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# Aristotle's Theory of Bodies. Oxford Aristotle series

Christian Pfeiffer, *Aristotle's Theory of Bodies*. Oxford Aristotle series. Oxford: Oxford University Press, 2018. x, 230. ISBN 9780198779728 \$60.00.

### **Review by**

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### Preview

In *Aristotle's Theory of Bodies*, Christian Pfeiffer elucidates the neglected topic of Aristotle's theory of body as quantity—i.e., body understood as a three-dimensionally extended continuous magnitude, which is bounded by surfaces and is a feature of physical substances. The associated concepts of surface, boundary, extension, contact, and continuity are also carefully treated.

Pfeiffer's project consists of an introduction (Chapter One) and two parts. The first part (Chapters Two through Four) contends that the study of body as quantity belongs to the conceptual foundations of physical science despite having the same domain as mathematics.

In Chapter Two, Pfeiffer distinguishes three senses of 'body' in Aristotle's thought—as quantity, substance, and matter—and asserts that he will focus on bodies only insofar as they are physical and quantitative.

In Chapter Three, Pfeiffer contends that the study of quantitative body is central to Aristotle's physical science. He controversially states that 'a discussion of body and magnitudes should be connected to and placed alongside the discussion of *Physics* III-IV' and the fundamental concepts of change, the infinite, place, void, and time, which are discussed therein (p.16; see also: pp. 1, 2-3, 9, 13, 51, 193). This is striking, as Aristotle considers understanding these concepts to be prerequisites for studying any branch of physical science. Pfeiffer's textual support comes from the introduction of the infinite at *Physics* III.4, 202b30-5, where Aristotle states that 'the science of nature is concerned with magnitudes and motion and time'. Pfeiffer claims that Aristotle here 'announces the need' (pp. 2, 27) for a parallel account of magnitude and places it on par with the concepts of *Physics* III-IV. However, magnitude is not mentioned in the introductions to any of the other topics in *Physics* III-IV and is conspicuously absent from the methodological claims made at *Physics* III.1, 200b12-25, where the topics to be treated over the next two books are said to need elucidation *not* just because they are related to κίνησις (as Pfeiffer suggests at p. 16) but because they are 'common to everything and universal' and, therefore, must be 'preliminary to further inquiry' in the physical sciences. The absence of magnitude from this passage weighs heavily against Pfeiffer's claim. Further, it is difficult to consider the study of magnitude as being as fundamental as those topics treated in *Physics* III-IV when one recalls that, in *Physics* I-II, Aristotle advances an account of matter and form and—as Pfeiffer himself admits—'facts about the topology of objects can be derived and be explained by the form' (p. 182). The account of magnitude seems, then, to merely be supplementary to that of matter and form, unlike the topics of *Physics* III-IV. Thus, I doubt the success of Pfeiffer's claim here. I also think (as I shall discuss below) that his desire to place the study of magnitudes amongst Aristotle's topics in *Physics* III-IV leads to additional difficulties in later chapters.

In the remainder of chapter three and the first section of Chapter Four, Pfeiffer argues that the study of body as quantity is not a mathematical investigation despite the fact that the mathematician also studies bodies and magnitudes. Pfeiffer explains that, because his study concerns body and quantity *insofar as* they belong to physical substances, it falls under the purview of the physical scientist—involving structural and ontological differences from the study of mathematics. Relying on a passage from *Physics* II.2, Pfeiffer explains that, while the domain is the same for both the mathematician and the relevant physicist (namely, magnitudes of physical substances), the focus is different, being physical magnitudes for the physicist but *simply* magnitudes for the mathematician. In other words, the physicist studies physical substances *qua* (ἤ) perceptible and movable magnitudes while the mathematician, instead, performs an act of ‘subtraction’ (ἀφαίρεσις) in order to ‘omit’ motion and sensible matter and study physical substances *qua* magnitude and extension alone. Pfeiffer’s account here is clear and well-argued, though his focus on establishing that the study of body *qua* quantity is not a branch of mathematics sometimes leaves the reader wondering if it is *mathematics*, instead, which is a branch of physical science (especially because of Aristotle’s fictionalist tendencies concerning mathematics). This could have been clarified if Pfeiffer discussed passages such as *De Anima* I.1, 403a23-b16 or *Metaphysics* VI.1, 1026a6-19, but I worry that his desire to situate his study within the project of the *Physics* explains their omission.<sup>1</sup>

The rest of Chapter Four carefully argues that the physicist studying body *qua* quantity can utilize mathematical principles while avoiding being downgraded to a ‘mixed science’ (like optics) or succumbing to the issues of kind-crossing raised in *Posterior Analytics* I.7 and I.13.

The second part of Pfeiffer’s project (Chapters Five through Seven) aims at constructing a ‘unified’ and ‘systematic’ (pp. 51, 76) account of Aristotle’s theory of quantitative bodies and their

related notions. Pfeiffer designates thirty-four of his most-important points as 'propositions' and, in Appendix B, helpfully lists them together as a 'manual [for] the working physicist' (p. 193).

Chapter Five is devoted to an analysis of *Categories* 6, which provides a background for the remainder of Pfeiffer's project and introduces the key quantitative notions of continuity extension, position, and body. Pfeiffer shows that a body is a continuous spatial entity whose parts have position in relation to one another such that all of the adjacent parts are connected at a common boundary. In Appendix A, Pfeiffer similarly engages in a close reading of *Metaphysics* V.13—Aristotle's other key text for his theory of quantity—and ingeniously argues that, in the relevant respects, the account of quantity here is compatible with the account in *Categories* 6—though the two have different emphases.

In Chapter Six, Pfeiffer further develops the theory of quantitative body. First, Pfeiffer explains Aristotle's claim in *De Caelo* I.1 that bodies are 'τέλειον' by contending that—in virtue of being three-dimensional, a trait which 'flows' from the essence of physical substances—they are complete because they fill *all* dimensions and are also normatively perfect because they are, in a sense, the 'end' of—and, thus, prior to—lower-dimensional magnitudes. Next, Pfeiffer discusses Aristotle's theory of boundaries. Boundaries are two-dimensional surfaces and property-bearers which are *not* proper parts of bodies but are, nevertheless, ontologically dependent particulars of bodies. Pfeiffer also contends that quantitative bodies are matter-form composites in a sense, with the outer boundaries serving as the individuating topological form and extension serving as matter. Pfeiffer is not particularly clear about what sort of body (substantial or quantitative) is doing the metaphysical work when he says things like boundaries 'depend on' and 'belong to' 'bodies' or 'their hosts', or that a boundary is 'dependent on the entity whose boundary it is' (p. 112). This means that the reader must keep in mind that quantitative bodies are ultimately grounded by

physical substances, so their two-dimensional surfaces are as well. Pfeiffer then discusses extension, calling it the 'matter' of quantitative bodies because, like physical matter, it is indeterminate with respect to its 'form' (in this case, the topological form) and, further, it is a logically—but not ontologically—separable feature of physical matter. Lastly, Pfeiffer contends, using *Physics* VI.1 as his key text, that continuums are divisible into infinitely divisible parts, which have the same number of dimensions as the original continuum, thus rendering matter 'foundationless'.

Pfeiffer shifts his attention, in Chapter Seven, to the notions of contact and continuity as they are developed in *Physics* V.3. He convincingly argues that their differences are ultimately grounded in metaphysical considerations. Accordingly, contact is to be understood as a relation between ontologically independent bodies and continuity as a relation between the parts of a single body. Pfeiffer begins the chapter by presenting Aristotle's definitions of contact—where all of the proper parts of two bodies are in different primary places, but parts of their boundaries are in the same two-dimensional place. Continuity, however, requires (in addition to contact) the relevant boundaries to become 'one and the same' and 'hold together' (p. 159). Pfeiffer then argues that, while the relevant parts of a continuous body share numerically one boundary, in the case of contact there remains two actual (but coinciding) boundaries because being in contact does not imply any change in the objects and losing a boundary *would* be such a change (perhaps even a *substantial* change). This line of thought, however, appears to contradict *Metaphysics* III.5, 1002a34-b3, where boundaries instantaneously become one when bodies come into contact and become two when they are separated, such that their 'generation' is not an additional 'change' at all. Pfeiffer acknowledges that there is possibly a tension between the positions of *Physics* V.3 and *Metaphysics* III.5 but dismisses it, saying that, if this is true, the latter view is 'distinct from Aristotle's theory in the *Physics*' (p.164 n. 54). Troublingly, he makes no attempt to reconcile the two accounts,

thereby damaging his claim that he is presenting a unified and systematic theory of Aristotle's understanding of quantitative body. This further suggests that Pfeiffer's central aim of integrating his theory into the project of the *Physics* has negative side-effects—especially there are reasons to believe that the two passages could be reconciled. For instance, one could say that, in the case of contact, there are *potentially* two boundaries but *actually* one, while, for continuity, there is potentially *one* boundary which would have to go through the crucial step of becoming actually one (and potentially two) if continuity were destroyed (suggesting that there would still be contact, for however brief a time), before becoming actually two when the bodies were fully separated.<sup>2</sup>

Pfeiffer concludes Chapter Seven by arguing that continuity is explained by the form of an object. This involves interpreting Aristotle's claims at *Physics* V.3 and *Metaphysics* V.6 to mean that a causal process must serve as the explanation for why one object comes to be from two. This process *also* gives the object its principle of unity. Further, while there are several ways to 'be one'—e.g. by being glued, tied, or grown together—the causal story has to involve the appropriate structuring such that a determinate form is thereby instantiated. Continuous things—as *Metaphysics* VIII.2 states—are, therefore, wholes whose being is explained by, and consists in, the way they have been produced. Thus, Aristotle's theory of quantitative body should again be seen to be intimately dependent on his overarching account of physical substances.

While this study firmly belongs to the history of philosophy, Pfeiffer makes a compelling case for treating Aristotle as an ancient forerunner to the modern metaphysical study of mereotopology. Pfeiffer deftly shows how Aristotle can engage with moderns on issues including how to define boundaries (pp. 90-4), whether divisions of objects produce 'open' or 'closed' intervals (pp. 100, 103-5), whether surfaces should be understood under the 'Somorjai' or 'Leonardo' conception or a hybrid view (p.

117), how a continuum should be treated (pp. 140-6), and even how to answer van Inwagen's 'special composition question' (pp. 186-8). This book is, therefore, of interest not only to historians of philosophy but also to modern metaphysicians.

Overall, Pfeiffer accomplishes the major goal of his project, which is to establish that 'a theory of bodies *as a whole* should be recognized as a genuine topic of Aristotelian scholarship' (p. 194). While I have been critical of Pfeiffer's work, my criticisms have been made from *within* the framework of the theory of quantitative body. By constructing this framework Pfeiffer has ultimately succeeded.

### Notes

1. For an earlier discussion (not cited by Pfeiffer)—which elucidates both the *Metaphysics* VI.1 and *Physics* II passages and makes many of the same points as Pfeiffer—see J. J. Cleary (1994), 'Emending Aristotle's Division of Theoretical Sciences', *The Review of Metaphysics* 48.1, pp.33-70.

2. On this view, Alexander of Aphrodisias would be correct, *contra* Pfeiffer (p. 160), to say that 'things are continuous when in actuality there is no boundary in between' (Simplicius, *In Phys.*, 570.6-7 Diels).