


Giere's Scientific Perspectivism as *Carte Blanche* Realism[†]

El perspectivismo científico de Giere como realismo carte blanche

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Recibido: 31/01/2021. Revisado: 02/03/2021. Aceptado: 30/03/2021

Abstract

In this paper we explore Ronald N. Giere's contributions to the scientific realism debate. After outlining some of his general views on the philosophy of science, we locate his contributions within the traditional scientific realism debate. We argue that Giere's scientific perspectivism is best seen as a form of *carte blanche* realism, that is: a view according to which science is a practice aiming at truth, and can warrantably claim to have attained it, to a certain degree; however, it does not place our confidence invariably in some specific feature of scientific representations.

Keywords: scientific realism; antirealism; empiricism; relativism; points of view.

Resumen

En este artículo exploramos las contribuciones de Ronald N. Giere al debate sobre el realismo científico. Tras esbozar algunas de sus ideas generales en filosofía de la ciencia, ubicamos sus contribuciones al interior del debate sobre el realismo científico. Argumentamos que es mejor concebir al perspectivismo científico de Giere como una forma de realismo *carte blanche*, es decir: una concepción de

[†] M. Gensollen: This paper is a research product of the "Science and Democracy" project (PIF20-2), funded by the Autonomous University of Aguascalientes (Mexico).

acuerdo con la cual la ciencia tiene como objetivo la verdad, y puede justificadamente afirmar haberla obtenido; sin embargo, no deposita nuestra confianza invariablemente en algún rasgo específico de las representaciones científicas.

Palabras clave: realismo científico; antirrealismo; empirismo; relativismo; puntos de vista.

1. Introduction

Something that can be expected from a philosopher is criticism of another philosopher's views. Indeed, philosophers are a curious bunch. We enjoy arguing for hours. Our outmost respect for the ideas of our colleagues is demonstrated by obsessively examining them in every detail, probing for flaws. Not surprisingly, this is how we intend to honor the recent loss of Ronald N. Giere: by engaging in a critical appraisal of his works.

Although, Giere's intellectual objectives were broad, understanding science was chief among them. Not only he deemed science a subject-matter worthy of attention, but he also viewed it as an enterprise deserving to be praised and emulated. His work in science studies was engaging and he made innovative contributions to the philosophy of science, he ventured through paths beginning to be trodden that ever since have become safer avenues.

In this paper, we will focus on his contributions to the scientific realism debate. We argue that, rather than viewing his perspectivism as a 'middle ground' between realism and antirealism, Giere's main contribution can be appreciated by means of what we call '*carte blanche* realism'. In order to support our claim, we first outline some major developments in Giere's program in the philosophy of science. We then overview the traditional debate on scientific realism, locating Giere's contributions in its proper place.

2. Giere's views on science

2.1. Constructive realism

Ronald N. Giere developed the foundations of his philosophy of science in the last two decades of the twentieth century, within what Moulines called "modelist and kindred views" of science, particularly "semantic versions of modelism" (2008, 156). Some common features of these otherwise heterogeneous views are the following: (i) a rejection and/or mistrust of an exclusively formal-syntactic methodology in the analysis and reconstruction of both scientific concepts and theories; (ii) an abandonment of the notion of 'theory' in favor of that of a 'model' or a reinterpretation of theories within a semantic or pragmatic framework; (iii)

an explicit or implicit leaning towards antirealism and/or instrumentalism; (iv) a pragmatization in the analysis of science; (v) an emphasis in case studies; and (vi) a pluralistic trend (Moulines, 2008, 129-132).

Since its inception, Giere's project was strongly naturalistic (1988). In the wake of Quine and Kuhn, Giere did not draw a sharp distinction in methodology and subject matter pertaining to the philosophy of science and those of psychology, although he relied mostly in the cognitive sciences rather than constructive psychologism as a fundamental source (Giere, 1992, xvi-xvii). His modelist view of science departed from a representational notion of 'model', conceived as an *abstract, constructed* entity that is *socially validated* by the scientific community. Models can be linguistically described or determined by non-linguistic means. In his representational view, language is not directly connected to the world. Instead, statements, equations, diagrams, and so forth, define a model that fits or not, and only to some extent, with some aspects of the real systems by means of *theoretical hypotheses* and their *similarity* to the world (1999b, 55-56). Finally, Giere deemed impossible to reach an exact correspondence between a model and reality. That led him to uphold a *constructive realism*, where different models can offer alternative representations of a single real system. Even if they can be assessed as better or worse, this evaluation would not be determined *only* by the way the world is. This possibility, made salient by the supposed fact of underdetermination of theory by evidence, opens the door for relativism. That is why Giere rejected the standard objectivist framework, since he claimed the underdetermination thesis relied on a standard objectivist characterization of truth and reference (1999a, 240). Thus, rather than viewing science as a producer of true or false statements in a standard objectivist sense, Giere urged us to think of science as a practice that produces models which, as it occurs with maps, may fit the world more or less. In this view of science, empirical evidence can contribute to decide which model fits better with some aspects of the world, notwithstanding the cultural values and presuppositions that played a role in the *process* of their selection and assessment (1999a, 241). The possibility of using alternative models would be determined by scientists' *interests* and *purposes* (Giere, 2009, 222). Thus, his initial constructive realism gave rise to a *perspectival realism*:

The result is a kind of realism regarding the application of models to the real world, but it is a realism that is perspectival rather than objective or metaphysical. The sorts of general principles operative in some sciences provide a perspective within which particular models may be constructed. When, through observation or experimentation, these particular models are judged to be well-fitting, we are justifiably confident that the world itself exhibits a structure similar to that of our models (Giere, 1999a, 241).

2.2. A naturalistic framework

Giere's perspectival realism appeared, as his preceding constructive realism did, within a strongly naturalistic framework. It was also aimed at an audience and determined by its methodology. As for the former, Giere confessed not being interested in the general philosophical debate between realism and idealism, nor in detailed philosophical arguments, based heavily on assumptions from metaphysics, philosophy of language and of mind. His intended audience was composed rather by the community of science studies, philosophers, historians, and sociologists of sciences, as well as interested scientists aiming for a broader understanding of their own practice (Giere, 2009, 221). As for the latter, instead of framing the issues in the philosophical debate of scientific realism, Giere intended to examine the real scientific practice in the framework of contemporary science (2006, 3). Thus, he sought "to change the terms of the debate by developing an alternative view that is more than a minor variant on already existing views" (Giere, 2006, 3). Finally, he claimed that his perspectival realism: (a) offered an understanding of scientific statements in between absolute objectivism and constructivism (Giere, 2006, 3); (b) accounted for actual scientific practice better than objectivist realism, without endorsing a wholesale constructivism;¹ (c) incorporated the idea that scientific theories are partially social constructions, and that social contributions can be singled out by means of a detailed historical study of each case; and (d) assumed that a certain degree of contingency is always present in science, rejecting any claim that purports to be an absolute truth. In his own words:

A proper understanding of the nature of scientific investigation supports the rejection of all claims to absolute truths. The proper stance, I maintain, is a methodological naturalism that supports scientific investigation as indeed the best means humans have devised for understanding both the natural world and themselves as part of that world. That, I think, is a more secure ground on which to combat all pretenses to absolute knowledge, including those based on religion, political theory, or, in some cases, science itself (Giere, 2006, 16).

As we have pointed out, Giere was seeking to change the terms of the traditional debate between realists and antirealists, which escapes his strictly naturalistic framework. His interest lied, in contrast, in the debate between objectivism and constructivism, that resulted from the historical criticisms of Kuhn, Feyerabend's epistemological anarchism, and the sociology of science of the Edinburgh School.² In this debate, Giere found himself closer to objectivism

¹ However, Peter Lipton (2007) labeled Giere's position as 'constructivism', close to both Kant and Kuhn. Giere (2013) himself classifies Kuhn as a perspectivist, although only in his last stages, when he abandoned the notion of 'paradigm' in favor of 'scientific lexicon' (Kuhn, 2000).

² There are different versions and degrees of constructivism. In its strongest version, it rejects the idea that the objects of scientific enquiry have mind-independent existence (Latour and Woolgar,

than constructivism, insofar as objectivism is not construed as a metaphysical position, but a sophistication of common-sense realism in which science makes lasting discoveries, that allow it to progress. Nevertheless, his defense of perspectival realism and his rejection of objective realism were grounded on actual scientific practice: "For a perspectival realist, the strongest claims a scientist can legitimately make are of a qualified, conditional form [...] There is no way legitimately to take a further objectivist step and declare [something] unconditionally" (Giere, 2006, 5-6).

2.3. Scientific perspectivism

For Giere, perspectivism admitted degrees. Depending on the stringency of perspectivism, one can approach versions of relativism or objectivism. In its weakest version, perspectivism claims that, as a matter of contingent fact, all scientific claims are made within the framework of some perspective. A moderate version holds that, due to our cognitive abilities and the world, scientific claims must be conditional on a perspective. A stronger version holds that there are no perspective transcending facts at all. Since Giere located his perspectivism at the weakest degree –although he accepted some claims of moderate perspectivism (2015, 1)–, he stirred away from a robust relativism.

His perspectivism was developed in four stages. First, Giere found in color vision not just an instance of perspectivism, but an ostensive definition of it (2009, 223). Facing objectivism and subjectivism about color, generally held by philosophers and scientists respectively, Giere found in current science on color vision a perspectival position in which colors are *relational*, with both subjective and objective components:

[...] colors are best thought of as neither completely objective nor purely subjective, neither as properties of either parts of the material world or of subjective experience, but as a property of an interaction between the material world and human observers. (2006, 38-39)

In a second stage, Giere extended his perspectivism about vision to scientific observation. The use of instruments in scientific observations involves the interaction with only some specific aspects of the physical world and is never totally transparent (2009, 223). An instrument is bound by design to receive

1979, 128-129) or that they progressively emerge from indetermination through constructive operations (Knorr-Cetina, 1983, 135). In its modest versions, many related to the Edinburgh School, it holds the *contingency thesis*: either the process of doing science is so imbued of all kind of human judgements and values that theory choice is not determined by the real structure of the world (Bloor, 1976), or it is the set of social circumstances what determines the result of inquiry (Collins, 1981), or the interpretation of experimental results requires the professional judgement subject to 'context opportunism' (Pickering, 1984). However, moderate versions do not deny the independent existence of the world.

some specific inputs from the phenomena under observation; the outputs it delivers, according to Giere, cannot completely eliminate the instrument's contribution. For instance, brain imaging technologies, using CAT or MRI, do not only produce images of the brain: "One cannot detach the description of the image from the perspective from which it was produced" (Giere, 2006, 56). From these considerations, one can wonder if there can be *compatible* or *overlapping* instrumental perspectives. Concerning *compatibility*, Giere thought there was no contradiction in claiming that different systems produce different images from the same inputs; but when different instruments deliver conflicting results: "... scientists confronted with this situation would draw the conclusion that one or the other instrument is malfunctioning and proceed to try to figure out what had gone wrong. They would not accept the result as simply a curiosity of nature" (2006, 57).³ Concerning *overlap*, Giere pointed out that it is a platitude to acknowledge that there can be different observational perspectives of the same objects. However, he did not think that this supports an objectivist realism:

Is this not good evidence that there is something "objectively" there? Indeed, this is good evidence that there is something there, but this need not be understood as knowledge in an "absolute objectivist" sense. / The simple but fundamental point is that to be an object detected in several different perspectives is not to be detected in no perspective whatsoever (Giere, 2006, 57-58).

The last two stages in Giere's perspectivism are meant to extend his considerations about color vision and scientific observation. A first extension concerns scientific theorizing: "One reason why the perspectival nature of existing human and instrumental observation seems undeniable is that we can understand the ways they are perspectival in terms of broader theoretical perspectives" (Giere, 2006, 93). Constructing scientific theories occurs in the setting of an ongoing scientific tradition that sets the scientific agenda. Here, the key is that, according to Giere, the relation between claims and the world is *indirect*. But does realism not require that scientific claims be *about* the world? How are models and scientific claims *connected to* the world? Giere summed it up as follows:

³ Possible incompatibility can also be neutralized from potential relativistic intrusions. To that end, Giere urged that "...if we consider purposes in the construction of a theoretical perspective, the threatened incompatibility may disappear. [...] If the purpose is to construct models of fluid flow, the principles of fluid mechanics, which treat water as a continuous fluid, generate by far the best fitting models. But if our purpose is to understand diffusion in a fluid, we must turn to the principles of statistical mechanics applied to molecules" (2009, 222). However, Giere went further towards realism by claiming that we can still question the nature of water beyond the possible application of models: "We need only be able to make a comparative judgment as to which perspective generates the overall best fitting models. Here the molecular perspective is clearly superior. We can understand how large numbers of small molecules might behave like a continuous fluid. We cannot understand the phenomenon of diffusion from a fluid mechanics perspective. That asymmetry is all that a perspectival realism requires" (2009, 222).

Linguistic statements are used to characterize abstract models which are in turn used to represent objects and processes in the world. At the highest level, statements characterize relationships among abstract entities and properties. Here the statements define what I now call 'principled models' [...] They cannot be used to represent anything in particular. For that one needs to add further conditions which, together with the principled models, yield models that can be used to represent real things (2009, 222).

His last step was natural, given his cognitivist naturalism. Since most scientific knowledge is a product of distributed cognitive systems, artifacts extend our cognitive capabilities allowing us to create new perspectives of the world (Giere, 2006, 116). Having outlined Giere's overall program, in the following section we will assess his contributions to the realism/antirealism debate.

3. Assessing Giere's perspectival realism

3.1. Framing the traditional debate

The philosophical debate over scientific realism has, at its core, two different concerns about science that were paramount in Giere's works. First, realists and antirealists discuss over the extent to which we are justified in believing scientific representations and outcomes (theories, models, and the like). We call this the 'Warrant Question' [WQ]. Second, by attempting to identify the aims of science as a practice (that might not coincide with the goals of its practitioners), realists and their foes attempt to account for actual features of an important ongoing human enterprise: science as we find it. Let us call this the 'Aims Question' [AQ].

Scientific realists claim, and antirealist (somehow) deny, that science aims at providing true representations of the world and that current scientific outcomes have, to a certain extent, achieved that objective. Although the labels 'realist' and 'antirealist' without further qualification might not mean that much, by situating themselves within this debate, many authors have detailed their answers to WQ and AQ. They identify some of the aims of science, as is currently practiced, and from them they address the issue of whether (and how much) we should trust science. Some currently influential versions of scientific realism can be jointly labeled as 'selective realism', since they claim that science aims to accurately represent specific features of reality (e.g., its structure, the entities posited by its theories, and the like); accordingly, they claim that our beliefs in those features of the world are warranted by mature scientific theories. A recent alternative to these forms of realism, 'Socratic realism', is championed by Timothy Lyons (2016). It claims that while scientific theories aim at attaining some special class of truths, we might have no reason to believe that those truths have been attained by past theories or will be attained by future ones.

As it is often the case when tackling big questions in philosophy, both the framing of the main issues and the potentially acceptable responses concerning scientific realism are highly contested. Addressing these basic concerns is prone to push back the debate towards technical details in logic, the philosophy of mind and language, epistemology, and metaphysics. Digressing on these issues, as Giere noted, would entail failing to engage with many of those whom he wishes to engage. However, his motivation for evading this nuances and philosophical curiosities is not only a rhetorical device; as we saw in section 2.2, it is something that emerged from his naturalistic framework, which “is based entirely on an examination of scientific practice, something appreciated by scientists as well as historians, sociologists, psychologists, and other students of science as a human enterprise” (2006, 5).

3.2. Giere's response to empiricism

Nonetheless, some heated questions surrounding scientific realism can still thrive in a naturalistic environment. One of them, that has been historically prominent, relates to the distinction between observable and unobservable aspects of reality. This distinction prompts pressing questions about the aims of science and the warrant in our attitudes towards it. One can ask, along the lines of AQ, whether science aims to provide an accurate representation of both observable and unobservable aspects of reality. Additionally, unraveling the thread of WQ, one can inquire if there are basis for belief in the unobservable claims of our scientific theories together with its claims about observables. Restricting our warranted belief and the aims of science to the observable realm is what characterizes empiricism, as form of antirealism. (In)famously, logical positivists had drawn the distinction by means of different vocabularies, one consisting in observational terms and the other composed by theoretical terms. In drawing the consequences of this view, their approach was plagued by what seem to be unsurmountable problems (Maxwell, 1962; Putnam, 1966). To his credit, van Fraassen (1980) replaced this approach by turning it into an empirical matter. He equated the observable side of the divide with what can be reliably perceived by unaided human sensory modalities. He then responded to AQ by identifying the aim of science with empirical adequacy; similarly, his response to WQ, restricts warranted belief only to observable aspects of scientific theories. However, as Giere recognized (2005, 151-153), van Fraassen's approach faces new hurdles. The scope and detail of human perceptual capabilities can radically vary among different persons. Moreover, beliefs can also have an influence on what people observe and how they report it. Besides, and more importantly, van Fraassen's “approach does not accord well with widespread scientific practice”. It faces the problem of reconciling “the obvious fact that doing science is a human enterprise

with the widespread scientific practice of taking as evidence results that go far beyond the observational capacities of unaided human observers” (Giere, 2005, 152).

As we mentioned at the end of the previous section, part of Giere's response to this problem relied on extending the reach of observation. According to his view, a human together with an experimental setup can be regarded as a cognitive system; within it the perceptual operation is cognitively distributed. Thus, even if a human cannot observe air pressure by means of her unaided sensory modalities, there is a sense in which a cognitive system of that same person with the relevant equipment and adequate training is able to detect changes in air pressure. This move, however, is only a partial response that avoids the main thrust behind WQ, i.e.: Are we justified in believing science when it ventures beyond observation? As we have seen, empiricists would respond “No”. Giere's broadening of the use of observation does not respond to this question but it calls for a follow up question: Are we justified in believing science when it ventures beyond detection? To this, Giere did not offer a single categorical answer; instead, he hinted that this question is to be responded on case-by-case basis. This is a first question concerning scientific realism that remains open in Giere's view.

3.3. Relativism and the absolute conception of reality

Another important question surrounding scientific realism that appears within the scope of Giere's naturalistic framework concerns the objectivity of scientific representations. Along the lines of WQ, one can ask whether scientific theories provide us with objectively warranted representations of the world. Additionally, AQ prompts the question of whether achieving objective representations of the world is among the aims of science. Relinquishing objectivity is the hallmark of relativism.

Bernard Williams offered a compelling way to cast out antirealist concerns about objectivity by focusing on the “...very basic thought, that if knowledge is what it claims to be, then it is knowledge of a reality which exists independently of that knowledge, [...] independently of any thought or experience. Knowledge is of what is there *anyway*” (2005, 48). As Williams noted, this assumption becomes problematic once different worldviews compete to claim a status as knowledge. Each of these views constitutes a representation of (part of) the world, and is grounded in beliefs, concepts, and singular experiences of its maker. Even if different representations are incomplete, or inaccurate, they might amount to knowledge; but for that to be the case “there must be some coherent way of understanding why these representations differ, and how they are related to one another. [...] [A] story can be told which explains how [...] can each be perspectives on the same reality” (2005, 49). Thus, explaining how different representations from diverse perspectives can be instances of knowledge seems to

require that there be something containing them, as well as their relations. One is tempted to assume that this "...will still itself be a representation, involving its own beliefs, conceptualizations, perceptual experiences and assumptions about the laws of nature" (2005, 49). As a result, the idea of objective knowledge seems to depend on what Williams calls 'the absolute conception of reality'; "if we cannot form that conception, then it seems that we do not have any adequate conception of the reality which is there 'anyway', the object of any representation which is knowledge" (2005, 49).⁴

Requiring an absolute conception of reality to attain objectivity presents a basic dilemma to scientific realists. Either the absolute conception is "entirely empty, specified only as 'whatever it is that these representations represent' [... slipping] out of the picture, leaving us only with a variety of possible representations to be measured against each other, with nothing to mediate between them" (Williams, 2005, 50). Or there must be "some determinate picture of what the world is like independent of any knowledge or representation" (Williams, 2005, 50); but that is open to the challenge that this is, once more, only a particular representation of the world, that provides "no independent point of leverage for raising this into the absolute representation of reality" (Williams, 2005, 50). Both horns of the dilemma seem fatal to realism.

In fact, Giere raised further concerns about objectivity by focusing on a humdrum scientific practice: the use of models as a strategy for the representation and study of phenomena or their underlying causes and mechanisms. Models are widely used in science, notwithstanding their acknowledged lack of accuracy and fidelity (Levy, 2017, 242). As Giere noted, most scientific models involve some degree of idealization, that deliberately distorts some aspects of (parts of) the world being represented. This leaves objective representation, understood as a perfect fit with (part of) the objective conception of reality, utterly out of the question. Thus, a second question for Giere's views concerns evading relativism.

3.4. Perspectives and *carte blanche* realism

Giere's innovation can be better appreciated through the view that we call '*carte blanche* realism'. According to it, science is a practice that aims at truth, and we are justified in claiming it has been attained, to a certain degree; however, our credence in scientific representations should not be placed invariably in some specific feature of theories. As a blank check that fixes an amount without specifying who will cash it, our commitment to scientific theories should be

⁴ Giere offers a somewhat similar rationale, that we find less compelling than that of Williams, by pointing out that "the question of whether any theoretical claim could be exactly true is connected to the question whether any theory could be complete in the sense that it encompasses the whole truth about everything". Concluding that "the only way any particular claim could be exactly true is it is part of a complete theory that is exactly true in every respect" (2005, 154).

strong, but not declared in advance by the flavor of our (philosophical) realism. By emphasizing the accomplishments of science, *carte blanche* realism sets itself apart from Lyons' purely axiological Socratic realism; in renouncing to declare the locus of this fit, it distances itself from selective realisms. In order to recognize what *carte blanche* realism brings to the table it is useful to compare it with empiricism and relativism.

As we saw in section 3.2, Giere extended the reach of observation by considering cognitive systems in which instruments and theoretical models played a crucial role. Thus, it remained an open question to AQ just how removed from observation, and perhaps detection, could we extend the aims of science. Additionally, responding to WQ required a principled way to assess the justification for credence in scientific outcomes. Both of these concerns were addressed by Giere's reliance on perspectives. To account for the notion of 'perspective' Giere found useful to explore the visual metaphor that gives rise to it (2009, 223). The notion of 'perspective' might overlap, at least partially, with that of a 'point of view'. For Lehtonen (2011, 246-250) points of view have many components, some about the observer, others about the observational tools, and still others concerning the observed object. The variables pertaining to the observer include aspects of: (1) the subject or type of subject, (2) her interests, aims and values, (3) her mental position or attitude, (4) her relevant background knowledge and expectations, and (5) her social, cultural, and historic context. The variables concerning observational tools might refer to: (6) the conceptual apparatus used by the subject, (7) the method of observation and (8) the basis of viewing or the data. Lastly, the variables concerning the observed object can include: (9) the object or focus of a point of view and (10) the observable features or properties of the object. The variability across these kinds of dimensions is meant to be included in Giere's 'perspectives': "Missing from this scene is any autonomous representational relationship between a model and the world. In my presentation of scientific practice there is no such character. Rather, the fundamental relationship is again triadic [...] *scientists* use *models* to represent aspects of the *world*" (2009, 222). Thus, the main task for perspectival realism, both for its *realism* and its *perspectival* components, lies in assessing which aspects of scientific representation remain invariant across different perspectives or points of view. Those are not bound to be identical with what each perspective classifies as 'observable' or 'detectable', thus superseding empiricism. Both the aims of science and our warranted justification in its outcomes can be extended beyond what a given perspective singles out as epistemically privileged observations.

However, Giere emphasized that there might not be a unique privileged perspective, or point of view, and "no such thing as an objective measure of similarity that is completely general" (2005, 156). However, instead of giving up to a full-blooded relativism, he insisted that "realism need not require that we be in possession of a perfect model that exactly mirrors the structure of the world in all respects and to a perfect degree of accuracy" (Giere, 1999a, 241). His per-

spectival response to relativism concedes that there might not be a single feature of scientific representation that remains constant across domains of inquiry. A 'perspective' resembles a Kuhnian 'paradigm', in that the truth of a scientific claim or the fit of models to the world can only be established within them; they do not require comparison to an absolute conception. Furthermore, their value cannot be determined by means of decisive observational tests. However, there are features that remain invariant across different models, even though they might not be the same across *all* models. In this sense, Giere's perspectives are not as broad as Kuhnian paradigms, understood as an entire constellation of beliefs, values, techniques, etc., shared by the scientific community (2006, 82).

4. Concluding remarks

As seen through the glass of *carte blanche* realism, one might be tempted to indict Ronald N. Giere's perspectivism for leaving too many unanswered questions. It all depends on one's expectations about philosophical responses to the debate over scientific realism. If the goal of this debate was to *strengthen our confidence in scientific practice* and its outcomes, Giere offered a sparse response. To him, the traditional debate succumbed to the scandal of philosophy: it became a perennial problem that, in the best-case scenario, stimulated our reflective and analytical abilities, leaving actual scientific practice in no man's land. In this sense, *carte blanche* realism demands no further philosophical inquiry into the basis for our confidence in scientific representations across the board. Even if we pay our epistemological duties to successful scientific theories, there is no telling in advance which parts or aspects of those theories will cash the check. On the other hand, if the point of the debate was to *improve our understanding of scientific practice*, Giere's approach is very fruitful. It encourages to pursue an intense agenda within the science studies community. It involves performing detailed case studies within a naturalistic and cognitivist framework, in order to establish where specifically our models are adequate, while acknowledging when non-epistemic values and interests can jeopardize objectivity and to what extent perspectival aspects of science pervade their outcomes.

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