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Entry on "Shape," *The Cambridge Descartes Lexicon*, ed. Larry Nolan (Cambridge University Press, forthcoming).

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Shape

From quite early in his career, Descartes lists shape as one of the three genuine "modes" of **extension** or ways of being extended, the other two being size and **motion**. This austere ontology of **body** is in sharp contrast to the Aristotelian Scholastic model of the **explanation** of natural phenomena that appeals to an elaborate scheme of forms and qualities. As a proponent of mechanistic scientific explanations, Descartes held instead that all natural phenomena can be explained entirely in terms of the arrangements of corpuscles, or extended micro-bodies, characterized solely in terms of size, shape, and motion.

Although motion plays a central role in Descartes's natural philosophy, shape is no less important to his scheme of scientific explanation. This is because the way that motion is characterized seems to presuppose that body has a determinate extension or shape. According to the "proper" characterization of motion Descartes introduces in the ***Principles*** it consists in "the transfer of one piece of matter, or one body, from the vicinity of the other bodies which are in immediate contact with it, and which are regarded as being at rest, to the vicinity of other bodies" (AT VIIIA 53, CSM I 233). Yet, this account presupposes the **individuation** of bodies from one another, which in turn seems to presuppose that a body, insofar as it is delineated from the bodies that surround it, has at any particular moment a determinate extension or shape. Further evidence for the explanatory importance of the mode of shape can be found in Descartes' insistence in his early work the ***Rules*** that shape plays a central role in all cases of sense **perception**: "sense perception occurs in the same way in which wax takes on an impression from a seal. It should not be thought that I have a mere analogy in mind here…" (AT X 412-413, CSM I 40-41).

As obvious as the idea that shape is a modification of extension might seem there are deep interpretative and philosophical difficulties with Descartes's claim. The principle interpretative difficulty is that it is not clear what he means by "shape," a difficulty that is exacerbated by the fact that he never offers an explicit explanation. In the *Rules* he says that shape, extension, motion and other purely material corporeal "natures" are "simple" in the sense that "they cannot be divided by the **mind** into other things more distinctly known" (AT X 418, CSM I 44) (see **simple nature**). Indeed, he says, "the concept of shape is so simple and common that it is involved in everything perceivable by the senses" (CSM I 40, AT X 413). These claims might seem to constitute an explanation of why Descartes does not think the notion of shape can be defined or explained: it is simply primitive or unanalyzable. However, this does not prevent Descartes in later works from explaining what he means by "motion," and we might

wish he had taken similar care with the notion of shape. There are nevertheless some hints in the *Rules* about how Descartes understands the mode of shape. In the context of a discussion of the type of abstraction used in forming the proper conception of the corporeal natures, Descartes says: "when we are concerned with a figure, we should bear in mind that we are dealing with an extended subject, conceived simply with respect to its having a shape. When we are concerned with a body, we should bear in mind that it is the same thing we are dealing with, in that it is something that has length, breadth and depth. In the case of a surface, we should conceive of the same thing, as being something with length and breadth—this time leaving out depth, though not denying it" (AT X 446, CSM I 61). There are two significant claims in this text. The first is that the shape of a body just is the body itself considered with respect to its having a determinate spatial extension in length, breadth and depth. It is indeed hard to know how to put this latter point more simply, but perhaps the idea could be expressed by saying that a shape is the body itself considered with respect to the particular spatial relations among its parts. Of course, in a **plenum physics** of the sort endorsed by Descartes, no object will retain its shape for longer than a moment; nevertheless, assuming that bodies in a plenum can be metaphysically individuated from one another, any particular body will at any moment have parts that bear determinate spatial relations to one another—and that is what it means to say that a body has a shape. When a piece of **wax**, for example, undergoes a change in its shape, it undergoes a change in the relations among its parts.

The second significant claim Descartes makes in the text is that the shape of an object is something distinct from the surface of the object, a mode that Descartes characterizes as "the limit of a body" (AT X 445, CSM I 60). This is important because it might seem *prima facie* plausible to identify shape with the limiting surface of an object. In fact, there is some evidence that **Leibniz** interprets Descartes in this way (G II 119 [M 152]). However, there is good reason to think that Descartes does not wish to identify the notion of shape with the notion of a limiting surface. Besides the text quoted above in which he denies that the shape of a body is to be identified with its surface, there are some texts in which Descartes make some surprising claims about surfaces—claims he does not make about shape. In the Sixth Replies, for example, he seems to endorse the idea that although a particular surface is a mode, it is a mode that can be had by more than one body at the same time. In other words, it appears that Descartes thinks of surfaces as "straddling modes": "I did not deny that the surface is the boundary of a body; on the contrary it can quite properly be called the boundary of the contained body as much as the containing one, in the sense in which bodies are said to be contiguous when their boundaries are together. For when two bodies are in mutual contact there is a single common boundary common to both which is part of neither; it is the same mode of each body…" (AT VII 433, CSM II 292) (See Hoffman 1990). As he confirms in a 1645 letter to **Mesland**, there is only a distinction "in relation of our thought" between the surface of a body, the surface of the containing body, and the surface intermediate between the contained and containing body: "these three surfaces are in fact a single thing" (AT IV 164, CSM 241-42; cf. AT VII 250f, 417, 433-34; CSM II 174f, 281, 292 and AT IV 187, CSMK 248). These claims are quite challenging from

the standpoint of understanding Descartes' ontology. However, for our purposes it is sufficient to note these remarks suggest that it would be a mistake to interpret the Cartesian notion of shape as a limiting boundary. Descartes never suggests that the shape of a particular object is something that could be shared by other bodies, since the shape *just is* that particular body regarded as having a particular length, breadth, and depth.

Descartes view that shape is a genuine mode of body was the target of repeated criticism by **Leibniz** (1646-1716) (see, e.g., C 522 [AG 34], A, VI, iv, 312 [RA 315], and G, II 77, 98, 119 [M 95–96, 122–3, 152]). Leibniz's objections are somewhat brief and underdeveloped, which has fostered differing interpretations. On one interpretation, given the infinite complexity of the plenum, any shape we attribute to a body will fail to account for infinitely more complexity that must exist along its surface (Sleigh 1990). On another interpretation, infinite complexity would result in the object's having a surface that could not be described in terms of the resources available to17th-century mathematicians and thus would not count as a "determinate" shape (Levey 2005). There is an alternative interpretation of Leibniz's criticisms, however, that cuts much more deeply into Descartes' **metaphysics** of matter by undermining the coherence of the idea that there could be metaphysically individuated bodies—bodies that have metaphysically determinate extensions or shapes—in an infinitely (or "indefinitely," in Descartes's preferred way of speaking) divided plenum. On this interpretation, the problem Leibniz sees arises from combining a Cartesian view about the individuation of bodies with the thesis that that plenum is infinitely divided and thus essentially fluid. According to Descartes, a body is individuated by motion: one body is "whatever is transferred at a given time, though this may consist of many parts which have different motions relative to each other" (AT VII 53-54, CSM II 233). In fact, in an infinitely divided plenum a body will have infinite parts which have different motions relative to one another, and this will be true of the interior of the body, of the surface of the body, and of everything outside the body. Another way to put this is to say that all bodies are to a certain extent fluid and so no matter how solid or coherent a body might seem it must be permeated with more fluid matter, both in its interior and along its surface. The point Leibniz wants to make, then, is that if there are determinate shapes and surfaces there must be a fact of the matter about which of these fluids that permeate the coarser parts are parts of the body and which are not. But it is not clear what could serve as the grounds of this fact if individuation is grounded in motion (Crockett 2005, 2009).

See also Body; Extension; Individuation; Leibniz, Gottfried Wilhelm; Motion; Place, External vs. Internal; Plenum

For Further Reading

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