



## BOOK REVIEWS

Chakravartty, Anjan, *Scientific Ontology: Integrating Naturalized Metaphysics and Voluntarist Epistemology*, New York: Oxford University Press, 2017, pp. xviii + 274, £53.

*Scientific Ontology* offers a combination of a naturalist approach to scientific ontology and a voluntarist approach. In the first part of this review, I will present a descriptive overview of the book; in the second part, I will offer a few critical notes.

The book is divided into three parts, titled ‘Naturalized Metaphysics’, ‘Illustrations and Morals’, and ‘Voluntarist Epistemology’. Its starting point is the observation that scientific theories and models (henceforth, simply ‘theories’) *underdetermine* their ontology. A scientific theory may deal with unobservable objects such as sub-atomic particles. But, Chakravartty argues, the question of whether it is committed to an ontology of unobservables is a philosophical rather than a scientific question, a question of *interpretation*. As such, it is a *meta-theoretical* question.

A central tenet of the book is that *scientific ontology has significant metaphysical and epistemic elements*: the interpretation of scientific theories abounds with metaphysical elements, and the question of how to go about interpreting scientific theories is epistemic. The epistemic question is especially important in light of persistent disagreements among practitioners—both scientists and philosophers—about the ontological commitments of science.

A significant constraint set by Chakravartty on scientific ontology is *naturalism*. By the claim that scientific ontology is bound by the norm of naturalism, Chakravartty means that it must be ‘sufficiently informed by or sensitive to scientific-empirical investigation’ [67], ‘continuous’ [83] with science, and ‘grounded’ [82] in, hence ‘constrained’ [80] by, science. The norm of naturalism has to do with minimisation of ‘epistemic risk’ [84] as well: ‘when it comes to knowledge of the world ... , empirical inquiry is our best bet for knowledge. ... [T]his is the place where the world itself can resist our descriptions’ [85]. But the requirement of *minimising risk* is balanced by another requirement: *maximising ‘explanatory power’* [87]. It is this second requirement that is largely responsible for the metaphysical character of scientific ontology. Metaphysics itself is characterized by Chakravartty, in a traditional manner, as significantly *a priori*.

Metaphysics enters into scientific ontology in two forms: (i) non-empirical assumptions, presuppositions, and background knowledge, (ii) metaphysical inferences. Metaphysical inferences are largely based on philosophical intuition. Their adequacy, however, is measured by pragmatic standards: ‘simplicity, internal consistency, coherence with other knowledge, and the capacity to unify otherwise disparate phenomena’ [79]. Metaphysical inferences form a ‘spectrum’ [53] or a ‘continuum’ [52], with some inferences having a greater metaphysical ‘magnitude’ [ibid.] than others. Magnitude is measured by the ratio of non-empirical to empirical elements. Metaphysical magnitude is correlated with epistemic risk: the smaller the metaphysical magnitude of a metaphysical inference, the smaller the epistemic risk involved in making such an inference. But there is no unique or objective boundary between acceptable and unacceptable

metaphysical inferences. Indeed, where to draw the boundary between metaphysical inferences that are conducive to knowledge and those that are not is not a theoretical question. It is a *subjective* question. This, perhaps, is the most provocative thesis of *Scientific Ontology*: where the line should be drawn 'is ultimately and ineluctably *in the eye of the beholder*' [168, my emphasis; see also xv]. This brings us to *epistemic stances*.

Where to draw the line between acceptable and unacceptable metaphysical inferences depends on one's epistemic stance. Chakravartty takes the idea of a *stance* from Bas van Fraassen and adjusts it to the topic of his book. A stance is 'a stand, orientation, or attitude regarding ontological claims' [206]. A stance does not make factual assertions, and as such is neither true nor false. Instead, it is an expression of 'feelings', 'affinities', 'caring[s]' [214], 'desires', and 'inclinations' [218]. Stances guide our epistemic behaviour and play a central role in deciding our epistemic policies. They reflect our tolerance for epistemic risk as well as the importance that we attribute to explanatory power. They determine what ontological positions are 'live options' for us [223], and in so doing they play a 'crucial role ... in determining what [we] believe' [218]. Epistemic stances, according to Chakravartty, are major factors in scientific ontology: 'different epistemic stances ... *generate* different scientific ontologies' [46, my emphasis]. What determines our stances? Ultimately, our *values* and *individual choices*. Stances are *subjective* and *voluntary*, and this renders them 'immune to the ... power of philosophical arguments' [203].

People vary considerably in their stances. Two stances that have an especially potent role in scientific ontology are (i) the empiricist stance and (ii) the metaphysical stance. Typically, those who subscribe to the empiricist stance have low tolerance for epistemic risk and are sceptical about the value of explanatory power; those who subscribe to the metaphysical stance exhibit greater tolerance for epistemic risk and attribute considerable importance to explanatory power. The result is that the reality of unobservables is commonly a live option for subscribers to the metaphysical stance but not for subscribers to the empirical stance.

Stances, however, do not express unique attitudes. Each stance includes a spectrum of attitudes, some more radical, others more moderate. Empiricists, for example, range from those who *deny* the reality of unobservables (believing that 'knowledge is limited to ... observable objects' [18]) to those who merely *suspend judgment* with respect to unobservables. They also range from those who regard metaphysical inferences as completely 'off limit' [39] to those who acquiesce to metaphysical inferences, although they limit themselves to metaphysical inferences of low magnitude. Subscribers to each stance also differ in their specific preferences. For example, subscribers to the metaphysical stance tend to be scientific realists, but, while some are entity realists, others are structural realists; while some believe in dispositional properties, others do not.

What are the adequacy conditions for stances? According to Chakravartty, there is just one such condition—*rationality*—and it amounts to nothing more than *inherent coherence*. Inherent coherence, in turn, consists of two requirements: (i) logical-probabilistic consistency, and (ii) pragmatic coherence, where this means, essentially, not undermining, or being 'in tension with', 'the attitudes and orientations that constitute the stance' [224]. Chakravartty recognises that this rationality constraint is rather weak, indeed 'very permissive' [49]. Both the empiricist and the metaphysical stance satisfy this only constraint. Chakravartty seems to believe that, as a result, neither is objectively preferable to the other.

Chakravartty, as we have noted above, is a *voluntarist* with respect to stances. What epistemic voluntarism means is that ‘it is possible to exercise some sort of voluntary control over one’s doxastic states: belief; disbelief; and suspension of belief’ [216]. In this sense, our ontological beliefs are ‘freely chosen’ [215]. This creates ‘significant ... uncertainty in scientific ontology’ [168]. Should we fear this voluntarism? ‘No’, Chakravartty says: ‘we should not fear this kind of voluntarism, but instead recognise and accept it as part of the nature of scientific ontology’ [ibid]).

The book raises several critical questions. I will mention just a few.

(a) If our scientific ontology is largely determined by subjective stances, chosen at will based on our feelings and inclinations, then in what sense is it a *philosophical theory*? Indeed, in what sense is it a *theory* at all? Does the naturalist constraint turn it into a theory? Not by itself. Being guided by our subjective feelings and inclinations, we can tell *any naturalist story* that we like or feel comfortable with (that is, any story that refers to and is compatible with uninterpreted scientific results). But this is a far cry from a *theory*.

(b) Metaphysical inferences are measured primarily by their ability to transmit *factual truth* from premises to conclusions, not in their ability to transmit feelings and inclinations from the former to the latter. Inferences are not voluntary. If scientific ontology is based on inferences, then it is not based on subjective feelings and inclinations. Furthermore, an inference is essentially an argument (both have premises, and what we call the ‘consequence’ of an inference is the ‘conclusion’ of the corresponding argument). So, if there is no room for philosophical arguments in determining our scientific ontology, how can there be room for metaphysical inferences?

Could the distinction between the metaphysical and epistemic perspectives on inferences and arguments solve the problem? I doubt it. The two are too intertwined in Chakravartty’s account of scientific ontology to separate ‘metaphysical inferences’ from ‘philosophical arguments’.

(c) The same reasons that lead Chakravartty to claim that ontological disagreements are a matter of a difference in stance are applicable to other disagreements in philosophy of science and in philosophy more generally. So, are all disagreements in philosophy of science reduced to differences in stance? Is the naturalist constraint itself a matter of stance (personal inclination)? Is all philosophy a stance? Is science, too, reduced to a stance? It is one thing to recognise that subjective feelings and inclinations penetrate all areas of our life and another to say that the adequacy of our theories is largely measured by its agreement with these.

(d) Chakravartty is aware of the possibility that philosophers will view his voluntarist approach to scientific ontology as *too weak, relativistic, an ‘anything goes’ view*, and he tries to prevent this. To this end, he says that the voluntarist approach does not neglect *truth*, that the goal of truth is built into the concept of scientific ontology. But if truth is a *central* goal of scientific ontology, then the constraints on an adequate approach to scientific ontology are largely veridical rather than a matter of stance, contrary to Chakravartty’s main thesis.

My main critical worries about *Scientific Ontology* thus concern the balance between *constraints* and *permissivism*. The issue is that of whether the book as a whole offers an open-minded approach to scientific ontology or, ultimately, an uncritical approach. Open-mindedness is clearly the desired result. Which result is achieved is a delicate question.

This critical question notwithstanding, I enthusiastically recommend *Scientific Ontology* to everyone interested in the philosophy of science, metaphysics, epistemology, and the philosophy of philosophy. This is a rich, erudite, interesting, deep, and important book. It is provocative and stimulating. And it raises important questions about the balance of theoretical and extra-theoretical considerations in philosophy, the place of values in theoretical knowledge, the exercise of freedom in knowledge, and the manifestation of human foibles in everything that we do, including disagreements over scientific ontology.

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**Glennan, Stuart**, *The New Mechanical Philosophy*, Oxford: Oxford University Press, 2017, pp. xi + 266, £30 (hardback).

This book aims to articulate and defend the metaphysics of the New Mechanical Philosophy. As Stuart Glennan makes clear [11],

[its] primary focus will be on ontological questions. The first question in this book is what a mechanism is as a thing in the world, and this will spur other ontological questions: What is it to be a part of a mechanism, a causal interaction, a system, a cause, and so forth.

Given the current popularity of the mechanistic framework, a systematic account of the mechanistic ontology can only be very welcome. As Glennan explains, the main thesis of the book is that ‘most or all the phenomena found in nature depend on mechanisms—collections of entities whose activities and interactions, suitably organized, are responsible for these phenomena’ [1].

After an introductory chapter that briefly contrasts New Mechanism with various alternative views, chapter 2 offers an account of what mechanisms are as things in the world. In this chapter the basic ontic categories (entities, activities, interactions, organization) of the New Mechanical Philosophy are explained. This chapter’s key point is that understanding mechanisms requires abandoning or revising the traditional metaphysical categories of properties, relations, and events. Chapter 3 focuses on mechanistic models as the vehicle of representation in science, while chapter 4 outlines the model-first approach to classifying mechanisms and to grouping them into kinds. Chapter 5 presents the various types of mechanism and the various taxonomic dimensions (the types of phenomena produced, the types of entities and activities, the types of mechanistic organization, and the types of aetiology). Chapters 6 and 7 outline the mechanistic view of causation, make a case for the key thesis that causation is production, and contrast it with the view that causation is relevance. These two chapters can be read relatively independently of the rest of the book, and should be of interest to all who work on the metaphysics of causation. Finally, chapter 8 is about mechanistic (and non-mechanistic) scientific explanation.