Helen Hattab
Descartes on Forms and Mechanisms.
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The replacement of Scholastic hylomorphism and the matter/form ontology with the principles of the mechanical philosophy comprised the most fundamental turn in seventeenth-century matter theory. One of the most profound changes of the scientific revolution, this transformation had far-reaching implications for epistemology, natural philosophy, conceptions of causation, human agency, and moral conduct. Descartes played a major role in occasioning and accomplishing this process. But, as Hattab deftly shows, he was neither alone nor isolated in these endeavors. *Descartes on Forms and Mechanisms* presents an important challenge and corrective to the common tendencies to simplify such complex transformations by overstating the conceptual ruptures and underplaying historical continuities. Hattab's thought-provoking account problematizes the rigidness of dichotomies such as revolutionaries versus traditionalists, major versus minor figures, and Aristotelianism versus the New Philosophy, to reinterpret one of the seminal chapters in the history of ideas.

At the core of this move was the rejection of the doctrine of substantial forms in favor of mechanical accounts of matter and material change. From their injection into Scholastic philosophy by Aquinas in the thirteenth century until their demise (or rather, their gradual but radical identity change) during the second half of the seventeenth century, bitter controversies over the nature and role of substantial forms abounded. The main thrust of Hattab's clearly organized argument, which unfolds in three parts and eight thematic and chronological chapters, is to 'show that Descartes' mechanistic alternative to substantial forms represents neither a complete break from the past nor an outgrowth from one particular philosophical movement of his day' (8). Instead, Hattab turns to Descartes' intellectual resources, which are partly culled from his writings and partly reconstructed from larger contemporary philosophical and cultural contexts, to provide a more balanced and nuanced account of how the traditional substantial forms gave way to a new mechanistic science.

In Part 1, Hattab portrays the intellectual background to Descartes' attack on the doctrine of substantial forms. She does so by presenting his arguments, but more importantly, by examining the status of the doctrine within contemporary Scholastic Aristotelianism, which influenced Descartes through his early education at the Jesuit Collège, La Flèche. Following a concise exposition of the Frenchman's critique of substantial forms, most clearly seen in his 1642 correspondence with his Dutch disciple Henricus Regius (Chapter 1), Hattab takes a critical look at how Aquinas extracted—or rather constructed—'substantial form' out of Aristotle's *Physics* and *Metaphysics* (Chapter 2), suggesting that the doctrine owes more to Aquinas' creative reading of Aristotle than to the Stagirite's views. Descartes' critique, however, was not directed

against the Thomistic version of the doctrine. As Hattab argues persuasively, Descartes' counterarguments map best onto the Spanish Jesuit Francisco Suárez's (1548–1617) reformulation and last-ditch defense of the doctrine, articulated around the turn of the century. Suárez's definition of substantial form drew on the immortality of the rational soul, a still relatively uncontroversial idea at the time, which even Descartes retained as the only substantial form in his cosmology. Suárez's redefinition of substantial forms—in particular his assertion that we cannot know them directly from experience—exposed the doctrine to attacks on both empirical and theoretical grounds. Epistemologically, Descartes deemed substantial forms to be obscure. Since we cannot possibly have any clear ideas of such notions or their mechanisms of action, their epistemological basis was essentially flawed: 'to explain an action by stating that it proceeds from a substantial form elucidates nothing, for it is equivalent to stating that the action proceeds from something we do not understand' (18). Descartes of course had to first demonstrate that natural philosophical inquiries depended on such clear and distinct notions in order to justify the introduction of a mechanical ontology.

In Part 2 Hattab examines the intricacies involved in Descartes' replacement of material substantial forms with mechanisms and the advancement of what she refers to as 'Descartes' unsupported reliance on the nature/machine analogy and his appeal to the superiority of explanations based on mechanical principles' (66). In this context, in Chapter 4, she analyzes the impact of Francisco Sanchez's (1550–1623) late sixteenth-century skeptical attack (*Quod nihil scitur,* 1581) on Scholastic philosophy and on Suárez's defense of substantial forms. By focusing on empirical justifications for the existence of substantial forms, Suárez distanced the doctrine from metaphysical and logical concerns, which were countered by Sanchez's undermining of Scholastic logic-centered reasoning and 'culminating in the rejection of the Aristotelian definition of *scientia* as an acquired disposition which is the accumulation of many syllogistic inferences' (70). The way Sanchez stressed the human inability to understand nature's vast complexity informed his radical epistemological skepticism. One possible solution was based on the human capacity to grasp the workings of (simple) mechanisms, which could potentially be extended by way of analogy to more complex natural processes.

Chapter 5 explores the intellectual resources Descartes had found in the resurfacing of texts such as the *Questiones Mechanicae*, commonly attributed to Aristotle in the sixteenth and seventeenth centuries. Such texts were instrumental in redefining the relationship between branches of applied arts (*ars*, *techne*) and philosophical causal knowledge (*scientia*). Referring to the elevation of mechanics from a 'lowly' art to a branch of knowledge on par with mathematics, Hattab underscores a crucial issue, namely, 'that Scholastic mathematicians of Descartes' time did not consider the matter of mathematics to be quantity at the most general, abstract level, but rather, as (Josephus) Blancanus makes clear, they took it to have divisions, proportions, and relations' (106). Descartes' *res extensa*, which he suggested as a replacement of prime Scholastic matter, was closer in its level of abstraction to this kind of definition of the matter of mathematics rather than to any unrestricted metaphysical abstraction of quantity, as is sometimes implied by historians of philosophy. Descartes' substitution of mechanisms for substantial forms redefined the relation between observation and reason, proposing a

new way to link them intelligibly by advancing from mechanical observable phenomena to more abstract analogical rationalizations. The process, however, nicely depicted in Chapter 6, evolved gradually from this novel perception of intelligibility through Descartes' articulation of a mechanical scientific method, and then on to his elaboration of a notoriously speculative metaphysical system in support of his mechanical science.

Part 3 (Chapters 7–8) deals with the actual collapse of substantial forms in face of the success of mechanical explanations. Here Hattab examines in some detail the metaphysical foundations of David Gorlaeus' (van Goorle) atomism as an early instance of the rejection of the Scholastic matter/form ontology in favor of a substance/mode one. On this account, which identifies matter with extension, bodies are not made up of matter and form but consist of aggregations of atoms, and their properties derive from various modes of extension (or particulate configurations, shapes, etc.). By tracing the evolution of Descartes' ideas, Hattab shows that 'even though Descartes never publically affirmed Gorlaeus' view that the human mind and body form an accidental union, the substance/mode ontology Descartes adopts from the *Meditations* onwards resembles Gorlaeus' metaphysics in key respects. In both cases, these new metaphysical foundations imply the elimination of substantial forms from the metaphysical as well as physical realm' (159).

In all, *Descartes on Forms and Mechanisms* is a work of high scholarly order. Hattab has written an important book, based on a careful and judicious analysis of primary sources. Although elegantly argued, the text is at times dense and demanding. It should be of primary interest to scholars of Descartes and students of early modern Scholastic philosophy, but also to all historians of early modern science, philosophy, and ideas.

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