

## Is perspectivism realistic enough for science?

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What I propose to do is to examine a view labelled 'scientific perspectivism' and ask whether we can rest satisfied with it.<sup>1</sup> The version I shall be reviewing is due to Ronald Giere and finds expression in his recent short monograph, *Scientific Perspectivism* (The University of Chicago Press, 2006).

Giere is known for a naturalist approach to science, and is closer to actual scientific work than most philosophers of science. We should, I think, take very seriously what he offers. In this book he is, for instance, concerned to respect the work done in 'science studies', which has been mostly of a historical or sociological nature and which has thrown up many statements that Giere himself wishes to reject as too "post-modern".

He sets out one of his aims thus: "to develop an understanding of scientific claims that mediates between the strong objectivism of most scientists, or the hard realism of many philosophers of science, and the constructivism found largely among historians and sociologists of science" (p. 3).

After setting out the opposed positions between which he intends to mediate, Giere's strategy is to use colour vision as an exemplar of the sort of perspectivism he believes characterises science. Chapter Two sketches what contemporary science of colour vision has revealed; Chapter Three extends these insights to scientific observation in general.

In Chapter Four Giere argues that "conception is a lot like perception, or, that theorizing is a lot like observing" (p. 61) so the various aspects of perspectivism that he has uncovered in vision and other observation can be found also in our theories. This chapter is the heart of the book since it tries to establish the truth and distinctiveness of Giere's perspectival approach to scientific knowledge.

The guiding idea in this book is perspectivism. What exactly does this convey? Giere is clear that it does not degenerate into a crude relativism of the sort that denies that "objects of investigation have an independent existence 'out there'" (p. 7, with one set of quotation marks omitted). But it is weaker than what he calls 'objectivist realism,' a view he sees as neatly encapsulated in this remark by van Fraassen: "Science aims to give us, in its theories, a literally true story of what the world is like; and acceptance of a scientific theory involves the belief that it is true" (quoted on p. 5).

One of his early suggestions (p. 13) is to appeal to perspectives in viewing a scene. The front view of a building is usually very different from the back or side view. Each one is legitimate, each reveals a truth, though of course not the whole truth. But his main example is colour. "Colors are real enough, but ... their reality is perspectival .... a genuine alternative to both objectivist realism and social

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1 This paper is a somewhat amended form of a talk given to the Cave Hill Philosophy colloquium on 2 October 2007. I am grateful to the participants, especially Roxanne Burton, for helpful comments.

constructivism" (p. 14) He immediately distinguishes two "dimensions to the perspectival nature of claims about the output" (p. 14) both of perception and of the instruments used to observe:

- the systems are responsive only to a particular kind of input;
- no system is totally "transparent", they all make a contribution to the outcome. As a consequence, we cannot transcend our human perspective.

When applied to theories, the idea is that a theory is a matter of fundamental *principles* (natural selection, the Schrödinger equations, Newton's laws, etc.). These are not true generalisations about the universe, but constraints on the construction of models of aspects of the world. Questions of truth, or rather closeness of fit, arise when we ask how well such models capture the goings-on to be explained, but those goings-on are not raw data but themselves *models* of data, statistically processed and cleaned up.

Giere's review of colour science stresses the variety of actual colour processing systems and the contingencies of such matters as the opponent system for hues – this means, he says, that the notorious red-green incompatibility is neither "a synthetic a priori truth, nor a truth of grammar, as Wittgenstein might have said ..., but a straightforward scientific conclusion" (footnote 4 on p. 121). He rejects both objectivism about colours (mainly because there are no interesting physical commonalities among the things that give us sensations of the same colour) and subjectivism (for reasons of coherence with evolutionary explanations of colour vision – we want to say that trichromat monkeys succeeded better than dichromats because they could reliably pick out ripe orange oranges from unripe green ones, an account that seems to underwrite the anti-subjectivist idea that fruit possesses a colour independently of any visualiser).

His survey issues in an interactionist picture: "colors are the product of an *interaction* between aspects of the environment and the evolved human [or other animal] visual system" (pp. 31-32), or again colours are to be taken 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" (pp. 38-39). Plausibly he suggests that colour scientists tend not to distinguish this view, that they actually hold, from a crude subjectivism, since both make colours crucially dependent upon the existence of variously structured perceivers.

Some consequences of his position are sketched. Suppose a carpet is seen by a dichromat and a trichromat. Giere wants to say that there is no objective difference; only colours as seen by a dichromat and as seen by a trichromat. More information is derived by the trichromat. And different perspectives are always compatible (cf. p. 33).<sup>2</sup> But we do not arrive at an undesirable relativity: "The trichromatic perspective is a widely shared, species-specific trait among humans, ... individuals are highly constrained in their public color judgments. Thus, understanding

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2 I think I grasp what Giere is getting at here. He admits that two people who share a perspective may disagree, and it would seem that two people who have different perspectives may produce incompatible judgments of the type 'A and B are (not) the same colour' – but these type of claim are not pertinent to his issue.

objectivity as reliable intersubjective agreement, color judgments turn out to be quite objective" (pp. 33-34).

Expanding on what is characteristic of perspectives, Giere argues that they are all *partial*: we respond to a portion of the electromagnetic spectrum, and are blind to the rest. He cautions against mistaken construals of this fact: we and other perceivers do not live in different worlds, but one world (though he wants us to take this as a methodological injunction, not a putative metaphysical truth); we do not just experience coloured representations but the world itself.

Gieryn continues by considering the role of instruments in our scientific observation of the world. He admits that an overarching aim has been to reduce the subjectivity of ordinary perception, but insists that such observation remains perspectival in several respects: our instruments respond only to part of the reality around them, they are limited and have finite powers of discrimination even in that response. Gieryn's examples are taken from astronomy and neuroscience. He describes the complex processes that create "true colour" photos of the Triffid nebula, but these pale before those involved in many other astronomical pictures: for one Hubble photo, detectors sensitive in the infra-red, 13 hours of exposure, four different filters, gravitational lensing, .... Gieryn's conclusion is that we do not discover the intensity and distribution of gamma rays at the centre of the galaxy, say, but rather those aspects *as indicated by a particular instrument*. Different instruments give different 'takes' on the same portion of reality. Gieryn considers whether this argues for there being something objectively there; his answer is that it indicates that *something* is there, but "to be an object detected in several different perspectives is not to be detected in no perspective whatsoever" (p. 58); we should not think of telescopic discoveries as moving us from a limited human perspective to a non-perspectival objective truth.

As noted already, Gieryn wants to carry over his perspectival account of perception and observation to the ways scientists represent some aspect of the world for their various purposes. While scientists use various things to do this representing – diagrams, graphs, computer images, etc. – Gieryn focuses on theories, and offers the account sketched earlier. In discussing the idea that a representational model fits some aspect of reality, Gieryn argues that the partiality that characterises perspectives entails that what is revealed from a particular perspective must be incomplete in some way: those aspects omitted have causal connections to what is included, so some interactions for the latter are omitted and so the model cannot fit exactly (p. 66).

There are interesting discussions of maps and modelling in the theory chapter that I shall pass over in silence to allow myself to try to articulate a doubt about his enterprise. I am afraid it will be couched in the logico-linguistic mode that Gieryn wishes to reject.

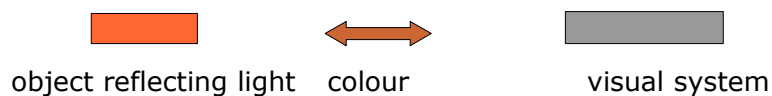
Gieryn opposes absolute objectivity in favour of his perspectival variety. Taking uncontroversial examples like 'A is to the left of B' we can agree that this is elliptical (a notion I have explored [elsewhere](#)) for 'A is to the left of B from perspective P'. But we can also say that in these cases the non-perspectival claim is literally incomplete, incapable of truth or falsehood. The only truths, which you can call absolute if you wish, are the fuller versions it is usually too pedantic to utter. This is the reason why relativising doesn't usually have the devastating consequences

people often assume: one shows that a claim that looks qualitative (or more generally, that looks to be a relation with  $n$  terms) turns out to be a relation (or a relation with  $n+1$  terms); this more complex claim, however, is as absolutely true as its misconstrued predecessor. To take another example, it is plausible to think that the grammatically monadic predicate in 'A is large' is really a dyadic relational predicate, so the claim is something like 'A is larger than the typical F' where F is the relevant kind of thing A is.

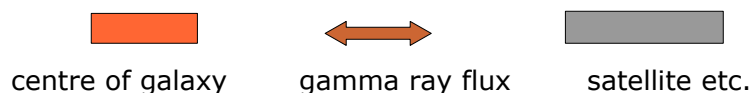
This move from quality to relation is one thing Giere says about colour, but it seems to me that he is also relying on the negative side of such an analysis: the additional<sup>3</sup> idea that the crucial element in the relation or interaction only exists in that interaction. Although we may be tempted to think of it (a colour, say, or a spatial relation specified without explicit mention of a frame of reference) as an intrinsic feature of things, it isn't.

But if we take one of Giere's scientific examples, it is not clear that we can continue to rely upon these notions. His denial of absolute objectivity for claims about gamma rays in the centre of our galaxy surely isn't the dubious idea that we cannot drop the perspective in such claims ('A is B according to COMPTEL' is meaningful but so is the simpler 'A is B', which might be offered by way of explanation of the former; it is not elliptical like 'to the left of'). But it doesn't sound much like what I called the additional idea in the case of colours either – that the gamma ray flux only exists because of the interaction between the galaxy and our instruments. We only get our 'take' on the flux because of the instruments we use, but it is going too far to think that such a flux is as ephemeral as the colours we see. We don't just think there is something at the centre of the solar system, we think it behaves in certain ways, ways that explain the observations we make using different instruments.

One way to highlight my problem (inspired by some remarks by Roxanne Burton) is to focus on the analogy between observations of gamma rays and Giere's interactionist account of colours. We can diagram the latter thus:



Transposing this to the gamma ray case, the question is whether we should understand Giere to be saying:



or whether the gamma rays ought to be included with the centre of the galaxy. As pictured, it would seem the gamma rays are taken to be merely relational aspects of the particular interaction. But while we can take colour only to exist in the

<sup>3</sup> It is additional and not entailed only if the analysis does not purport to be exhaustive. Since most such analyses do claim to be telling us 'this is how it is and *nothing more*' then it isn't usually an extra.

interaction, we surely think that the gamma rays are as real as the light reflected from objects. But if we put the gamma rays where I have 'centre of galaxy', what then do we put in the interaction spot? It would surely be too simplistic to put there the photographs and other models we might produce to picture the flux (that would be supposing people forgot that false colour pictures are indeed false). So I conclude tentatively that the analogy does not work as smoothly as Giere would like.

To try yet another way of putting it, it is true that having various perspectives on one thing does not itself give us a non-perspectival picture, but Giere seems in danger of not really acknowledging the force of the idea that we have *one* object there. What we seem to do is to construct a model that explains how that one thing reveals itself in the various perspectives we have on it – we try, with greater or lesser success, to put together one blind man's feel of the elephant's trunk, another of its tail, another of its back, etc. to produce a conjecture that unifies them, as one might say.

Consistently with his refusal to go beyond explicit perspectives, Giere tends to underplay the sort of consilience that has impressed scientists so much.<sup>4</sup> This is what he says about the constancy of the speed of light as postulated by various different theories:

the fact that  $c$  shows up in several different theoretical perspectives is indeed significant. Moreover, models incorporating it do often exhibit an extraordinarily good fit with real physical systems. But being a component of several successful theoretical perspectives does not make something independent of all theoretical perspectives. So what we should conclude is that the speed of light is indeed fundamental to our most basic and experimentally best-tested theoretical perspectives on the physical world. From these perspectives, the velocity of light is indeed a fundamental constant of nature. That is as far as realism can go (p. 93).

What I am suggesting, and Giere is apparently rejecting, is that science aims to go beyond its current theories.<sup>5</sup> Consilience of the sort Giere here alludes to indicates, I think, that we have probably got hold of a fact about light that goes beyond our incomplete theories of it. We do not currently have a theory that unifies special relativity and quantum theory, but on my view their consilience on  $c$  argues for that being something that will survive (maybe modified in the way some Newtonian notions "survive" in Einstein's theories) into any such future theory.

So while there is much to be gleaned from Giere's accounts of observation and theory, I am inclined to doubt that Giere has found a middle way between what he regards as an excessive objectivism and the relativism he rightly wishes to reject. More generally one might go on to wonder whether Giere's detailed account of scientists comparing models of the world generated within the constraints provided

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4 See, for a discussion of the classic case of atoms, the papers discussing Perrin in Achinstein's edited book, *Science Rules* (Johns Hopkins University Press, 2004).

5 I am not denying, of course, that Giere recognises that science continually changes. The point is that I think there is more to a scientist's 'take' on the world than is embodied in his latest theories. Something metaphysical, perhaps.

by a set of principles with models of data need actually supersede the traditional picture of them trying to uncover the actual ways of working of the universe. The best we can do is compare à la Giere, but the intent and what we postulate by way of explanatory story is to grasp the objective truth, not merely to claim that this bit of reality can be adequately modelled in this story.

Giere points to a serious problem with this traditional way of construing scientific theorising: there are unlimited numbers of alternative theories that would do as good a job with respect to our actual data (p. 91). Simple realism has the problem of explaining why we can ignore them, while Giere simply avoids the problem by insisting on the restriction to the perspectives currently in play. My feeling is that this is too facile, but of course, if it is, we still have work to do.