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A MIDDLE WAY

Robert W Batterman

Reviewed by Mariam Thalos

[A Middle Way: A Non-fundamental Approach to Many-Body Physics](#)

Robert W. Batterman

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Before a theorist may even begin to offer an explanatory model (correct, useful, or otherwise) of some aspect of the universe, that theorist is required to settle in advance—and often implicitly—the following questions:

(1) What counts as a satisfactory explanation for present purposes?

(2) To what extent must the current model harmonize or be compatible with potentially adjacent models in the relevant tradition or toolbox (for example, a more so-called fundamental theory that may be knocking around)?

And most importantly:

(3) What are the relevant degrees of freedom in the target system? And what are degrees of freedom anyway?

Batterman's most recent book reprises an ongoing engagement with the first two questions in connection with certain topics in the philosophy of physics, especially around the relationship between a given theory of macro-phenomena and the purported 'foundational theories' of the domain. This engagement is potentially of great interest to researchers working on general philosophy of science issues, including and especially reductionism, physicalism, and general questions around explanation. Indeed, there is much of value in Batterman's freshest engagement. Let's begin there.

The most philosophically valuable contribution in the book revolves around a question he labels AUT: 'How can systems that are heterogeneous at some (typically) micro-scale exhibit the same pattern of behavior at the macro-scale?'. This is an excellent question. Batterman's answer is to reprise a position he has defended in numerous publications. Simply, the 'details' of the interactions at the lower scale are one or more of the following: ignorable (p. 27) or unimportant or 'not that relevant' (p. 29). The 'pattern' is more important than the 'details'. The result, according to Batterman, is that the higher-scale phenomenon—to the extent one can 'ignore' or deem what happens at the lower scale 'irrelevant'—is relatively (or 'almost completely') autonomous or independent of the lower-scale phenomena. But the only philosophically respectable way to ignore details or deem them irrelevant is to offer an account that convincingly explains why 'the details that genuinely distinguish these systems from one another at the smaller scales, are irrelevant for the macroscopic behavior of interest' (p. 33).

Chapters 1 and 2 of *A Middle Way* expand on this theme. These chapters do a better job of this than his previous book-length effort (Batterman [2002]), and draw on the arguments of a recent article (Batterman [2018]) in which he articulates the idea that it's important to explain why attention to 'details' interferes with advancing the correct explanation. Thus another theme in the book is the importance of what he calls 'meso-scale structure', as well as what he calls the 'hydrodynamical methods', which as far as I'm able to discern amount to much the same thing except that 'hydrodynamical' tends to suggest properties of flowing masses like liquids or analogues of them. Application of 'hydrodynamical' thinking helps the theorist identify the 'right variables' (the 'natural' quantities) around which to construct the correct (that is, most predictive) model of the phenomenon of interest. Chapters 3, 4, and 5 provide examples of applying these principles of explanation in hydrodynamics itself (Chapter 3), Brownian motion (Chapter 4), and materials science and engineering (Chapter 5). Note that these chapters are highly technical and may not be accessible to the lay philosopher.

The remainder of the book (Chapters 6 and 7) argues that the meso-scale and/or natural variables (some of them geometrical and topological) are indeed the 'right' variables for studying and (as he says) for 'characterizing' the behaviour of many-body systems—they are the true guides to the 'natural kinds' and so ontologically 'superior' (p. 121). The argument is foreshadowed earlier in the book: the 'natural', meso-scale variables apply over the 'correct' range of cases and thus help to explain the 'irrelevance of the details'—thereby explaining the autonomy of 'universal' behaviour.

In sum, Batterman's thesis is that a range of scientific theories provide us with the best explanations of their target phenomena because they identify the correct meso-scale variables for mounting explanations (because they are the guides to law-governed natural kinds) and explain the 'universal' behaviour of phenomena that behave alike despite being different at shorter scales and 'multiply realized'. Still, one is entitled to ask: What do these commendable theories have in common, stated in philosophical, and specifically metaphysical, terms? What, essentially, is this ontological superiority that Batterman invokes? But one will not find an answer to that question, except insofar as one is satisfied with the answer that ontologically superior methods illuminate the correct natural kinds. The company of those unsatisfied with this answer (the present writer counts herself among them) must draw the conclusion that Batterman does not answer the question he sets himself—namely, why, philosophically, are the 'details' explanatorily 'irrelevant' to the phenomenon under study—and thus that Batterman does not provide a general answer to that most luminous question, AUT, he so eloquently poses.

The middle way of Batterman's title is, I would maintain, still philosophically murky. Most importantly, his book does not answer the questions that motivates it: What do those quantities and/or variables identified by Batterman in Chapters 3–5 have in common that allow them all to address AUT in the same voice? What makes all the theories so identified travellers of this 'middle' way? What makes the sciences in question therefore 'non-fundamental'? Is it a virtue or failing that they are 'non-fundamental'? And how does one identify a scientific or philosophical methodology as travelling along a 'middle way'?

Batterman's efforts would have been much enhanced had he paid philosophical attention to question 3, regarding degrees of freedom. There are excellent grounds to suspect that this concept contains the kernel of a satisfying answer to AUT—the concept of degree of freedom might have provided Batterman with reasons for deeming such 'details' as in some way obscuring the true degrees of freedom relevant to a behaviour. Indeed, there now exists a literature on degrees of freedom that provides an answer to AUT, a literature to which, in the interests of full disclosure, I myself have contributed.

This literature proceeds via addressing the question of what counts as a degree of freedom in the target system. Thus, why do systems that are quite different at a micro-scale exhibit the same macro-behaviour? Because there is a reduction in the degrees of freedom in the systems of interest. That approach has been around for at least a decade. Both Jessica Wilson and I have offered versions of this answer.¹ To be sure, a philosophically respectable answer to the question also needs to provide an account of what it is to be a degree of freedom, as well as why and how reductions in their number occur in some paradigm cases. That is philosophical work that is in fact taken up in both Wilson's and my own work. The virtue of this approach is that it does what Batterman's so-called middle way fails to do: it answers AUT in a general way, and in philosophical terms, that can be clearly exemplified in a variety of different cases that both Wilson and I examine—indeed, in some of the very same cases discussed by Batterman. What's more, it discusses the virtues and failings of approaches that do not take the so-called fundamental pathway to explanation. This literature is not discussed or referenced by Batterman.

Will philosophy make progress on this and related philosophical issues (a question also asked by Wilson [2017])? The chances of progress would be better if some literatures are not consistently ignored, as they seem to be here.

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Notes

¹ See (Thalos [1999], [2002], [2006], [2013]; Wilson [2010]).

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