Aristotle's Theory of Bodies. Christian Pfeiffer. Oxford: Oxford University Press, 2018. Pp. 240. $60.00 (hardback). ISBN-13: 978-0198779728.

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In recent decades, there has been tremendous growth in scholarship devoted to Aristotle's natural philosophy. Missing from the conversation has been an extended discussion of the theory of body that underlies Aristotle's more specific accounts of entities such as the elements, composite materials, and organisms. In this excellent addition to the Oxford Aristotle Studies series, Pfeiffer offers the reader such a study. In doing so, he provides a carefully argued interpretation of bodies and their place within Aristotle's natural philosophy.

Aristotle's Theory of Bodies is a study of bodies as quantitative entities. As purely quantitative entities, bodies may be examined apart from the specific qualitative features that belong to them as natural substances. In the first part of the book, Pfeiffer carefully shows that the study of body belongs to physics rather than mathematics; in the second part, he develops Aristotle's topological conception of body. What emerges is Aristotle's commitment to a nuanced and complex account of bodies. The account is historically interesting, particularly within the study of Aristotle's natural philosophy; likewise, Pfeiffer's lucid argumentation sets the stage for examining further relations between Aristotle's account of body and those found in contemporary metaphysics.

Throughout the book, Pfeiffer is determinate in his focus, and is careful to avoid the difficult metaphysical questions that may sideline the entire purpose of his investigation. This, in itself, is a remarkable accomplishment—particularly given the extent to which the study of quantitative body may easily be sidetracked by a study of fundamental matter, mathematics, or motion. By remaining determinate in its focus, Pfeiffer's book readily accomplishes the goal that it sets out: to offer a complete study of body *as such* in Aristotle, thus bringing together a number of passages (particularly from the *Physics* and *Metaphysics*) that have received little attention in the contemporary literature.

In part 1 chapter 1 Pfeiffer argues that the study of bodies underlies the physical sciences: although bodies are quantitative entities, they are not primarily mathematical entities. In chapter 2 Pfeiffer explains that his study will be restricted to the study of body as an entity in the category of quantity, rather than the study of body as substance or matter.

In chapter 3 Pfeiffer argues that the study of bodies is not a mathematical investigation, but rather, belongs to the conceptual underpinnings of Aristotle's natural science. Pfeiffer situates the study of body alongside the topics of *Physics* iii and iv; the study of magnitude, or body as quantity, is related to Aristotle's studies of motion, the infinite, time, and place. Although the mathematician also studies lines, surfaces, and bodies, the study of body belongs to the physical sciences because the physicist must address additional questions, such as the ways in which lines, surfaces, and bodies depend upon their limits.

In chapter 4 Pfeiffer contrasts the study of bodies as it occurs within physics as opposed to mathematics. He appeals to Barnes's distinction between domain and focus: the *domain* of an investigation is the objects that are studied, whereas the *focus* of an investigation concerns the way that the objects are studied. Physics and mathematics have the same domain, because they both study the bodies and magnitudes of physical substances. Although the focus of both studies is different, there is overlap; the geometer studies physical bodies *qua* extended, but separate from motion, whereas the physicist studies physical bodies *qua* extended and moveable magnitude. Physics is thus subordinate to geometry because geometry operates by subtracting features. Accordingly, the physicist may use the results of geometry without violating Aristotle's warning against kind-crossing.

Part 2 of Pfeiffer's study offers a detailed analysis of Aristotle's theory of bodies as quantitative entities. In chapter 5 Pfeiffer shows that *Categories* 6 allows for a definition of body in the category of quantity. First, a quantitative body is continuous rather than discrete; like line, surface, place, and time, all adjacent parts of a body are connected by a boundary. Second, a quantitative body has parts with position; like line, surface, and place and unlike time, its parts are spatially separated and exist at the same time. Finally, quantitative body is extended in three dimensions, in contrast to line, surface, and place.

Chapter 6 develops what Pfeiffer calls a 'topological account' of physical bodies and their limits in Aristotle. Bodies are complete because they are extended in all possible dimensions; nonetheless, being three dimensional is not part of the essence of a physical substance, but rather, follows from its essence. The boundaries or limits of bodies are two-dimensional surfaces. External boundaries occur at the edges of a body and explain its completeness or wholeness, whereas internal boundaries occur within a body and explain its continuity.

On Pfeiffer's account, the limits of bodies are not *parts* of bodies: the parts of any entity must stretch out in the same number of dimensions as the entity, and since bodies are three-dimensional and their limits are two-dimensional, limits are not parts of bodies. Furthermore, the limits of bodies are real: surfaces are not merely conceptual entities. Finally, limits are dependent particulars that depend upon their hosts. Since limits form closed intervals, the limit of a body and its place are different surfaces located in the same spot.

The relationship between body and limit, according to Pfeiffer, is analogous to the relationship between matter and form. The outer limit of each body is its topological form; it is distinct from metaphysical form because a metaphysical form can survive quantitative changes in a body, whereas a topological form cannot. Likewise, the (topological) matter of a body is its extension; it is enclosed and bounded by the limit of the magnitude. Objects are not literally constituted by extension; rather, extension is an abstraction from ordinary matter. Likewise, since extension is infinitely divisible, topological matter resembles an atomless gunk.

In chapter 7, Pfeiffer explains Aristotle's account of contact and continuity, two relations that obtain between bodies and their parts within a topological account of bodies. Two bodies are in contact when parts of their boundaries are coincident. Entities are coincident when there is an overlap in their primary places; if there is no such overlap, then entities are separate. Thus, when two bodies are in contact, parts of their boundaries are in the same spot; since the boundaries of bodies depend upon their hosts, and contact does not change the configuration of a body, contact between two distinct objects requires two distinct boundaries in the same spot.

Continuity, in contrast, requires that entities have coincident boundaries (that is, the entities are in contact) and that the coincident boundaries become one and the same and hold together. Unlike *mere* contact that occurs between two different objects, continuity can only occur between the parts of a single object. Nonetheless, the parts of a continuous object do not overlap—only the boundaries of parts do—and accordingly, the parts of an object are not in the same place as the whole.

Pfeiffer recognizes that one might expect the internal boundaries of various continuous objects to differ with respect to status; for instance, the internal boundary separating a mass (such as water) into halves seems different from the internal boundaries that separate a brick from a wall. Pfeiffer suggests two ways to explain this difference. First, structured wholes (like a wall composed of bricks) have actual internal boundaries, whereas unstructured wholes (like a mass of water) have potential internal boundaries. Second, one may use the model of motion in a single object to treat one object as two; although an arm is a single object, one can treat the joint at which it bends as a boundary, thus treating the single continuous object as if it were two.

Finally, Pfeiffer remarks that Aristotle's consideration of body allows him to provide a general answer to the special composition question. In general, for some Xs and an object Y, the Xs compose Y if the Xs are continuous in virtue of Z. Z, it turns out, will be a formal cause. A theory of bodies cannot explain which formal causes will function in each case; rather, it must be supplemented by the unique explanatory framework that each of the special sciences can provide.

Pfeiffer's interpretation of body in Aristotle carves out a unique place for quantitative body in the science of nature. Body as such is not a purely mathematical entity, and accordingly, its study cannot be reduced to the study of mathematics; likewise, bodies have identity conditions distinct from those of perceptible substances, and so cannot reduce to substances, either. This, however, is precisely where a tension lies in Pfeiffer's interpretation; specifically, there is a tension in simultaneously maintaining the unique status of bodies and their dependence upon physical substance.

The tension can illustrated through an analogy between quality and quantity. Qualities depend upon physical substance for two reasons: (1a) physical substances can survive the loss of a quality, and (2a) qualities cannot survive the destruction of the physical substance to which they belong. Body, on Pfeiffer's account, is essentially a quantity: it is a three-dimensional extension bounded by its topological form, that is, its external two-dimensional limit. If quantity and quality are analogous, and body is a quantity, then one would expect that (1b) a physical substance can survive the loss of its (particular) body, and (2b) a (particular) body cannot survive the loss of the physical substance to which it belongs.

The problem arises because if bodies do not reduce to either mathematical entities or physical substances, then (2b) appears to be false. When a perceptible substance such as an animal perishes, its qualities do not survive; this is why death is accompanied by a change in temperature and moisture. Nonetheless, it would appear that a change from a living thing into a corpse is not accompanied by a change in body: the same volume or extension and the same shape can survive the change, if only briefly. Thus, body can survive substantial change, and since body is a kind of quantity, there is a case in which quantity can persist without a substance.

The problem could be avoided by accepting the reduction of bodies either to perceptible substances or to mathematical entities. If bodies reduce to perceptible substances, then (2b) remains true: the body of a living thing and a corpse are different, even if they retain the same extension and topological form, because they belong to different substances. If bodies reduce to mathematical entities, the consequence depends upon one's view of mathematical objects in Aristotle. If geometrical objects are real, then bodies may turn out to be specific instances of the structure possessed by geometrical objects. If geometrical objects are constructed and serve as a useful heuristic, then perhaps bodies, too, are simply useful fictions for the student of nature.

Despite the tension, I believe that Pfeiffer is right to attribute to Aristotle the belief that bodies have a unique status to the extent that they depend upon but do not reduce to perceptible substances. Perhaps a solution is to be found by rethinking the relationship between topological form and extension; perhaps, in contrast, the problem is one that belongs to Aristotle, rather than Pfeiffer's account of Aristotle. In either case, *Aristotle on Bodies* provides the foundation for a further exploration of topics situated at the intersection of Aristotle's natural philosophy, metaphysics, and philosophy of mathematics. As such, it is an extremely valuable contribution to the literature that should be required reading for students and scholars of these topics in Aristotle.

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