PERSPECTIVAL REALISM

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1. Perspectival Realism

Perspectival realism[1] is best described as a cluster of views in philosophy of science committed to both the existence of *mind-independent* things and to the historical and cultural *situatedness* of scientific knowledge (Massimi 2018a). The first is the realist commitment, whilst the latter is the perspectivalist commitment. Perspectival realists react against both *objective realism* and *social constructivism*. Perspectival realists take issue with the objective realists' tendency to formulate *complete* and *objectively true* images of the world. For example, for the objectivist realist, scientific claims such as 'HIV is a virus that damages the immune system', 'Whales are mammals' or 'The electron has spin half' are objectively true claims about the mind-independent world. From the perspectival realist's viewpoint, such claims, though they are about mind-independent entities such as HIV, whales, and electrons, cannot be objectively true, but only *perspectively true*. That is, such claims can be "relative to a perspective" (Giere 2006b, 81), "guides to an independently operating world" (Teller

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[1]In contemporary philosophy perspectivism has been advocated in connection to causation (Price (2007), Ismael (2016)), mechanistic causation and explanation (Craver (2013), Dewhurst (2018), Kastner (2018), Winning (2018)), time (Baron and Evans (2019), Rovelli (2017), Torrengo (2017)), meta-ethics (Schafer 2014), peer disagreement (Kvanvig 2013), justification (Sosa (1991) and Rosenberg (2002)), contextualism and relativism in philosophy of language (Bach 2011), and issues of realism in philosophy of science. In this paper the focus is on perspectival realism (Giere (2006a), Teller (2011), Massimi (2018a), etc.) and not on perspectivism broadly construed. Since debates in other areas of contemporary philosophy are orthogonal to our focus, they shall, with few exceptions, be bracketed in what follows.

2011, 471), or "true across scientific perspectives" (Massimi 2018a, 357), but not true simpliciter. Thus, the perspectival realist denies the epistemological commitment of the objectivist realist according to which the scientific enterprise can produce an ultimate, objectively true picture of the world.

Perspectival realists also take issue with the social constructivists portrayal of science as the product of social interactions and institutions and not as the product of interactions with a mind-independent world. Though perspectival realists admit that science is subject to some degree of contingency, they are also committed to mind-independent things. Cashing out the nature of this commitment is one of the main problems of perspectival realism. Perspectival realists share with social constructivists the commitment to *epistemic pluralism*, the idea that there are multiple ways of acquiring knowledge about the world and multiple different descriptions of mind-independent entities, none of which are objectively true. The commitment to epistemic pluralism seems to be incompatible with the realist commitment, a tension which will be explored in subsequent sections.

It will however prove instructive to explore the origins of perspectival realism first. Giere (2006b)'s first formulation of perspectival realism takes lessons from colour vision to extend to scientific practice in general, in particular to modelling practices. Giere takes different systems of vision to amount to different, yet compatible perspectives on the world. The dichromate and the trichromat experience the world in different ways, but it cannot be said that the dichromate's experience is veridical whereas the trichromat's is not. Furthermore, just as different systems of vision constitute different perspectives on the world so do different scientific models of the same target system. Moreover, since disagreement can only occur within the same perspective and models constitute different perspectives, they cannot disagree, so we should think of them as being compatible. However, since certain modelling practices feature genuinely incompatible models which block realist inferences about phenomena, Giere's lessons from the visual metaphor cannot be easily extended to modelling practices. Besides the challenge from incompatible models, the visual metaphor has also been criticised by Brown (2009) and Chirimuuta (2016).

The visual metaphor perpetuates a misleading "model of knowledge seeking" (Chirimuuta 2016, 754) as "the picturing of objective facts" (id.), which is "ultimately a passive activity" (Brown 2009, p. 219), incompatible with the practice of science. Scientific practices such as modelling, where the role of the agents and their purposes are pivotal to the process of representation, are better fashioned after a haptic metaphor. Whereas the visual metaphor promotes a "spectator theory of knowledge" (Brown 2009, p. 219), the haptic metaphor promotes an idea congenial to science according to which we learn about the world "through tinkering and interacting with it" (Chirimuuta 2016, 755). Whilst more appropriate than the visual metaphor, the haptic metaphor is nevertheless limited. For example, it cannot apply to astrophysics and cosmology, where direct interaction and tinkering with the objects of investigation is not possible.

Having assessed the initial plausibility of the visual metaphor as a springboard for perspectival realism, let us now turn to two main arguments for perspectival realism derived from scientific practice.[2]

2. Two Arguments

2.1. **The Synchronic Argument from Modelling Practices.** The first argument in favour of perspectival realism, call it *the synchronic argument*, is derived from contemporary scientific practices, in particular from modelling practices (Giere 2006b). We can formulate the argument from modelling practices either i) in terms of the knowledge that can be retrieved about the world from modelling practices, or ii) in terms of the claims about the world warranted by the use of instruments.

The first formulation goes as follows:

P1. Diverse modelling practices are ubiquitous in contemporary scientific practice.

P2. Diverse modelling practices often give rise to multiple, different models of the same target system.

P3. Different models constitute partial perspectives regarding the same target system.

[2]Massimi (2018c) was the first to distinguish between a synchronic version and a diachronic version of perspectivism.

P4. Knowledge obtained through partial perspectives regarding the same target system is inherently perspectival.

C. Therefore, modelling practices yield partial and perspectival knowledge about the world.

Focussing on the kind of knowledge that can be yielded by instruments, perspectival realists insist, once more, that such knowledge is inherently perspectival. Here is how the second formulation of the argument goes:

P1. We use instruments to learn about the world.

P2. Instruments are sensitive to certain inputs, but not others and are thus not transparent.

P3. Since instruments are not transparent, the claims warranted by the use of instruments are partial and perspectival.

C. Hence, instruments yield partial and perspectival knowledge about the world.

Modelling practices and the instruments used to investigate the world can only give us a limited and fragmented image of the world and never a complete and objectively true picture of the world. Yet, through modelling practices and instruments we interact with a mind-independent world and thus science studies the interactions between our modelling practices and instruments and the world and not the interactions between social interactions and institutions.

2.2. **The Diachronic Argument from History of Science.** The second argument for perspectival realism is derived from the history of science. It is another epistemic argument aimed to refute the claim that science offers complete and objectively true images of the world. Let us call it *the diachronic argument.* The structure of the diachronic argument is as follows:

P1. Once we reflect on the succession of past scientific theories we are led to the conclusion that although many past theories proved to be false, some at least, got something right about the world.

P2. Since many such theories have been abandoned, yet some claims were retained, it cannot be the case that science gives us true and complete images of the world.

P3. Instead, what history of science teaches us is that there are multiple different perspectives regarding the same phenomena.

C. Thus, history of science yields perspectival knowledge of the world.

Different perspectives on the same phenomena are particularly important also because they enable different justifications for scientific claims about the world. Massimi (2012), for example, argues that although scientists' beliefs about the world are motivated by things in the world, such beliefs must also fit into a scientist's epistemic perspective. Knowing the epistemic conditions under which scientists can gain knowledge of nature's fundamental properties is as important as employing the relevant detection procedures for gaining access to such properties. For example, we can know that J.J. Thompson discovered the electron because we can know the epistemic conditions under which he gained knowledge of electrons, even though he did not call them electrons. Hence, the realist can only benefit from incorporating an account of perspectival justification in any story about how knowledge of the world is acquired. Wolff (2018) makes a similar recommendation for the (structural) realist. Wolff argues that whilst the representational theory of measurement can be seen as a form of structural realism, in order to justify the attribution of measurement structures to particular attributes, it must be supplemented with Massimi's epistemic perspectival realism.

To judge the viability of perspectival realism as a novel alternative to realism, both its perspectivalist and its realist commitments must withstand scrutiny. However, whilst the commitment to the perspectival nature of knowledge is supported by a synchronic and a diachronic argument, the commitment to realism is more problematic. In fact, perspectival realism can be challenged on precisely this point: its commitment to realism seems at best insubstantial and at worst entirely lacking.

3. Two Challenges

3.1. **The Realism Challenge.** One of the main challenges to perspectival realism is the *Incompatible Models Argument (IMA)* (Chakravartty (2010), Morrison (2011)). The main idea behind IMA is that pluralism about perspectival modelling is incompatible with perspectival realism. Pluralism here refers to the observation that in scientific practice many different models are often employed for the same target system. Whilst in many cases different models complement one another sometimes different models are inconsistent with one another. Since inconsistent models can attribute contradicting properties to the same target system it can be difficult to specify the nature of the physical system modelled. Thus, IMA challenges the perspectival realist's commitment to realism. The argument has the following structure:

> P1. Incompatible models of the same target system are used by scientists for predictive purposes.
> P2. These models ascribe different properties to the same target system and thus appear to contradict each other.
> P3. The predictive success of a theory is taken by realists as an indication of the theory's approximate truth.
> P4. However, if several theories of the same system are predictively successful and if these theories are mutually inconsistent, they cannot all be true, not even approximately (Frigg and Hartmann (2018, p. 29)).
> C. Thus, incompatible models cannot yield a realist commitment to the same target system.

There are two different perspectivalist responses to IMA. According to the first response, each of a number of different models of the same target system reveals one particular aspect of the relevant phenomenon. When models are taken together, a fuller, yet different perspective regarding the target system emerges. Let's call this the Giere-Rueger response (Giere (2006b), Rueger (2005)). According to the Giere-Rueger response, incompatible models do not yield ultimate or even approximate truths about the phenomenon, but they do yield perspectival knowledge of the phenomenon. A compelling example is provided by Plutynski (2018), who argues that cancer theories, due to the complexity of their object of investigation, can only yield partial and perspectival knowledge. Cancer theories, according to Plutynski, are not in conflict with one another.

The Giere-Rueger response to IMA has been challenged by Chakravartty (2010) and Morrison (2011). Morrison argues that "perspectivism is simply a re-branded version of instrumentalism" (Morrison 2011, p. 350). Looking at modelling practices concerning the structure of the nucleus, Morrison shows that inconsistent models do not yield knowledge of fundamental aspects of the target system, and thus any realist inference based on IMA is unsubstantiated. According to Morrison there are at least 30 different models of the nucleus, each making very different assumptions about the same target system. Different models ascribe different types of behaviours to the nucleons leading to incompatible characterisations of its nature. For example the incompatibility of the different models makes it difficult to determine if they are probability waves, point particles or space-occupying objects. Although each of these models is predictively and explanatorily successful in a given domain, there is no way to "build on and extend the models in a cumulative way" (p. 351) so as to approximate the true nature of the nucleus. If the different models cannot be cumulated because they attribute contradictory properties to the same target system, the success of the models cannot be taken to indicate their approximate truth. Thus the Giere-Rueger response fails to secure even a weak realist commitment.

A second response to IMA comes from Massimi (2018b), who argues that IMA relies on "unduly demanding and ultimately inadequate" (Massimi 2018b, p. 14) premisses that cannot "carry the full argumentative weight for IMA" (id.). Massimi is responding primarily to Chakravartty (2010), who sees IMA as incompatible with perspectival realism, but not with dispositional realism. Chakravartty argues that different modelling practices may appear to ascribe contradictory properties to the same target system, but contradictions can be explained away once the dispositional behaviour of non-perspectival physical systems is understood. However, the role of dispositions is highly disputed in science and the examples that Chakravartty offers (such as the solubility of salt) are a long way short of constituting a response to genuine cases of inconsistent *scientific models*, such as those offered by Morrison.

Furthermore, by not showing how knowledge of dispositional facts is acquired the dispositional realist ends up relying on a form of epistemic bootstrapping (Massimi 2012). Massimi points out that the dispositional realist's commitment to non-perspectival facts relies on the possibility of acquiring relevant knowledge about such facts. Yet, the dispositional realist does not offer a compelling story regarding how knowledge of dispositional facts is acquired. For example, the dispositional realist fails to justify how we come to know that salt is indeed soluble. Since the realist commitment is dependent on such knowledge, which would explain away the appearance of incompatible models, the dispositional realist cannot claim to secure a commitment to dispositional facts.

The perspectival realist, unlike the dispositional realist, can explain how we acquire knowledge of the world (Massimi 2012). By knowing the epistemic perspective of past scientists we can know what justified their claims. Furthermore, by comparing past systems of knowledge with our current scientific knowledge we can assess which of the surviving claims are still supported by empirical evidence. Thus we can ascertain the progress made in learning about particular entities by tracking the ongoing empirical support of surviving justified claims of past scientists. For example, once we take into account the different perspectival images of the electron produced by J.J. Thomson, P.A.M. Dirac, and modern quantum electrodynamics we can know what can be said about the electron and ascertain the progress made since J.J. Thomson's discovery. Hence, the perspectival realist tackles IMA by explaining how different epistemic perspectives may nevertheless yield knowledge about the same entities.

3.2. **The Relativism Challenge.** Another main challenge to perspectival realism is the relativist challenge. If modelling practices and lessons from history of science can only yield perspectival knowledge then all scientific knowledge is knowledge from within a perspective. If all knowledge is perspectival, can we have any knowledge of non-perspectival facts? Can we know any truths about the world?

A number of different affirmative responses are available. According to Teller (2011), a novel conception of truth which is appropriate for modelling practices is needed. Models are idealisations and because the world is too complex, they cannot be accurate. At the same time, accurate, but imprecise statements cannot be true. Thus, whilst models cannot deliver traditional truths, neither can imprecise non-idealised statements about the world. But since models yield knowledge of the world, Teller suggests we understand truth in connection to modelling practices in terms of *semantic alter-egos*. What this means is that a pair of sentences, one which is precise and true, but inaccurate, together with its imprecise, but accurate semantic alter-ego can jointly be used to make true claims about the world. An imprecise statement counts as true in virtue of being the semantic alter-ego of a precise, but inaccurate statement. Although models cannot tell us precisely what the nature of the target system is, models, in "in many fortunate cases, function as accurate guides to an independently operating world" (Teller 2011, p. 471).

Teller's response, whilst prima facie appealing, cannot deliver on the normativity of realism (Massimi 2018a). According to Massimi, science, by realist lights, ought to get things right (p. 4). Since perspectival realism shares with scientific realism this normative commitment to get things right, perspectival truth can be "neither truth indexed to a scientific perspective [a la Teller], nor truth relative to a perspective [a la Giere]" (p. 2). Instead, perspectival truth is truth across perspectives, with the following caveats: i) no perspective can sanction its own truth; ii) any truth claim must meet certain standards of performance adequacy common across perspectives (Massimi 2018a; Massimi 2018c). Thus, perspectival truth claims are the result of "cross-perspectival agreement on the ongoing performance-adequacy of knowledge claims" (p. 17). Accuracy, empirical testability, projectibility, and heuristic fruitfulness are examples of standards of performance adequacy that Massimi envisages to be common across perspectives. Since perspectival truth, on Massimi's proposal, tracks mind-independent facts across perspectives, perspectival realism can be taken to provide a safeguard against truth relativism.

There are, however, some problems with this proposal. Whilst cross-perspectival evaluation may be possible in the context of synchronic modelling practices, it is not clear how cross-perspectival evaluation would work for diachronic practices. This is because even if standards of performance adequacy of diachronic practices can be successfully recovered or rationally reconstructed, the ultimate verdict regarding ongoing performance-adequacy of knowledge claims is still provided from within the current vantage point. Whilst judging past systems of knowledge with the benefit of hindsight may not lead to truth relativism, it certainly makes perspectival realism vulnerable to the pessimistic meta-induction (PMI), a charge famously raised by Laudan (1981) against scientific realism. In brief, PMI challenges the realists' strategy to infer truth from the success of a theory. Laudan notes that there have been many successful theories, for example Dirac's hole theory (Pashby 2012) or Fresnel's theory of light and the luminiferous ether, which have nevertheless been abandoned, and thus, one cannot infer the truth of a theory from its success. Similarly, one cannot infer a theory's truth from the ongoing success of its accuracy, empirical testability, projectibility, and heuristic fruitfulness. At best, one might infer the theory's empirical adequacy (Van Fraassen 1980; Van Fraassen 2010) and suspend judgement on its truth or approximate truth, thus adopting a form of constructive empiricism along the way. Thus, as it stands, perspectival realism fares considerably worse than its rivals (constructivism empiricism, and arguably also structural realism) as a means of responding to historical case studies that motivate the PMI.

4. Conclusion

To sum up, perspectival realism is a view in philosophy of science according to which two seemingly incompatible commitments can be reconciled: the commitment to a *mind-independent* world and the commitment to the *situatedness* of scientific knowledge. The commitment to the situatedness of knowledge, shared with constructivists, is supported through arguments from contemporary scientific modelling practices and through lessons from the history of science. The commitment to a mind-independent world, shared with realists, remains largely unsupported. Future efforts should be directed towards a renewed defence of the realist commitment to a mind-independent world.

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