

Macroscopic Metaphysics: Middle-sized Objects and Longish Processes

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BOOK REVIEW

Macroscopic Metaphysics: Middle-sized Objects and Longish Processes, by Paul Needham, Cham, Springer, 2017, xi + 224 pp., ISBN 9783319709987, US\$109.99 (hardcover)

In *Macroscopic Metaphysics*, Paul Needham compiles a variety of meditations on the inter-relations between metaphysics and matter theory that represent the long arc of his research career and which reach toward a formalised metaphysics of matter. The book is centrally organised around Needham's own mereological formalism, which is introduced in the first chapter, developed in chapters 2–4, and tested against various historical and contemporary metaphysical worries about the natures of substances and processes through the latter half of the book. As such, it toes the line between a collection of essays and a monograph, with a mixture of new material and portions of previously published essays reassembled. The book aims to draw careful distinctions between individuals and the matter that constitutes them, in order to preserve, extend, and precisify metaphysical conversations about substances and material bodies in the light of a quantum understanding of the ultimate makeup of matter.

The introductory chapter on mereology, which establishes Needham's formalism, is a daunting read, not least because there are more than 30 operators and relational predicates defined in the first two chapters. The foundations are careful, with useful codifications of distinctions between individuals and the regions, times, and quantities of matter they occupy. However, occasional inconsistencies in the presentation and labelling of definitions, alongside Needham's anachronistic use of the early-twentieth-century convention of using periods to designate main operators, unnecessarily compound the challenge, and the reward may seem to some a bit meagre relative to the effort. Readers who come to the book with a particular objective may find it more appetising to begin in chapter 2, or even chapter 5, and simply refer to the extensive appendix on the formalism to fill in the details.

Once his foundational relations are defined, Needham conducts a selective survey of a complicated ontological landscape, observed through his chemically trained spyglass. The aim of the book is the construction of a contemporary philosophical theory of matter, built from the human scale outward. In its logical foundation, as well as its use of historical and contemporary chemistry, the theory Needham builds captures some of the natural-philosophical spirit of the matter theories of the ancients. This is no accident, as chapter 5 is spent reviewing Aristotle's views on heterogeneous substances and reshaping Aristotle's account with the tools of the mereological formalism. This historical diversion, along with the following chapter's discussion of chemical theory during the Enlightenment, contributes substance to Needham's view but fits awkwardly within the arc of the book.

More generally, the chapter sequencing leaves something to be desired, and Needham does little to motivate his choices on this front. There is a perfunctory preface that gives an overview of the order of chapters and a guide to reading, but the motivations for ordering laid out therein are not recalled through the body of the book, and the final chapter ends without an indication of what was supposed to have been built in the preceding pages, or to what end. This oversight is disappointing, since the project of the book is the development of a single theory.

The book is at its best when Needham is using thoughtful examples, grounded in an inescapably chemical view of the world, to reveal complex mereological puzzles where once appeared to stand straightforward distinctions between substances. Needham's examples are developed in his characteristically careful, unhurried manner, and they unfailingly arrive at


a clear point that advances the discussion. For instance, Needham frames chapter 2, ‘Occupying Space’, around a passage from Leonardo da Vinci on the division between the sea and the sky. Da Vinci’s meditation concerns the existence of a material boundary between the water and the atmosphere, ultimately concluding that there exists a surface between the two that is not a part of either. Needham uses this conclusion to study what would be required of the matter in the atmosphere in order to label it a material body, or the sort of thing that could even have a surface at all. He writes,

For only very short periods at best, the water and other material making up the sea abuts the nitrogen, oxygen, etc. making up the air. Modern science tells us that, as conditions of temperature and pressure vary, the proportion of water vapour in the air varies, as do the proportions of the various substances from the air—oxygen, nitrogen, carbon dioxide, etc.—dissolved in the water. Parts of the liquid phase are transformed into the vapour phase and enter the air, or parts of the water vapour in the air enter the liquid phase, along with parts of the oxygen, nitrogen, carbon dioxide, etc. in the air which dissolve in the liquid. Even when equilibrium obtains at constant temperature and pressure, there is still an exchange of microparticles between the phases. While equilibrium holds at the macroscopic level, there is a dynamic equilibrium at the microscopic level in which the more energetic water particles leaving the liquid phase are matched by less energetic water particles in the in the gas phase entering the liquid phase. (35)

Needham argues that these observations show the need to distinguish between individuals and the matter of which they are constituted. He concludes that making this distinction allows us to understand the abutment of macroscopic individuals even as there are exchanges among their constituting matter. Time and again in his account, and in particular in his revisiting of the perennial question of whether water is H_2O , this distinction aligns with the division between macroscopic and microscopic quantities of matter, although the question whether this pairing is ultimately a necessity of the account or a contingency of nature is never satisfyingly resolved.

On the water front, Needham offers a complementary perspective to the thermodynamic definition of water he is known for having developed in chapters 7 and 9, concluding that, with the distinctions drawn by the account, ‘Water is H_2O again’ (185). In some ways, much of the account’s development is a targeted means to arrive back at this conclusion, and in so doing to re-license the set of inferences afforded to a metaphysics or a philosophy of language that ordains this identity. While Needham has spent much of his career engaged with philosophy of science, the concerns of that literature are not central in this book, and he does not draw implications from this new view of water for any of the philosophy-of-chemistry debates about chemical classification in which he has previously participated.

A desire to analyse the success and the implications of Needham’s solution to the water problem, and to the more general problem of identifying and talking about macroscopic substances while maintaining a subscription to atomic theory, should be sufficient motivation to pick up a copy of the book. However, ultimately, the chapters fail to constitute an individual account that is more than a merely mereological sum of its parts, so readers should be cautioned against expecting a tidy or cumulative narrative.

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