., a form of realism that is able to take into account some of the main concerns raised by antirealists. In order to do that, Mitchell tries to combine the two most promising selectivist views on science, namely entity realism and structural realism.

Following Chakravartty (2021), Mitchell sees structural realism as a top-down approach on what is real, which emphasizes "formal, mathematical descriptions furnished by theory" (Chakravartty, 2021, p. 353-354), and entity realism as a bottom-up approach to what is real, which emphasizes "causal interactions and manipulations at the heart of experiment" (Ibidem, p. 354). Mitchell thinks that both approaches are right to some extent, and that they both identify crucial aspects of our endeavor to define what is real. According to Mitchell, on the one hand, a "bottom-up approach takes causation as the foundation of positing what's real. Unobservable phenomena are taken to be the cause of experimental data, and thus the interactions and results of empirical practices provide the required metaphysical warrant" (Mitchell, forthcoming, p. 121).

Causation is a crucial ingredient in Mitchell's view on realism, since in her view empirical reliability, causally construed, is essential to the justification of claims of realism. But according to Mitchell, it is not possible to provide an objective account of what is real that is based on causation and that is completely independent from the activity of the epistemic subject. Mitchell provides a fine-grained analysis of the "roles played by the theoretical characterization of the phenomena and the philosophical theory of causation in judgments about the reliability of experimentally produced data" (Ibidem, p. 132). In other words, when we deal with the issue of providing an account for a given causal process, we have to consider the theories we develop to account for causation itself and to design experiments, to interpret data, etc. On the other hand, a "top-down view recognizes that unobservable phenomena are the referents of abstract explanatory theories [...]. The structures described by the mathematical relations in our best theories are taken to be isomorphic or otherwise similar to what is real" (Ibidem, p. 121-122). The role played by theories in determining what we should take as real cannot be overlooked, even if it cannot even be taken in isolation from empirical experimentation, since when we are confronted with different rival theories, it is empirical confirmation that allows us to determine which theory we should select (Ibidem, p. 125). So, despite entity realism and structural realism both capture some aspects of our attempt to define what is real, neither of the two strategies alone is able to correctly define what is "required for warranting claims of realism" (Ibidem, p. 122). So, entity realism and structural realism should be integrated. And indeed, Mitchell aims at offering "a non-dichotomous alternative" (Ibidem, p. 112) to the selectivist realist. But in their standard formulations, entity realism and structural realism are rival and incompatible views on science. According to Mitchell, this is mainly due to their both being foundationalist views, i.e., views that claim to be able to tell us what the fundamental ontology of our world is. But foundationalist and representationalist views on realism, which claim to be able to tell us how really things are in the world independently of us, are prone to antirealist arguments, such as the ones from underdetermination and history of science, arguments that remind us of how fallible and uncertain our claims on what is real might be, because assume the role of the epistemic subject to be negligeable in accounting for what is real, and in so doing provide us with unreasonable accounts of our attempts to define what is real.

Here enters pragmatism. Indeed, Mitchell's move mainly consists in depriving both entity realism and structural realism of their foundationalist ambition and in combining them in a pragmatist framework, where they can both be reshaped and be regarded as the two paths we have to follow in combination to fallibly identify what is real. Anti-foundationalism and anti-representationalism are traditional issues of pragmatism (Cherryholmes, 1992), so Mitchell's proposal can be seen as a genuinely pragmatist view on science. But pragmatism is not only able to make entity realism compatible with structural realism. It is also able to complement them both with what standard formulations of selective realism lack. Indeed, according to Mitchell, what "we are warranted in claiming about what is real are not just structures and not just entities, rather it involves the integration of both human interventions and conceptualizations" (Mitchell, forthcoming, p. 122), and it is precisely a pragmatist approach to realism that is able to identify "the roles

that agency and judgment play in the human reasoning and experimental practices that support claims about nature" (Ibidem, p. 112). Mitchell clarifies how the role played by the epistemic subject in the tangled relationships that obtain among theories, phenomena, and data in scientific practice cannot be overlooked or eliminated, so that a reasonable account of our attempt to define what is real has to take that role into account.

To recapitulate, Mitchell tries to combine a top-down approach and a bottom-up approach to what is real with a pragmatist perspective on the role played by the epistemic subject in determining what is real. The crucial ingredient in Mitchell's recipe for such a kind of pragmatist realism are affordances. Mitchell takes this concept from the famous work of ecological psychologist J.J. Gibson (1979). Gibson (1979) introduced the term and concept of 'affordance' in order to counter representational and computational views on perception and cognition of his time and support a view on perception centered on direct perception in naturalistic environments (Chong, Proctor, 2020). According to Gibson, "the *affordances* of the environment are what it *offers* the animal, what it *provides* or *furnishes*, either for good or ill" (Gibson, 1979, p. 127). This means that not only perception, but also "possible actions are directly conveyed by the environment" (Chong, Proctor, 2020, p. 120). In other words, an affordance "invokes what things external to an agent provide to the agent for action" (Mitchell, forthcoming, p. 113). Coming to the issue of scientific realism, the point is that, according to Mitchell's proposal, we should not be realist about theories or entities, which cannot be taken as correct representation of ultimate constituents of the world, rather we should be realist about affordances, "constructed from the integration of top-down and bottom-up strategies" (Ibidem). The main idea behind Mitchell's proposal is that as the concept of affordance allows Gibson to stress the fact that organism and environment cannot be taken in isolation in order to account for organism's behaviour, so the concept of affordance allows her to stress the fact that objective reality and epistemic subject cannot be taken in isolation in order to account for epistemic subject's attempt to define what is real. It is "the joint contributions of causally grounded experimental data and theoretically structured representational models together" that "specify what is real and what is not" (Ibidem, p. 123).

Two other main ingredients in Mitchell's recipe for realism are: 1) her commitment to an interventionist view on causation, which characterizes causal dependency as invariance of the relation R that obtains between a cause C and an effect E under an intervention that modifies C in several possible ways, a view that is mainly based on the work of Woodward (2003); 2) her reliance on arguments from robustness in providing us reason to believe that what we identified as real is indeed real, an idea that can be traced back at least to Salmon (1984). According to Mitchell, when "multiple different types of experiment generate data from which 'the same' phenomenon is inferred, then realism is the conclusion of a no-miracles argument" (Mitchell, forthcoming, p. 125). In other words, when our hypotheses are severely tested and robustly empirically confirmed, we have reason to believe that it is the universe itself that is providing something to experiment and theoretical models, i.e., that affordances of real phenomena are responsible for the convergence of theoretical models' predictions and results of diverse empirical experimentations.

3. Some Remarks on Mitchell's Proposal

Mitchell's variant of scientific realism, the most interesting and qualifying features of which we briefly summarized in section 2, can easily be seen in continuity with the trend that characterized the realism/antirealism debate in the last two decades described in section 1. Indeed, Mitchell's position is weaker under many respects than the good old scientific realism advocated, for instance, by Putnam (1975), Boyd (1973), and Smart (1963). What makes Mitchell's proposal different from good old scientific realism is precisely what makes it so appealing, what gives it the necessary theoretical sophistication for being considered a variant of scientific realism worth being discussed in the current context of the debate between realists and antirealists.

Mitchell tries to walk what Chakravartty (2021) calls the realist 'tightrope': in order to defend scientific realism from antirealist challenges, the realist has to face "the temptation to affirm less and less", while in order to avoid the risk of making her position indistinguishable from that of many antirealists, the realist has to face "the temptation to affirm more and more", and "it is no easy feat to get the balance *just right*" (Chakravartty, 2021, p. 351). What we are going to do in the rest of this paper is to assess whether Mitchell managed to walk safely the realist tightrope and found the right balance between bold metaphysical commitments and skepticism about the possibility of acquiring knowledge of deepest aspects of reality. In this section we analyse some aspects of Mitchell's proposal that might require some further refinement and clarification in order to make it less prone to criticisms that might come to it from both the realist and the antirealist side. More precisely, we address the following issues: whether Mitchell's proposal can be classified as a genuine form of scientific realism (section 3.1); whether the fact that in Mitchell's proposal figure some variants of the no miracle argument is in tension with some other of its features (section 3.2).

3.1. Scientific Realism or Antirealism? The Issue of Truth and the Future of Science

To assess whether Mitchell managed to walk safely the realist tightrope, the first issue to be discussed is whether Mitchell's proposal can easily and objectively be classified as a genuine form of *scientific realism*. Obviously, this is not a question that can be fully addressed in a paragraph. But here we do not aim at providing a definite answer to that question. We just wish to make it clear how difficult it might be to uncontroversially prove that Mitchell's self-proclaimed realist position is indeed realist enough to be classified as realist by an independent observer in an objective way, i.e., independently from how the proponent of a given proposal classifies her proposal. To see this point, consider Mitchell's attitude on a crucial issue that divides pragmatists and realists, namely the issue of truth. It is important to focus on the issue of truth in analyzing a pragmatist variant of scientific realism, because terminology can easily mislead in this context, since "some self-avowed pragmatists also refer to themselves as realists, but [...] their realism is generally not what goes by the name 'scientific realism' more specifically. One way of generating the distinction [...] is to pay attention to the theories of truth typically endorsed by these camps. While scientific realists generally opt for some version of the correspondence theory [...] pragmatists generally do not" (Chakravartty, 2018, p. 611).

Mitchell (forthcoming) sticks to pragmatist orthodoxy in refusing to commit herself to the claim that our best scientific theories are true, and that truth is correspondence between language and reality, i.e., the standard formulation of scientific realism.[14] She explicitly criticizes foundationalist and representationalist views on realism and claims her view to be both anti-foundationalist and anti-representationalist.[15] By rejecting the idea that we can identify how really things that are independent of us are in the world at the deepest level of reality (foundationalism) and the related idea that scientific theories provide us with correct descriptions of how things that are independent of us are in the world (representationalism), Mitchell inevitably commits herself to some epistemic notion of truth or to some truth surrogate.[16] And indeed, in Mitchell (forthcoming) the term 'truth' almost never occurs, and she continuously underlines the role played by judgment of the epistemic subject in reasoning and practices that support claims about what is real. This means that claims about what is real cannot be understood in Mitchell's view as propositions made true or

[14] On the relationship between truth and scientific realism, see Chakravartty (2018). On the idea that scientific realists should endorse the correspondence theory of truth, see Sankey (2008). On the idea that truth should be understood by scientific realists as a semantic relation between language and reality, see Niiniluoto (2002).

[15] See Mitchell (forthcoming, p. 112): "I will defend an interactionist, pragmatist account to replace fundamentalist representationalist approaches to what constitutes realism of scientific theories and models".

[16] For a survey on non-epistemic and epistemic notions of truth, see Glanzberg (2021).

false by how really things are in the world independently from the epistemic subject, and so that she rejects any non-epistemic notion of truth.

But is it possible to reject any non-epistemic notion of truth, such as the one usually adopted by realists, namely truth as correspondence, and be a scientific realist at the same time? There is not a straightforward and uncontroversial answer to that question. According to some authors, it is possible, at least in principle, to combine semantic antirealism, i.e., the view that we should not commit ourselves to a non-epistemic notion of truth, and at least some forms of scientific realism, if what we mean by 'realism' is properly qualified (Alai, 2020; Chakravartty, 2018). According to semantic antirealism, the meaning of sentences consists in their conditions of verification, where 'verification' may mean, for instance, fallible confirmation or appropriate assertibility. This means that, in a sense, semantic antirealism almost amounts to verificationism (Alai, 2020, p. 7). But "verification conditions fall short of truth conditions in principle; [...] if meaning consists of verification conditions [...] uttering 'S' actually means that 'S' is verified, confirmed, or assertible, not [...] that 'S' is true" (Ibidem, p. 8). From what we have said so far about Michell's proposal, it seems fair to claim that Mitchell embraces semantic antirealism.

As already noted, it seems also fair to admit that it might be possible to combine semantic antirealism and scientific realism, if scientific realism is understood as the ontological claim that unobservable entities exist and are objective in the same way in which observable entities exist and are objective (Ibidem, p. 11). Indeed, according to Alai (2020), it might be possible to understand the realist claims about the existence of unobservable entities in verificationist terms, so that semantic antirealism could be conjoined with a sort of non-metaphysical view of realism that confers to unobservable entities the same degree of reality and objectivity that it confers to observable entities, and this might be sufficient for such a position to be regarded as a realist position.[17] We will not discuss further Alai's thesis that *prima facie* semantic antirealism is not incompatible with at least some forms of scientific realism, since it is not relevant to our main purpose, i.e., to assess Mitchell's proposal. Let us assume, for argument's sake, that Alai is right, and that the conjunction of semantic antirealism and scientific realism is *prima facie* logically consistent. Mitchell's proposal might thus still be provisionally classified as a form of scientific realism by following this line of reasoning. But there are at least two main problems for the realist who wishes to take this route that we have to further discuss. We will analyse the first problem in the rest of this section, while we will address the second problem in the next section.

One problem is that mere logical compatibility between semantic antirealism and scientific realism might be a too weak condition for determining whether a given position can be regarded as a genuine form of scientific realism in the current context of the debate between realists and antirealists. Indeed, if it is reasonable to think, as we argued in section 1, that at least both the requirements there discussed have to be fulfilled in order for a given position to be classified as a genuine form of selective scientific realism, i.e., 1) acceptance of abduction and inference to the best explanation and 2) commitment to a non-revolutionary view on future science, then if a given position refuses foundationalism and any commitment to a non-epistemic notion of truth, it seems that that position is not really able to fulfill the latter requirement.

A genuine pragmatist accepts the possibility that what we now deem real might change in the future, either for accumulation of new evidence, for instance thanks to the introduction of new instruments or techniques, or for the conception of better theories. Indeed, usually pragmatists are fallibilist, i.e., accept the idea that there is no knowledge claim (at least in natural sciences) that can be said to be in principle unrevisable, given that we are limited beings.[18] Mitchell seems to perfectly conform to such pragmatist attitude. For example, Mitchell writes that her variant of scientific realism "eschews a static representationalism of the real" (Mitchell, forthcoming, p. 112), and that in her view there is "no fixed ontology of entities or fixed ontology of structures. Instead, what we project back as being constitutive of

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[17] See Alai (2020, especially sections 2.2 and 3).

[18] On pragmatists' commitment to fallibilism, see, e.g., Legg and Hookway (2021). On fallibilism, see Brown (2018).

nature is contingent on a complementary relationship between what we can detect and how we represent it. Nature is independent of us. [...]. But what is viable as a metaphysics of what is real according to our science is what we, as limited beings, are justified in claiming about nature (Ibidem, p. 124). But a 'static' view on at least some aspect of science, a 'fixed ontology', albeit incomplete, is precisely what one needs in order to commit oneself to a non-revolutionary view on science in a least some domain. Otherwise, one will never be able to identify what one should expect to be retained in future theory change, and so, one will never be able to identify what we should *now* be realist about. And this would amount to be unable to rescue the most basic realist intuition, as already noted above (see section 1). Mitchell writes that as "experiences, experimental techniques, conceptual re-orientations and theoretical innovations change, our warrant for claiming which phenomena are real will track those changes" (Ibidem, p. 113). This means that Mitchell is open to at least the possibility that our warrant for claiming realism about any phenomenon might change, and so that it is impossible to claim once and for all whether any given phenomenon is really real.

On the contrary, selective realists usually argue that "although we should indeed anticipate further radical and fundamental changes in our theoretical conception of the natural world, we can nonetheless identify particular elements, aspects, or features of our best scientific theories that we can justifiably expect to find preserved throughout the course of such further changes" (Stanford, 2021a, p. 218). As already noted, if the realist is not able to claim that at least some parts or aspects of our current theories will be preserved in future science, she is not able to face the challenge from the history of science. But to claim that some parts or aspects of our current theories will be preserved in future science, one has to claim that our current theories are at least approximately true and adopt a non-epistemic notion of truth. Otherwise, one could not be confident that even those parts or aspects of our current theories that she thinks we should now be realist about will not undergo some change in the next future.

The difficulty to fill the gap between pragmatist's and scientific realist's attitude on this issue is clearly stated by Cherryholmes: "How would we know if our beliefs described 'reality'? It is only by acting on our beliefs and observing the consequences that we would know whether our beliefs worked. But this is a pragmatic test that could yield contrary results on the occasion of a future test. Scientific realists are not interested in consequences or in what is workable, but in 'reality'" (Cherryholmes, 1992, p. 14). Mitchell (forthcoming) claims that we should regard as real those phenomena for which we have theoretical and empirical warrant for claiming that they are real, but she does not add that that warrant is unrevisable, and so that we should expect to find claims about the existence of those phenomena preserved throughout the course of science's historical development, precisely because she sticks to her commitments to an epistemic notion of truth and to the thesis that the epistemic subject plays a relevant role in warranting claims about what is real. These two commitments do not allow one to really close the gap between pragmatists and scientific realists, since in order to secure realism, something more than an epistemic notion of truth is needed. Indeed, if "scientific realists were to give up the idea of describing [...] what is really 'real', then they would become indistinguishable, perhaps, from pragmatists" (Cherryholmes, 1992, p. 15).

In this regard, consider an author whose view on realism Mitchell (forthcoming) explicitly says to feel very close to her own view, namely Hasok Chang. Chang too is involved in the development of a pragmatist form of scientific realism (see, e.g., Chang, 2016). Despite Chang claims that his position is a form of scientific realism, Chang rejects standard formulations of scientific realism and the correspondence theory of truth, embraces a coherentist and epistemic notion of truth, given that he claims that in his view "coherent epistemic activity" is "involved in the definition of truth" (Chang, 2016, p. 114), and defends a coherentist and fallibilist view on what is real. Indeed, Chang explicitly claims that like "truth in my pragmatist coherentist conception, [...] [this notion of] reality comes in different degrees, and is defeasible, as it is based on coherence" (Ibidem, p. 117). But coherence conditions fall short of truth conditions, i.e., truth conditions according to the correspondence theory of truth, and so coherence is not able to secure claims about what

is real once and for all.[19] A passage by Chang clearly shows how pragmatists, if remain faithful to pragmatism, fail to fulfill the requirement on future science which has to be fulfilled in order for a given position to be classified as a genuine form of scientific realism: Chang states that "Joseph Priestley claimed to be able to manipulate *phlogiston*, and one cannot deny that most of his numerous experiments were successful. [...]. Did Priestley's successes mean that he and his contemporaries should have granted reality to phlogiston? In short, my answer to that question is yes" (Ibidem). The idea that what is real might change over time is precisely the sort of things scientific realists are usually unwilling to concede, while pragmatists are usually inclined to accept.[20]

Mitchell's view is in line with that of Chang on this issue. Indeed, Mitchell states that ontology based on our science is what we "are justified in claiming about nature" (Mitchell, forthcoming, p. 124). But justification conditions fall short of truth conditions, i.e., truth conditions according to the correspondence theory of truth, and so justification is not able to secure claims about what is real once and for all. Even more explicitly, Mitchell states that her "non-fundamentalist, pragmatist approach to realism embraces the contingency of judgments about what is real" (Ibidem, p. 138). Both Chang and Mitchell do not commit themselves to any claim on future science and do not think that knowledge claims about what is real should be regarded as unrevisable. It seems thus fair to conclude that pragmatist attempts devoted to combine semantic antirealism and scientific realism might fail to be regarded by an independent observer as realist enough to be objectively classified as a genuine form of scientific realism since they fail to fulfill the requirement on future science.

3.2. The Indispensability of the No Miracle Argument *for Defending Scientific Realism*

Another problem that one has to face if one tries to combine semantic antirealism and scientific realism is the following one: if one supports scientific realism by relying on the no miracle argument (on which, see section 1), one defends at the same time scientific realism *and* semantic realism (Alai, 2020). The point is that the no miracle argument is thought to be able to defend scientific realism precisely because it is thought to be able to support the claim that at least some parts or aspects of our best scientific theories are true in some metaphysically robust, i.e., non-epistemic, sense of 'true'. By supporting that claim, the no miracle argument allows the realist to fulfill the requirement on future science that a given position needs to fulfill to be classified as realist. This means that if one does not wish to embrace semantic realism, one has to refrain from defending scientific realism by means of the no miracle argument. Think on what we discussed

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[19] On the coherence theory of truth, see Young (2018).

[20] Chang embraces what he calls ontological pluralism, according to which whether a given entity is real depends on whether assuming the existence of that entity allows some coherent activity in a given domain to be performed. Thus, strictly speaking, in Chang's view, phlogiston and oxygen can both be regarded as real today, if we can engage in coherent activities by assuming the existence of those entities (Chang, 2022, section 3.4). So, it might be objected that Chang's position can be regarded as a position which endorses a non-revolutionary account of the future of science. But closer inspection shows that this is not so. Indeed, first of all, Chang's view can be regarded as committed to a non-revolutionary view on future science only to the extent that it allows different and incompatible entities to be real. Thus, if a revolutionary change occurs in science and new entities are admitted in our ontology, this will not necessarily amount to the dismissal of the entities that figured in the superseded theory. But this does not mean that Chang denies the possibility of revolutionary development in science. On the contrary, he thinks we should conceive of science in the most progressivist possible way and admit all possible forms of progress in science, even revolutionary ones (Ibidem, p. 211-216). Secondly, even in Chang's cumulative view of ontology what is real changes over time, since ontology becomes larger and so the set of entities that exist does not remain fixed. So, even if in Chang's view nothing which is accepted in science is rejected later, since for any domain new entities can always be accepted as real, this view is at odds with the view defended by those selective realists who commit themselves to a non-revolutionary view on future science. We thank an anonymous reviewer for pressing us on this issue.

in previous section (section 3.1): Mitchell does not wish to commit herself to a non-revolutionary view on future science. If she were to defend her position by means of the no miracle argument, given that the no miracle argument supports at once scientific realism and semantic realism, she would instead find herself committed precisely to such a view on the future of science. So, she has to refrain to defend her position by means of the no miracle argument. And here is where the problem really lies. According to Alai (2020), indeed, if one does not rely on (at least some variant of) the no miracle argument, one is not really able to defend scientific realism from classical antirealist challenges, such as the arguments from underdetermination and the history of science (see section 1). In other words, scientific realism without semantic realism, "albeit coherent, is indefensible" (Alai, 2020, p, 18).

This means that if one adopts a pragmatist variant of scientific realism, such as the one proposed by Mitchell, and embraces semantic antirealism, one faces a sort of dilemma: either one rejects semantic antirealism, and thus embraces a more standard form of scientific realism in order to be able to adequately defend scientific realism from antirealist challenges; but this would amount to reject pragmatism; or one maintains semantic antirealism, and thus pragmatism; but then one is unable to adequately defend one's own variant of scientific realism from antirealist challenges. Both the horns of this dilemma are obviously difficult to take for the supporter of a pragmatist variant of scientific realism. It might be objected that the pragmatist, scientific realist might 'bite the bullet' and decide not to counter the argument from the history of science, i.e., to accept that claims about what is real are revisable. But shouldn't this sort of pragmatist, scientific realism be more properly seen as a kind of scientific antirealism? Here the issue risks becoming terminological, but the point is that it is not clear to us why in such a case we should still speak of 'realism'. As Nickles writes: "Isn't it misleading to retain the term 'scientific realism' for something so different from 'good old' scientific realism?" (Nickles, 2020, p. 107). We suspect that the insistence on defining one's own view as a form of 'scientific realism' instead of as a form of 'scientific antirealism' when one's position does not fulfill the two requirements a position needs to fulfill in order to be classified as selective realist illustrated above (see section 1), is due more to one's understandable dissatisfaction with what is usually associated with the term 'antirealism' than to some cogent theoretical reason.

Turning to the issue at stake, we noted that Mitchell should refrain to defend her position by means of the no miracle argument, unless she wants to commit herself to semantic realism. Now, the indispensability of some form or another of the no miracle argument to adequately elaborate a variant of scientific realism is confirmed by the fact that Mitchell herself relies on some form of the no miracle argument in order to develop her own variant of realism. In Mitchell's view, it is, in the ultimate analysis, by means of a sort of the no miracle argument that we infer the reality of affordances responsible for the phenomena we observe. Abduction and no miracle arguments are indeed repeatedly invoked by Mitchell in accounting for the processes that allow one to justify one's claim about what is real. For instance, Mitchell states that the "agreement between a theoretical model-based prediction from phenomena to data and the experimental inference from data to phenomena are the joint source of justification for the existence of the phenomenon and relations specified in the model" (Mitchell, forthcoming, p. 125). This can easily be seen as an abductive realist inference from empirical success of science to the claim that what is thought to be responsible for such success exists. Mitchell states also that if "the data of multiple, diverse experiments all agree with the model-based prediction, then that is taken as the strongest evidence that the multiply detected phenomenon is real" (Ibidem). This argument from robustness seems to be nothing but a variant of the standard realist abduction from empirical success of science to the existence of what is thought to be responsible for such success. What distinguishes it from standard realist abduction is the requirement that the existence of a given phenomenon should be supported by several (almost) independent and convergent experiments. This requirement just makes what would be miraculous in the standard no miracle argument even more miraculous, i.e., it is aimed at showing how robust confirmation of a given phenomenon would be utterly inexplicable without assuming the existence of such phenomenon. But this additional requirement does not succeed in completely filling the gap between empirical success and the inferred existence of what is thought to be responsible for such success, unless one combines it with acceptance of the correspondence theory

of truth and the claim that robust empirical confirmation is a good indicator of truth. Thus, the requirement of robust confirmation might fail to fill the gap between empirical success and the existence of what is thought to be responsible for such success for the very same reason the standard abductive argument does not allow one to safely infer, from empirical success of a given theory, the existence of what is thought to be responsible for such success, namely if it is not a good indicator of truth.[21]

But the issue of whether robust confirmation is a good indicator of truth is beyond the scope of our article. The question we wish instead to address here is the following one: Does the fact that Mitchell deploys some no miracle arguments in developing her position and that, at the same time, embraces semantic antirealism makes her position somehow inconsistent, given that, as noted, if one embraces semantic antirealism, one should refrain from defending one's view by relying on the no miracle argument? In our view, the answer to this question is in the negative. Let us unpack this claim a bit. If one thinks that robust confirmation allows one to safely draw conclusion on what exist, then one should commit oneself to a non-revolutionary view on the future of science. Indeed, the inference from (robust) empirical success to the existence of what is thought to be responsible for such success usually proceeds via some form of the correspondence theory of truth. This allows one to determine what we should be realist about and to commit oneself to a non-revolutionary view on science. But if one rejects the correspondence theory of truth and any other non-epistemic view on truth, as Mitchell does, one is not really able to secure realism by means of an argument from robustness. Indeed, if one adopts an epistemic notion of truth, one remains open to the possibility that, even if we now infer the existence of a given phenomenon thanks to an argument from robustness, our judgment on the existence of such phenomenon might well be modified in the next future. As shown above, Mitchell embraces an epistemic notion of truth and remains open to the possibility that our claims about what is real might be revised in the future. Thus, despite she deploys some variants of the no miracle argument in developing her view, the no miracle arguments she deploys are not intended to secure scientific realism in the same sense in which realists usually think those arguments are able to secure scientific realism (Alai, 2020), and so it can fairly be said that Mitchell consistently commit herself to semantic antirealism, despite she thinks we can draw (provisional) conclusions on what is real by reasoning abductively. In other words, Mitchell deploys some abductive arguments in developing her view that can be regarded as instances of the no miracle argument but does not rely on the no miracle argument 'to defend' scientific realism.

4. *Conclusions*

In this article, we discussed the variant of scientific realism recently proposed by Mitchell (forthcoming), which is a sophisticated and well-articulated pragmatist view on science that aims at developing reasonable ontological commitments based on scientific practice. We firstly placed Mitchell's proposal in the context of the current state of the debate over scientific realism and identified two requirements a given position should fulfill to be classified as a genuine form of selective scientific realism, namely 1) acceptance of abduction and inference to the best explanation, and 2) acceptance of a non-revolutionary view on future science. Then, we summarized the salient features of Mitchell's proposal. Finally, we addressed the following issues: a) whether Mitchell's proposal can be classified as a genuine form of scientific realism. We pointed out that Mitchell's proposal fails to fulfill the latter requirement a given position needs to fulfill to be regarded as a genuine form of scientific realism, given that Mitchell accepts abduction but embraces an epistemic notion of truth which does not allow one to commit oneself to the claim that future science will not be revolutionary because one correctly identified some aspects of reality; b) whether the fact that in Mitchell's proposal figure some variants of the no miracle argument is in tension with another of its

[21] On arguments from robustness in the context of the debate over scientific realism, see Soler (2012), Stegenga (2012), and Nickles (2020, especially section 1.11).

qualifying features, namely her commitment to semantic antirealism. We argued that even if Mitchell deploys some no miracle arguments in developing her position, she does not rely on the no miracle argument to defend scientific realism in the same way in which scientific realists usually defend scientific realism by relying on the no miracle argument, i.e., in combination with the correspondence theory of truth. We thus concluded that her position is not made inconsistent by her use of the no miracle argument.

We also underlined how Mitchell consistently embraces semantic antirealism and refuses to commit herself to a non-revolutionary view on future science. Those choices make Mitchell's proposal a genuine pragmatist view. Moreover, if Mitchell commitment to abduction and inference to the best explanation might be unpalatable to some antirealists, it is quite commonly shared by pragmatists. And so is her commitment to realism. Indeed, Mitchell's commitment to realism seems to be limited to metaphysical realism, i.e., the claim that the world exists independently of us, a claim shared by many pragmatists and scientific antirealists alike, which is a far thinner kind of realism than scientific realism. All those facts considered, it seems fair to conclude by saying that, despite Mitchell's claim that her proposed position is a variant of scientific realism, Mitchell's view is more easily classifiable as a very interesting and coherently developed pragmatist view on science worth being studied and discussed than as a genuine variant of scientific realism. We obviously might be wrong, and Mitchell might certainly disagree with our assessment of her view. But we think that we contributed at least to highlight some aspects of her view that might need some further refinement and clarification if she is really interested in defending the claim that her position is a genuine variant of scientific realism.

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