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RESEARCH ARTICLE

Scientific Realism/Anti-Realism Debate: Roy Bhaskar's Position

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Abstract: The debate between scientific realism and anti-realism has long revolved around scientific theories. Realists contend that scientific theories are true or approximately true. In contrast, anti-realists posit that scientific theories are shaped as mere instruments that help to predict and categorize observable phenomena. As such, anti-realists find no truth value in scientific theories and only accept their empirical adequacy. Roy Bhaskar, as a critical realist, believes in the existence of the unobservable entities and considers them knowable. Furthermore, because he considers knowledge fallible, he maintains that theories arising from social activities may or may not be true. The purpose of this article is to clarify the position that Bhaskar takes in the debate between scientific realism and anti-realism. Before addressing this central purpose, the article first tries to find out whether Bhaskar is indeed a realist in three metaphysical, epistemic

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and semantic dimensions. The study argues that his alternative position on the truth/falsity of theories would detach him from the anti-realist camp, and he is not an anti-realist in terms of any of the three dimensions mentioned above. Of course, Bhaskar draws what could be called a "delicate border" between his realist approach and that of realists who attribute the approximate truth of a theory to its success.

Keywords: Scientific realism; anti-realism; Roy Bhaskar; theory; truth; experiment.

1. Introduction

Belief in unobservable entities and a mind independent world have long been the central issues addressed in debates between scientific realism and anti-realism. Such debates have focused on various topics. Yet, specifically speaking, realism refers to any philosophical stance that believes in the reality of things (Manee 2018, 32; Pölzler 2018). Scientific realism takes a realist position in relation to what best human theories can describe. Realism suggests that scientific theories are true or approximately true and their theoretical terms have putative factual reference (Bueno 2015, 153). On the contrary, anti-realists (e.g., instrumentalists, constructive empiricists) do not believe in the association between scientific theories and truth and view theories as mere tools that can predict or categorize observable phenomena (Mizrahi 2020a, 38).

Although this conflict began many centuries ago, it remains one of the topical issues in philosophy. Defending their specific schools of thought, philosophers have speculated on the debate and in some cases have offered new readings (Rowbottom 2019). As such, some thinkers have concentrated on the dichotomy, trying to provide understandable and clear explications of both realist and anti-realist assumptions as a way of exploring the roots of the opposition (Rouse 2018; Mulder 2012). Proposing the idea of relative realism, some philosophers have sought to resolve the conflict by expressing some premises that could be acknowledged by both realists and anti-realists (Mizrahi 2020b).

The present study seeks to clarify the position of Roy Bhaskar, who identifies himself as a critical realist, in this debate. On the one hand, he believes in a mind independent world, finding it possible to gain knowledge about the unobservable aspects of the world. On the other hand, he posits that cognition is fallible and that truth cannot be known with certainty. This study primarily elaborates on the debate between realists and anti-realists. Next, to answer the central question raised, the study investigates Bhaskar's realism in terms of its metaphysical, epistemic and semantic. We argue that his approach, in all three dimensions, stands in opposition to anti-realism. Of course, in the debate, he draws a delicate border between his approach and that of realists. Paragraph: use this for the first paragraph in a section, or to continue after an extract.

2. The Debate between Realism and Anti-Realism

Are theories true or approximately true descriptions of the world and its theoretical entities have putative factual reference, or are they mere instruments that facilitate scientific goals (e.g., prediction)? The way a philosopher approaches this question would decide his/her position on the debate between realism and anti-realism (Bonilla 2019, 3962).

As Stathis Psillos point out scientific realism has three stances that each of the anti-realist schools has reacted to one of these three stances (Psillos 1999, xix–xx):

(1) The metaphysical or ontological stance: the world has a definite and mind independent natural-kind structure. It is in contrast to the idealist and phenomenalist approaches.
(2) The semantic stance takes scientific theories at face-value, seeing them as truth-conditioned descriptions of their intended domain, both observable and unobservable. This stance differentiates scientific realism from eliminative instrumentalist and reductive empiricist accounts.
(3) The epistemic stance asserts that unobservable entities are knowable and regards mature and predictively successful scientific theories as well-confirmed and approximately true of the world. In

contrast, epistemic antirealist, like constructivist empiricists, reject the possibility of recognizing the unobservable entities and suffice with the empirical adequacy of theories.

To better understand the nature of the debate, one should first realize how realists and anti-realists defend their claims. For this reason, their most central arguments are explored below.

2.1. The "No-Miracle Argument" (NMA)

Science is successful and the scientific community has always relied on successful theories to pursue its goals. Realists link this success with truth, and in response to the central question in the debate, they attribute scientific success to its truthfulness (Lewis 2001). The NMA, advanced by Hilary Putnam, represents the most important argument in sustaining realism (Putnam 1975). In his argument, Putnam uses the inference to the best explanation (IBE). Among a set of existing hypotheses, the IBE tries to select the hypothesis that can provide the best explanation based on available evidence (Harman 1965, 89).

Putnam argues that realist hypotheses "that terms in mature scientific theories typically true that the theories accepted in a mature science are typically approximately true, [and] that the same term can refer to the same thing even when it occurs in different theories" are the only scientific explanation of success of science (Putnam 1975, 73). On this account, he maintains that realism is the only philosophical approach that does not view scientific success as a "miracle" (ibid.). The reason for this is that believing in any explanation other than the truth of scientific theories would attribute scientific success to miraculous happenings. Putnam's argument as be formulated as follows (Mizrahi 2020c, 52–53):

- Premise 1: Our best theories can make successful predictions and explanations;
- Premise 2: If the theories are not true or approximately true, their success would be like a miracle;
- Premise 3: The best explanation for this success is realism, which finds scientific theories true or approximately true;
- Conclusion: Our best theories are true.

Apart from anti-realists, some realists have criticized Putnam's idea, finding faults with his NMA (Macarthur 2020). Some even called it fallacious (Hoyningen-Huene 2018) or did not generally view the IBE as a relevant contribution to the debate (Frost-Arnold 2010). Some other critics did not it prioritize success as an adequate condition for the truth of a theory, suggesting that even if success could serve as a factor of truth, it would not be possible to conclude that most successful theories are true (Wray 2013, 1720). Furthermore, epistemic success would not guarantee the ontological necessity of the unobservable entities assumed to exist in a theory (Wray 2018). Despite all these criticisms, the NMA remains the most important argument that realists rely on.

2.2. Pessimistic Meta-Induction (PMI)

In response to advocates of the NMA, Laudan, as an instrumentalist, provides a history of the philosophy of science and successful theories that were ruled out over time. He mentions many previously proposed theories that were successful and central terms in scientific theories genuinely refer, according to the claims of theorists. However, such theories were proven to be wrong, and today no one could find them "true" or claim that a term such as "aether" is a referring term (Laudan 1981, 35). To further support his argument, Laudan offers a list of theories although he claims the list could still include more instances (ibid., 33):

- The effluvial theory of static electricity
- The phlogiston theory of chemistry
- The caloric theory of heat
- Theory of the electromagnetic aether
- The optical aether
- The theory of circular inertia.

Advancing an inductive argument, he concludes that some theories are successful and are claimed to refer to real entities by the terms they use and are thus called "true", but they may be ruled out in the future. As such, their terms would be non-referring. Considering this argument, the success of a theory does not necessarily establish its truth (Laudan 1981, 32). As Laudan further explains, if there were no such a thing as atom,

atomic theories would not be (approximately) true. If genes did not exist, genetic theories would not be (approximately) true, no matter how valid such theories may appeared (ibid., 33). Questioning the NMA, Laudan demonstrates that the empirical success of a theory could not substantiate its truth.

There are various versions of the PMI, although they have been criticized as well (Park 2014). Criticizing the PMI, realists emphasize that the false parts of a theory would not have any role in its success, and that the success of a theory would not justify its entirety (Kitcher 1993, 142). Meanwhile, the aspects of a theory that have a central function in its success will be preserved in scientific image (Psillos 1999, 108, 139).

2.3. Arguments of Constructive Empiricism

As an epistemic anti-realist, van Fraassen takes an agnostic stance toward the existence of unobservable entities, viewing experience as the only source of human knowledge. As such, he contends that we cannot talk about what moves beyond empirical evidence. He advances some arguments against realism, which are briefly reviewed below.

The Positive Argument of Constructive Empiricism

Introducing constructive empiricism, van Fraassen explains that the purpose of science, contrary to the claim of realists, is not to achieve truth but empirical adequacy. He does not regard scientific activity as an attempt to discover the truth of unobservable entities, but rather he suggests that science seeks to construct models that are empirically adequate. On this account, accepting a theory means that the theory in question provides an accurate description of observable phenomena (van Fraassen 1980, 5, 12). Otherwise put, van Fraassen does not strongly associate the success of science with its truth. Meanwhile, he does not believe that success arises from miracles, suggesting that the success of science stems from its empirical adequacy (van Fraassen 1980, 39–40). Relying on such stances, van Fraassen calls his stance on science and scientific activity a positive argument for constructive empiricism because "it makes better sense of science, and of scientific activity, than realism does and does so without inflationary metaphysics" (van Fraassen 1980, 73).

Underdetermination of Theory by Evidence (UTE)

The UTE denotes that in most cases several theories may be compatible with the available evidence, although the evidence is not substantial enough to determine a theory in the face of its competing theories (Manee 2018, 36). There is debate over whether van Fraassen relies on the UTE. However, many philosophers, such as Psillos, believe that van Fraassen uses the UTE to repudiate truth in scientific theories (Psillos 1999, 156). Regardless of these debates, the UTE is indeed one of the arguments that anti-realists resort to, criticizing the NMA.

The NMA claims that only one theory can provide the best explanation, and only realism is capable of explaining the success of theories by finding them true. The UTE, however, claims that evidence cannot determine the truth of a theory. The reason for this is that in most cases there may be at least two theories that explain the same phenomenon, and existing empirical evidence equally supports the two theories. As such, it would not be possible to select a theory among the competing ones, and there would be no reason to find a theory to be true. Relying on the UTE, anti-realists show that there is no reason to believe in the truth of one specific theory (Manee 2018, 36; Psillos 1999, 156–58).

2.4. The Anti-Induction (AI) Argument

As mentioned earlier, the most important argument of realists is the NMA. Recently, however, a new argument called the "anti-induction" has been advanced, which claims to be more effective than the NMA because it remains valid in the face of the problem of theory rejection due to scientific development over time. The anti-induction argument rests on the history of science and postulates that because previous theories were wrong, most successful theories in the present are approximately true. The reason for this idea is that scientists hope to reach correct and successful theories by constantly ruling out false theories. Anti-realism uses the uniformity principle in the PMI and emphasizes previously wrong theories to repudiate the truth of presently existing theories. In contrast, the anti-induction argument relies on the disuniformity principle, underscoring the approximate truth of current theories (Park 2018, 330–32).

Defending his argument, Park explains to critics that most of them are anti-inductionists when they resort to trial and error in science or everyday life or when they assert that failure is the mother of success. Such anti-inductionist tendencies rest on the disuniformity principle (Park 2018, 340). Therefore, Park contends that scientific theories could provide approximately true descriptions of the world. In his argument, Park refers to the disuniformity principle and a number of famous proverbs. Yet, what can be criticized about his argument is that it centrally relies on the disuniformity principle, without providing any justification for using the principle. Meanwhile, he does not explain whether the disuniformity principle is a necessary or contingent issue? Another question left answered is when it is justifiable to use induction in science and when it is justifiable to draw on anti-induction.

3. Aspects of Roy Bhaskar's Realism

With more clarity about the various dimensions of the realism / anti-realism debate, one can now observe that realists try to advance arguments that scientific theories are true or approximately true. In contrast, anti-realists' counter-argument tries to pursue an instrumentalist approach to scientific theories. From the perspective of Bhaskar's realism, science deals with ontological questions about what things exist and how they behave. In the transcendental arguments Bhaskar advances, he depicts a world that involves causal structures and enduring mechanisms; he believes the purpose of science is to gain knowledge about these mechanisms. This section of the present study seeks to answer the question in what sense Bhaskar's critical realism is a realist approach. Otherwise put, is Bhaskar's philosophy of science a realist approach from metaphysical, epistemic, and sematic stances?

Before engaging with Bhaskar's position, it is essential to note that in the philosophy of science literature, standard realism is typically defined by Paul Psillos' tripartite division into ontological, epistemic, and semantic dimensions. The longstanding debate between realism and antirealism also primarily unfolds within this framework, with antirealists generally dissenting from realists on one or more of these dimensions. Bhaskar, who establishes a depth ontology and diverges from standard realism, naturally

arrives at a distinct epistemology that distinguishes him from conventional realists. A key point of contention between Bhaskar and standard realism lies in his rejection of the correspondence theory of truth. Since antirealists don't subscribe to the truth of theory, the question arises: Does Bhaskar's denial place him among antirealists?

To address this, it is necessary to analyze Bhaskar's stance across the aforementioned three dimensions, delineate his boundaries with standard realism and antirealism, and clarify the realist aspects of his position as he claims. In other words, while a precise mapping of Bhaskar's realist discourse–due to the complexity of his ontological foundations and their tight interconnection with concepts such as causal mechanisms, natural necessity, and normic laws–requires independent research, the first step involves situating him within the traditional debate. This allows demonstrating how he attempts to transcend the limitations of standard realism by proposing a dynamic, dialectical version of the school without veering into antirealism's camp.

3.1. The Metaphysical Stance

Inspired by Kant, Bhaskar bases his critical realism on transcendental questions. Considering the fact that scientific activity cannot be denied, he tries to figure out the specifications of the world in which science is possible. As such, he posits that experience in science is as much dependent on sense-perception as it is on experimental activity. Following this premise, he suggests that experience in science is conducted by humans as both perceivers and causal agents, and thus he transcendentally analyzes sense-perception and experimentation (Bhaskar 2008, 13, 21).

Analyzing sense-perception

Contrary to empiricism, which postulates that humans are only certain of the things they can experience through sensation, Bhaskar tries to show that "There could be a world of events without experiences" (Bhaskar 2008, 22). Exploring human perception of objects, he posits that the intelligibility of sense-perception presupposes the intransitivity of the object perceived. For instance, the fall of an apple, as an event experienced by a human being, does not exclusively depend on his/her perception, because the event exists independently from experience.

This intransitivity and the independence of objects are also presupposed in scientific change and scientific education. This understanding assumes that there is something distinct and independent of the teacher and students that is described differently by different people (Bhaskar 2008, 21). In other words, objects are independent of human knowledge and as humans change their approach to them, objects will not change. Therefore, whether humans gain knowledge about objects or not, objects simply remain what they are. For instance, current flow in metal conductors is an event that does not depend on human knowledge and metals were conductors even before the law of conductivity was discovered by human agents (Bhaskar 2008, 11–12).

Given these premises, Bhaskar concludes that events are categorically independent of experiences, and that there are events in the world that have not been experienced. The history of science witnesses that at any given moment in time there could be unimaginable events that may be theoretically or empirically acquired as knowledge (Bhaskar 2008, 22). Furthermore, Bhaskar contends that if a scientist believes in an ontological realm, it would be possible for him/her to rationally criticize epistemic claims. That is to say, scientists, in their scientific explorations, seek to gain knowledge of intransitive objects that are independent of human knowledge, and this pursuit makes it possible for them to criticize reservoirs of knowledge gained (Bhaskar 2008, 13, 33).

Analyzing experimental activity

Bhaskar criticizes philosophers who would view a constant conjunction of events as the necessary condition for the law of causality. As such, he clarifies that experiment is necessary because causal laws are different from sequences of events (Benton & Craib 2010, 125). Proposing the concept of open and closed systems, he recognizes the world as an open system in which there are diverse mechanisms simultaneously operating, and this situation could give rise to disturbances in mechanisms and finally prevent them from being actualized (Bhaskar 2008, 114).

An open system, then, rarely involves sequences of events. However, humans as causal agents working in scientific laboratories, as closed systems, try to dissect a given mechanism and produce constant conjunctions. Bhaskar focused on this feature of experimental activity as a basis for his investigation. He posits that casual laws are not the same as the sequences

of events produced by human agents in experiment. He explains that only if an "ontological distinction" exists between causal laws and the sequences of events beyond the closed experimental system, the scientist can discover causal structures by artificially generating regularities (Bhaskar 2008, 23). As such, Bhaskar's transcendental understanding of sense-perception and experimental activity can be recapitulated as follows:

(1) Causal laws are independent of the sequences of events, and events are independent of experiences;
(2) There is a world existing independent of the human mind, while human beings make efforts to gain knowledge about the mechanisms in the world;
(3) Knowledge is a mode of achievement that is acquired by human involvement in nature.

As a result, Bhaskar emphasizes the above transcendental stance and distinguishes transitive objects (that are variable and human-dependent) from intransitive objects (that are independent of human knowledge and agency). As such, he underscores the existence of a real world beyond the scope of human mentality. This position is opposed to that of idealists who deny the existence of the world independent of the human mind.

Additionally, Bhaskar's analysis of sense-perception and experimental activity suggests some ideas other than the distinction between causal laws and the sequences of events (which are themselves independent of human experience). More specifically, he uses the distinction as evidence to propose that reality is composed of three levels: empirical, actual, and real (Bhaskar 2008, 47, 2009, 19). The empirical level refers to the level that is observed and experienced by us. The actual level of reality is occurring regardless of being observed or experienced. Finally, the real level involves causal structures and fundamental mechanisms that generate events. According to Bhaskar, the world is composed of complex things that have causal powers and tendencies, and operating a mechanism in its characteristic way is nothing but a thing goes on acting in a certain way. Bhaskar finds such mechanisms real and regards them as intransitive objects that are embedded in reality and generate events. As such, he expresses his opposition to anti-realism, which denies the existence of the unobservable level and finds the

world confined to the observable level. Therefore, the ontological aspect of Bhaskar's philosophy is evidently in line with realism.

3.2. The Epistemic Stance

It was mentioned earlier that epistemic realists believe it is possible to gain knowledge of the unobservable dimensions of the world, while suggesting that highly successful scientific theories are approximately true. The question here is whether Bhaskar, who is a metaphysical realist, subscribes to epistemic realism or not. Following a transcendental approach, Bhaskar describes the world as being inherently structured, differentiated, and stratified. On this basis, he views scientific activity as an ongoing motion that makes every effort at any given moment in time to permeate into deeper strata of reality, providing insights into generative mechanisms. Clarifying that the purpose of science is to discover generative mechanisms of nature (Bhaskar 2008, 4), Bhaskar both emphasizes the possibility of knowing the world and describes science as an activity for unearthing reality.

He explains that scientists do not exclusively try to accumulate constant conjunctions, but they also try to discover causal powers of things (Bhaskar 2008, 205), and such causal powers or generative mechanisms are what explain the behavior of the things. For instance, thing A shows a particular behavior because it has the power B. As such, science seeks to figure out what kinds[1] of thing exist, what powers such things have, and how they behave (ibid., 165-169). Contrary to transcendental idealism, which posits mechanisms are human subjective constructs, Bhaskar underscores the "real" nature of mechanisms and contends that they are not artificial constructs. He further states that science tries to explain phenomena by referring to such mechanisms (ibid., 37, 157).

Because in Bhaskar's view reality is composed of empirical, actual, and real levels, he does not find science confined to the empirical level of observation and clarifies that scientific activity is governed by experimental intervention that tries to discover mechanisms at the real level. Given this premise, he contends that observation is often accompanied with action. Pointing out human intervention in nature and experiments, he asserts that if there were no real mechanisms, they would not reveal their effects in

experiments and science would be meaningless and merely limited to observation (Benton & Craib 2010, 125).

Bhaskar further acknowledges that notion of causal powers help us confirm the existence of entities that all we knows is their powers (Bhaskar 2008, 171). The entities that can only be known, through the detection of their effects, not shown to exist (as in the detection of radio-active materials by a Geiger counter, of electricity by an electroscope, of a magnetic field by a compass needle (ibid., 171, 177).

These explanations clarify that Bhaskar's realism depicts a world independent of the human mind and finds it possible to gain knowledge about the observable and unobservable dimensions of the world. This stance taken by Bhaskar is opposite to the views of epistemic anti-realists (e.g., van Fraassen) who advocate an agnostic approach to the existence of unobservable entities and believe knowledge could be only acquired from observable dimensions. Yet, does Bhaskar, like other realists, maintain that the best scientific theories are approximately true? The answer to this question is provided in the next section, which addresses the semantic stance of Bhaskar's philosophy of science.

3.3. The Semantic Stance

A semantic realist would claim that the terms used in scientific propositions should be interpreted literally. Such a person would also believe that scientific propositions are structured in a way that they can be found true or false depending on their correspondence or lack of correspondence with the world. In order to find out whether Bhaskar advocated semantic realism and answer the question remaining from the epistemic stance, one should elucidate Bhaskar's process of theorizing in his philosophy of science.

"Theory" in Bhaskar's Philosophy

The logic of scientific discovery in Bhaskar's philosophy primarily rests on regularities and semi-regularities that are explained by referring to generative mechanisms. As such, first plausible ideas about hypothetical mechanisms are constructed and then the ideas are subjected to theoretical criticism and empirical examination (Bhaskar 2008, 157). Bhaskar places mechanisms at the core of theory, emphasizing that the rationality of a scientific theory is only supported when its objects exist in reality (Bhaskar 2008, 36-

37). He suggests that gaining knowledge about mechanisms depends on a combination of perceptual, technical and intellectual skills (ibid., 37). He believes that scientists, in producing plausible ideas, use creative models, metaphors, and analogies. In fact, he sees a theory as the product of a creative process in which an unfamiliar thing is understood through analogy with the familiar (Baert 2005, 94). For instance, the movement of atoms may be similitude with the motion of billiard balls, the blood circulation system may be likened to a hydraulic model, or the biochemical structure of genes may be metaphorically described as linguistic codes (Bhaskar 2008, 12-13).

Although Bhaskar regards theories as way of referring to hypothesized inner structure of the world (Bhaskar 2008, 149), he believes scientific theorizing concerned with mechanisms and the world's causal structures is fallible. As such, he states that the claims of scientific theories about reality are not necessarily true, and they may be wrong (Baert 2005, 93). The reason for this situation is that scientists rely on their antecedent knowledge, including pre-established theories, models, tools, facts and methods to produce new knowledge. Because any of these items may undergo change and correction, new knowledge itself may be transformed (Bhaskar 2008, 11–12). Bhaskar, then, is opposed to classical empiricism, which suggested that a theory could be reducible to experience and could remain invariant. Bhaskar, however, maintains that a theory is neither reducible to experience nor can it remain unchanged. A theory is a product generated through social activity and is prone to change like any other social product (Bhaskar 2008, 178). As a result, he contends that it is always possible for a description of mechanisms to be wrong; for instance, our explanation of "why water must boil when heated" may be resting on a false assumption of this mechanism (ibid., 198).

Because Bhaskar views the world as an "open" system, he does not believe a theory's power of prediction could serve as an accurate test of its validity. More specifically, in an open system, the operation of conflicting mechanisms may prevent a given mechanism from being actualized or may lead to the generating of counter-instances. As a result, he does not find it a necessary or a sufficient condition for a theory to be compatible with facts,

emphasizing that only in a closed system a theory can be fairly examined (ibid., 128, 151).

The above observations clarify why Bhaskar not proving any criterion for the truth of a theory. However, it must be noted that the lack of a criterion for the truth of a theory does not mean that Bhaskar denied the possibility of reaching true theories. As he states, science seeks to provide a true explanation of reality. Although a theory arising from scientific work beyond their observational propositions always remains uncertain, there is also the possibility of a true account of reality. Bhaskar's stratified description of the world and his conviction that scientific theories are social products reveal why he always took a critical approach to human knowledge of reality and saw scientists' explorations potentially fallible attempts. In Bhaskar's opinion, it is always possible that there are more fundamental mechanisms in deeper strata of reality for a given phenomenon we are describing and explaining that remain undiscovered to us.

Yet, despite all these issues, the answer to the question whether Bhaskar is a semantic anti-realist is negative. More specifically, he is neither a reductionist who would reduce the meaning of unobservable entities in scientific theories to that of observable entities, nor is he an eliminative instrumentalist who would deny any meaning of the conceptual parts of a theory and consider them merely useful instrument (Psillos 1999, 10–11). Similarly, Bhaskar is not among thinkers who would consider only the observable part of the theory to have truth-value. As a result, he cannot be regarded as a semantic anti-realist, although he draws a delicate border between his philosophy and that of semantic realists. He is silent about the truth and falsity of scientific theories, providing no criterion for deciding truth/falsity. Of course, he does not find it impossible for a scientific theory to be true, thus distinguishing his approach from that of thinkers such as Laudan.

Bhaskar believes that because humans are capable of manipulating nature, they can produce a closed experimental system through intervention and inquiry how mechanisms hypothesized in theories work (Bhaskar 2008, 232). As he explains, "theory without experiment is empty. Experiment without theory is blind" (ibid., 182). Therefore, discovering whether the theoretical entities in a theory have a real referent or not would demand experimentation and action with reality. As such, mere philosophical

arguments cannot provide valid judgments. Of course, Bhaskar's emphasis on experimental activities does not denote that such activities can certainly determine the truth or falsity of a theory. Furthermore, he points out that experiment requires functional equipment, and in some cases a century may pass by until the instruments for testing a theory can be manufactured in practice (ibid., 183). Even then, experiments may reveal that some terms used in a theory have a real referent and some fail to do so. Otherwise put, Bhaskar leaves the truth and falsity claims of the theory to the valley of scientific activity and experimental scholars, although he does not provide a philosophical criterion for truth and falsity.

Given the discussions above, the answer to the remaining question about the epistemic aspect of Bhaskar's philosophy seems to be obvious. Does he believe that the most successful scientific theories are (approximately) true? As explained earlier, contrary to epistemic realists, he does not attribute the approximate truth of a theory to its accurate predictions and success. However, this stance should not imply that Bhaskar repudiates the possibility of truth in a theory. In contrast to van Fraassen, Bhaskar does not maintain that acceptance of the theory is the only guarantee of the empirical adequacy of the theory. He clearly defends the possibility of gaining knowledge about the unobservable dimensions of the world, suggesting that such knowledge could be even true. Given this stance, he obviously distinguishes his approach from that of epistemic anti-realists.

4. Bhaskar's Position in the Debate between Realism and Anti-Realism

In this section, the central question of the study is raised once again: Are scientific theories true or approximately true descriptions of the world or are merely useful instruments? In response to this question, anti-realists have taken different stances. Some basically rule out the existence of theoretically assumed unobservable entities, and some pursue an agnostic approach or deny the possibility of acquiring any knowledge of such entities.

Meanwhile, anti-realists generally agree that theories can be exclusively evaluated in terms of their (non)usefulness, and not in terms of their truth

or falsity. Even anti-realists (e.g., van Fraassen who is recognized as a realist in terms of ontology and semantic), contend that only the observable parts of a theory can be subject to truth-value. Realists, on the other side of the debate, suggest that a theory's (approximate) truth is decided by its success.

Although Bhaskar does not propose any ideas regarding the truth of theories, the present study, relying on the discussions mentioned above, emphasizes the argument that Bhaskar's position in the debate does not advocate anti-realism. In the metaphysical aspect, Bhaskar uses his transcendental analysis to describe a stratified world involving causal powers and generative mechanisms. Real structures and mechanisms are embedded in reality and they can be discovered through active engagement with nature, creative procedures, and experimentation.

This ontology of a stratified world is also reflected in the epistemic aspect of Bhaskar's philosophy, which posits that the purpose of science is to explain events and phenomena by referring to fundamental mechanisms. Although from Bhaskar's perspective exploring deeper strata to discover causal structures depends on the scientific theorizing and speculation and is influenced by social factors, his specific emphasis on intransitive dimension and the independent effects of causal powers salvage his approach from the abyss of relativism. Accordingly, he makes it possible to capture causal powers and generative mechanisms under experimental activities. In other words, Bhaskar both underscores the possibility of gaining knowledge about the unobservable dimensions of the world and finds it possible to achieve a true account of reality. Therefore, one can argue that, in his approach, a theory can be true or false and its assumed entities may be referring. As such, he distances himself from semantic anti-realists, although he does not provide any criterion for the truth/falsity of scientific theories.

Finally, Bhaskar's position in the debate seems to be evidently distinct from anti-realist positions. He defends a realistic approach to science in various ways and considers a true account of reality is possible. However, he draws a delicate border between his approach and that of other realist approaches. Contrary to the conventions of both sides of the debate, which try to support their camps by relying on philosophical and historical arguments, Bhaskar leaves unanswered the central question in the debate

concerning the truth/falsity of theories. Meanwhile, he is cognizant of the importance of experimental activity in uncovering the accuracy of theoretical entities and in correcting, improving, modifying, and advancing scientific theories.

5. Conclusion: The Way that Bhaskar Puts in Front of Us

Standard realists believe that the aim of scientific activity is to achieve the true or approximately true theories. In this approach, the theoretical entities at the heart of scientific theory refer to the real, and they imply statements that are true or approximately true. When talking about truth, standard realists normally consider the correspondence theory of truth. To compare this approach to that of Bhaskar, one has to first answer this question: What is the aim of scientific activity from the perspective of Bhaskar, and how does he respond to idea of "truth" or "approximate truth" in scientific theories?

According to Bhaskar, scientific activity are meant to discover generative mechanisms existing in reality. At first glance, Bhaskar's approach to the aim of science may not seem different from that of realists, and there may be some mere terminological differences. However, if put his understanding of the aim of science in the broader body of his philosophy, we could observe an important gap between his approach and that of realists. Bhaskar states that scientific activity seek to discover generative mechanisms and causal structures, although he does not express any specific ideas regarding the truth/falsity of theories. More specifically, he does not seem to be concerned with this issue. Bhaskar does not offer any criteria for revealing the truth/falsity of a scientific theory, while his philosophy does not address the problem of truth/falsity. Yet, why does Bhaskar not specify the criteria for evaluating the truth/falsity of theories? The reason for this is that he views a scientific theory as a transitive product dealing with intransitive objects. As Bhaskar observes, the material cause or the content that a scientific theory is constructed to address shapes the context in which scientific activity is conducted. As such, the content may be affected by metaphors, presumptions, values, and other factors that may have a contextual role in scientific activity. Therefore, a scientific theory is composed

of transitive objects and is a variable construct, and thus finding the correspondence between a theory and intransitive reality does not represent a strategic concern to Bhaskar.

If the correspondence between a theory and intransitive reality is not a strategic concern, then what is it Bhaskar finds important in scientific theories and theorizing? In Bhaskar's approach, the significance of a theory lies in the guidelines that it suggests for creating artificial conditions shaping experiments. Yet again, what is the purpose of creating artificial conditions in scientific activity? As the earlier review of Bhaskar's arguments revealed, he arrived at the conclusion that reality involves various causal mechanisms that work simultaneously. To discover such mechanisms through scientific activity, they must be analyzed under artificial conditions so that the effect of one specific mechanism can be observed as a regularity. Of course, it would be necessary to create such artificial conditions, because if mechanisms work at the same time they could disturb each other and their effects as regularities cannot be discovered.

Under such circumstances, a scientist would require theories to be able to create artificial conditions. A theory and its presumably existing entities direct the scientist toward implementing a particular experimental layout. In fact, the idea of scientific activity from Bhaskar's viewpoint suggests that the scientist relies on existing empirical evidence and materials obtained through scientific activity to innovatively construct a theory. Such a theory, like any other theory in science, involves some theoretical entities. In the next step, the scientist tries to draw inspirations from the theoretical content and the entities contained in it, designing experiments to find some mechanisms. Hoping to find potentially causal mechanisms, the scientist tries to explain previously observed phenomena. In Bhaskar's philosophy of science, contrary to what is said by the standard realists, a theory is not supposed to be true or probably true in order to be a theory, rather the theory's essence lies in its capability of being a source of inspiration for new experiments for probable finding of new mechanisms.

Bhaskar's philosophy of science takes into account a theory and its presumably existing entities, but it does not concern itself with whether the theory in question is true or not. The major issue is whether existing facilities and technologies, following theoretical inspirations, can construct

experimental conditions that help scientists discover causal mechanisms. Theory is transitive while causal mechanisms are intransitive. Bhaskar emphasizes the possibility that a theory may properly lead us to a causal mechanism.

There is a contrast that can better distinguish the views of standard realists from those of Bhaskar. Realists have advanced such philosophical arguments as the NMA and AI to demonstrate why scientific theories are true or approximately true. Yet, Bhaskar's philosophy and his realism does not basically require such philosophical attempts. Why would Bhaskar seek to defend philosophical arguments (e.g., the NMA and AI), while considering theories to be social and human products transformed by contextual factors and historical determinants? For instance, the falling of an apple from a tree is an event caused by a causal mechanism (or some mechanisms) that can be explained by Newton's classical mechanics or Einstein's general relativity, which are two remarkably different theories. This is why Bhaskar does not find it practical to focus on the truth of a theory or on the reality of the entities it assumes to exist. Instead, he tries to explain how a theory, through the inspirations it provides, could direct the scientist toward discovering a causal mechanism, which is the main aim of scientific activity.

Now, it would be important to mention a feature of Bhaskar's philosophy of science: He does not offer any guarantee that the regularity observed under experimental conditions would necessarily implies a causal mechanism. He points out that such observations may implies a causal mechanism. More specifically, he only mentions the possibility of discovering a causal mechanism. If from Bhaskar's perspective one of the aspects of progress in scientific activity lies in discovering an increasing number of causal mechanisms, then such progress would be a contingent matter. As such, following Bhaskar's explication, scientific activity may not necessarily lead to progress in science, it may only lead to progress. Bhaskar, however, does not determine the criteria for measuring such progress. Therefore, Bhaskar, with the methodological code he proposes (by invitation to experimentation), only promises the possibility of progress in discovery of more causal mechanisms, but not anything beyond that. Moreover, he does not, or better said cannot, suggest any metrics for measuring this contingent progress.

It was mentioned earlier that Bhaskar believes the aim of scientific activity is to discover causal mechanism embedded in things. Given the discussions about Bhaskar's views in this study, one could re-state his aim of scientific activity. He suggests that the aim of science is "practical achievement" that can be realized through experimental conditions. In such a case, however, some causal mechanisms are eliminated, which is a condition that makes it possible to observe a regularity that may be generated by a given mechanism. This practical achievement, however, differs from what realists prioritize as theoretical aim in scientific activity: the truth or approximate truth of theories. Of course, this contrast should not imply that realists do not seek any mode of practical achievement arising from scientific activity, but rather it is meant to highlight the difference stances taken in Bhaskar's view and that of realists.

The PMI argument could challenge the views of advocates of standard realism. Yet, given the explication of Bhaskar's philosophy provided in this study, his approach cannot be challenged by the PMI argument. The reason for this is that Bhaskar sees a theory as a human/social product that, affected by transitive objects, undergoes transformations throughout the history of science. As such, finding a correspondence between a theory and reality, or defining criteria for evaluating such a correspondence is not part of Bhaskar's philosophical agenda. This should not imply, however, that theory does not have any character in his approach. In fact, theory, with its experimental suggestions, serves as channel that could lead a scientist to causal mechanisms.

In Bhaskar's philosophy of science, theories always remain uncertain. Similarly, causal mechanisms discovered under experimental conditions are uncertain. What is definitely certain in Bhaskar's philosophy of science is the possibility of discovering causal mechanisms, and even if some experiments may go wrong, future ones can hopefully accomplish scientists' goals. In other words, what is not uncertain in Bhaskar's philosophy of science is possibility of achieving progress in the aims decided for science. Of course, he does not define any criteria that could help to measure scientific progress, but he suggests methodological code that can make progress possible in practice.

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References

Baert, Patrick. 2005. *Philosophy of the Social Sciences: Towards Pragmatism*. Cambridge: Polity Press. https://doi.org/10.1177/0001699305056562

Benton, Ted, and Ian Craib. 2010. *Philosophy of Social Science: The Philosophical Foundations of Social Thought*. New York: Palgrave Macmillan.

Bhaskar, Roy. 2008. *A Realist Theory of Science*. New York: Routledge. https://doi.org/10.4324/9780203090732

Bhaskar, Roy. 2009. *Scientific Realism and Human Emancipation*. New York: Routledge. https://doi.org/10.4324/9780203879849

Bonilla, Jesús P. Zamora. 2019. "Realism versus Anti-Realism: Philosophical Problem or Scientific Concern?" *Synthese*, 196(10): 3961–77. https://doi.org/10.1007/s11229-015-0988-6

Bueno, Otávio. 2015. "Realism and anti-realism about science: a pyrrhonian stance." *International Journal for the Study of Skepticism*, 5(2): 145–67. https://doi.org/10.1163/22105700-04031176

Frost-Arnold, Greg. 2010. "The No-Miracles Argument for Realism: Inference to an Unacceptable Explanation." *Philosophy of Science*, 77(1): 35–58. https://doi.org/10.1086/650207

Harman, Gilbert H. 1965. "The Inference to the Best Explanation." *The philosophical review*, 74(1): 88–95. https://doi.org/10.2307/2183532

Hoyningen-Huene, Paul. 2018. "Are There Good Arguments against Scientific Realism?" In *Philosophy of Science*, 3–22. Cham: Springer. https://doi.org/10.1007/978-3-319-72577-2_1

Kitcher, Philip. 1993. *The Advancement of Science: Science without Legend, Objectivity without Illusions*. Oxford: Oxford University Press.

Laudan, Larry. 1981. "A Confutation of Convergent Realism." *Philosophy of Science*, 48(1): 19–49. https://doi.org/10.1086/288975

Lewis, Peter J. 2001. "Why the Pessimistic Induction is a Fallacy." *Synthese*, 129(3): 371–80. https://doi.org/10.1023/A:1013139410613

Macarthur, David. 2020. "Exploding the Realism-Antirealism Debate: Putnam contra Putnam." *The Monist*, 103(4): 370–80. https://doi.org/10.1093/monist/onaa010

Manee, Samal HR. 2018. "The 'Truth'Between Realism and Anti-Realism." *International Journal of Philosophy*, 6(2): 32–39. https://doi.org/10.11648/j.ijp.20180602.13

Mizrahi, Moti. 2020a. "Key Positions in the Contemporary Scientific Realism/Antirealism Debate." In *The Relativity of Theory*, 35–49. Cham: Springer. https://doi.org/10.1007/978-3-030-58047-6_3

Mizrahi, Moti. 2020b. "Relative Realism: The Best of Both Worlds." In *The Relativity of Theory*, 109–62. Cham: Springer. https://doi.org/10.1007/978-3-030-58047-6_6

Mizrahi, Moti. 2020c. "Key Arguments for Scientific Realism." In *The Relativity of Theory*, 51–77. Cham: Springer. https://doi.org/10.1007/978-3-030-58047-6_5

Mulder, Jesse M. 2012. "What Generates the Realism/Anti-Realism Dichotomy?" *Philosophica*, 84: 53–84. https://doi.org/10.21825/philosophica.82156

Park, Seungbae. 2014. "A Pessimistic Induction against Scientific Antirealism." *Organon F*, 21(1): 3–21.

Park, Seungbae. 2018. "The Anti-Induction for Scientific Realism." *Grazer Philosophische Studien* 95(3): 329–42. https://doi.org/10.1163/18756735-000044

Pölzler, Thomas. 2018. "Can the Empirical Sciences Contribute to the Moral Realism/Anti-Realism Debate?" *Synthese* 195(11): 4907–30. https://doi.org/10.1007/s11229-017-1434-8

Psillos, Stathis. 1999. *Scientific Realism: How Science Tracks Truth*. New York: Routledge. https://doi.org/10.4324/9780203979648

Putnam, Hilary. 1975. *Philosophical Papers/1 Mathematics, Matter and Method*. Ca,bridge: Cambridge University Press. https://doi.org/10.1017/cbo9780511625268

Rouse, Joseph. 2018. "Beyond Realism and Antirealism–At Last?" *Spontaneous Generations: A Journal for the History and Philosophy of Science*, 9(1): 46–51. https://doi.org/10.4245/sponge.v9i1.26979

Rowbottom, Darrell P. 2019. *The Instrument of Science: Scientific Anti-Realism Revitalised*. New York: Routledge. https://doi.org/10.4324/9780429022517

Van Fraassen, Bas C. 1980. *The Scientific Image*. Oxford: Oxford University Press.

Wray, K. Brad. 2013. "Success and Truth in the Realism/Anti-Realism Debate." *Synthese* 190(9): 1719–29. https://doi.org/10.1007/s11229-011-9931-7

Wray, K. Brad. 2018. *Resisting Scientific Realism*. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108231633