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CHALMERS' DEFENCE OF SCIENTIFIC REALISM
AGAINST CARTWRIGHT

1. INTRODUCTION

At least since the publication of her *How the Laws of Physics Lie* (1983), Nancy Cartwright has had a reputation as one of the most significant opponents of scientific realism. A testament to the significance of her work, for scientific realists, is the energy that one particular scientific realist, Alan Chalmers, has devoted to attempting to deflect the threat posed by Cartwright, having criticised her in no less than six articles, published over a thirteen year period (Chalmers 1987; 1988; 1993; 1996; 1999a and 1999b).¹ In this paper I examine Chalmers' efforts to defend scientific realism from the challenges that Cartwright poses. I discern two forms of argument that he employs. These are (1) attempting to argue for the compatibility of Cartwright's observations about scientific explanatory practice with scientific realism, and (2) directly attacking the coherence of Cartwright's alternative to scientific realism. I show that the former is insufficient to deflect the threat that Cartwright presents to scientific realism and the latter is unsuccessful.

The fact that one realist has failed to develop a satisfactory response to Cartwright is not, in itself, overly significant. However, it becomes more significant when we consider that Chalmers has been a leading figure in the philosophy of science for three decades. Furthermore, it can be reasonably assumed, given the determination that Chalmers has displayed in his opposition to Cartwright, that he has apprised himself of the various arguments that have been mounted against her by others. If he believed that any of these were efficacious he would presumably have used these himself, or at least mentioned them, in his many writings on the subject. The fact that a leading scientific realist philosopher has failed to provide a satisfactory response to Cartwright, despite many years of trying, is *prima facie* evidence that there is not a good response to her, that is currently

available to the scientific realist, and that is a significant conclusion to draw.²

Debates between Cartwright and her scientific realist opponents are somewhat complicated by the way in which Cartwright's position has been further articulated after the publication of *How the Laws of Physics Lie* (1983), the book that motivated Chalmers and other realists to set themselves against her. I begin by outlining Cartwright's 1983 position, which inspired Chalmers' opposition. I then identify two important ways in which it has been subsequently articulated by her, that are relevant to discussion of Chalmers' criticisms.

2. CARTWRIGHT'S DEVELOPING POSITION AND ITS CHALLENGE TO SCIENTIFIC REALISM

Despite its name, Cartwright's *How the Laws of Physics Lie* (1983) is not an argument for one simple conclusion. It is a work that brings together arguments for three interrelated conclusions. These are:

- (1) The manifest explanatory power of fundamental laws does not argue for their truth.
- (2) In fact the way they are used in explanation argues for their falsehood. We explain by *ceteris paribus* laws, by composition of causes, and by approximations that improve on what the fundamental laws dictate. In all of these cases the fundamental laws patently do not get the facts right.
- (3) The appearance of truth comes from a bad model of explanation, a model that ties laws directly to reality. (Cartwright 1983, pp. 3-4)

These striking claims are backed up by a detailed examination of the ways in which fundamental laws are used in actual scientific explanations. In contrast to the low-level phenomenological laws of science that are intended to accurately describe the empirical realm, and about which Cartwright is a realist, fundamental laws are understood by her to be generalisations that are true of idealized models, but are not even approximately true of the world itself. We cannot infer that laws, which are true of the idealized models of science, are even approximately true of the world because of the unsystematic nature of the relations between the idealized models of science and actual reality. Papineau brings out the importance of this point in a summary of Cartwright's case against realism about fundamental laws:

Cartwright argues that the standard 'derivations' of (physical) effects from fundamental theory are mediated by *ad hoc* assumptions, mathematical short cuts, and fudge factors. Since these devices are in general unmotivated by the fundamental theory, the derivation fails to provide any inductive support for the fundamental theory. The basic theory effectively does no work in the derivations, by comparison with the simplifications, argues Cartwright, and so deserves no credit. (Papineau 1996, p.19)

Scientific Realists believe in the truth, or approximate truth, of the theories that scientists tell them are the best explanations of natural phenomena. Scientific realists argue that, if an explanation is the best explanation by the lights of science, then we are warranted in believing that it is true or approximately true. Furthermore, scientific realists advance the 'success of science argument', which has it that realism is the best explanation for the empirical success of science. If the success of science argument is not made then realism cannot receive the credit for any successes which we might be warranted in attributing to science.³ So, scientific realists rely crucially on the viability of inference to the best explanation in at least two ways to make their case.

The viability of inference to the best explanation is at the heart of debates between scientific realists and contemporary empiricists. Notoriously, van Fraassen (1983) disputes that being the best explanation need have anything much to do with being true. Scientific theories are selected by scientists as 'the best', in part, because of their non-empirical virtues, such as elegance and simplicity.⁴ These are considerations of their utility to us, not considerations that are obviously relevant to an assessment of their closeness to truth.

The challenge of Cartwright's *How the Laws of Physics Lie* (1983), for scientific realists, is twofold. First, it advances a way of thinking about scientific explanation that is very different from the ways that realists favour, and which is amenable to antirealist conclusions. This is the 'simulacrum view' in which scientific explanations are understood as explanations of idealized simulacra that are unsystematically related to reality. The scientific realist needs either to show why this approach to actual scientific explanation is mistaken, or show how, despite appearances, the evidence that Cartwright marshalls in favour of the simulacrum view of explanation can be accommodated by scientific realists. As we will see, Chalmers attempts to take the latter course of action.

Second, the alternative way of accounting for the explanatory role of fundamental laws and scientific theories, described in *How the Laws of Physics Lie* (1983), deepens the threat to the viability of both the inference that our best scientific theories are true, or approximately true, and the inference that realism is the best explanation of science's success, due to van Fraassen. Now scientific realists are faced with a fleshed out alternative

way of thinking about what follows from being the best explanation. Scientific realists claim that our best fundamental scientific explanations describe truths about the world, at least approximately. Cartwright tells us that the fundamental explanations that appear to us to be the best explanations of natural phenomena are actually explanations of behaviour that would take place in idealized simulacrum of the world that are easier to explain than messy reality. On her view our best explanations are explanations that misrepresent the actual world. The scientific realist needs to show us why the former account of the explanatory success of the theories that have the fundamental laws of physics at their heart is more plausible than the latter.

Cartwright's ideas have continued to evolve since the publication of *How the Laws of Physics Lie* (1983). Before going on to consider Chalmers' responses to Cartwright we need to take note of two particular developments. In *Nature's Capacities and Their Measurement* (1989) Cartwright advocates realism about causal capacities. She had already advocated realism about causes, as well as about phenomenological laws, alongside theoretical antirealism (Cartwright 1983), so this was not, on the face of it, a major change of position. However, it needs mentioning, because it is the basis of Chalmers' (1993) challenge to the coherence of her position.

In her subsequent writings, Cartwright has become more explicit about the metaphysical consequences of her position (Cartwright 1994; 1999). She now describes herself as an advocate of metaphysical nomological pluralism, the view that 'nature is governed in different domains by different systems of laws not necessarily related to each other in any systematic or uniform way; by a patchwork of laws' (1999, p. 31). This view of the underlying disunity of nature is compatible with an apparent unity of fundamental explanations in science, because, as we have seen, for Cartwright, fundamental scientific explanations are not direct representations of reality. The advocacy of metaphysical nomological pluralism makes Cartwright's opposition to the scientific realist's success of science argument all the clearer. If reality has an underlying disunity, not reflected in scientific explanation, then scientific explanation does not succeed by representing reality as it is.

3. CHALMERS' EVOLVING RESPONSE TO CARTWRIGHT

Phase One: 1987-8, Accommodation

Alan Chalmers' first published discussions of Cartwright's ideas occur in two papers that appeared in the late 1980s (Chalmers 1987; 1988). In both of these papers Chalmers takes note of Cartwright's discussion of laws of nature and argues that the points she makes about the roles that the laws of physics play in actual scientific explanation can be accommodated by the metaphysically rich 'transcendental realism' developed by Roy Bhaskar. He informs us that 'Cartwright's examples describe situations that are entirely to be expected if Bhaskar's realism is correct and so do not constitute a case against it' (1987, p. 87). Transcendental realists advocate realism about causal powers (as well as tendencies and 'generative mechanisms') and understand laws of nature to be generalisations about the invariant behaviour of causal powers in the absence of interference. This is a different view of the ontological status of laws of nature from the anti-metaphysical Humean views that Cartwright had been concerned to attack in *How the Laws of Physics Lie* (1983). Whereas Humeans have extreme difficulty accommodating differences between generalizations about raw empirical data and the generalisations that scientists make when they identify laws of nature, transcendental realists have no such difficulty. Because of its metaphysical richness, it is plausible to hold that transcendental realism can accommodate Cartwright's insights about scientific explanatory practice.

Unlike scientific realists who appeal to a success of science argument to justify realism about explanatorily successful scientific laws, Bhaskar mounts a transcendental argument for realism, which is why he is a self-described 'transcendental realist'. We are warranted in believing that the fundamental laws of science are true, according to Bhaskar, if and only if we make a transcendental presupposition that the causal powers that scientists identify in laboratory experiments — in 'closed systems' in his terminology — are present in the broader world — present in 'open systems', in his terminology — even if their presence is not apparent in the complexity and confusion of open systems. Making this transcendental presupposition is the *only* way to render scientific practice intelligible, according to Bhaskar (1975), and as scientific practice is intelligible to us we have no choice but to make it, or so Bhaskar assures us. It is difficult to overstress the importance of this argument for Bhaskar. As one sympathetic commentator puts it: 'Most of the leading ideas of transcendental realism

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