JUSTIN E.H. SMITH, **Divine Machines: Leibniz and the Sciences of Life**. Princeton and Oxford: Princeton University Press, 2011. Pp. xii + 380. ISBN 978-0-691-478-7. £30.95 (hardback).
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The German philosopher G.W. Leibniz is a household name, and yet seems to linger only at the periphery for most historians of early modern science. Apart from his contributions to mathematics, he is better known as an idealist philosopher whose contemplations about bodies and souls were solely based on metaphysical foundations. Justin E.H. Smith's new book challenges this notion and introduces the realist side of Leibniz as a natural philosopher for whom 'biology' was *the* foundational science. Smith's proposal to speak of a 'philosophy of biology' in an early modern context might raise a few eyebrows among the more traditional-minded historians of science. But his deep analysis of Leibniz's writings shows that sticking to established chronological narratives of emerging disciplines comes at a cost. He argues convincingly that the persisting perception of the priority of physics in the seventeenth century, followed by a focus on chemistry in the eighteenth century, and then, finally, on the birth of modern biology in the mid-nineteenth century, maintain an epistemic separation that is somewhat ahistorical in itself. In fact, early modern natural philosophers – for whom the 'merely physical' (inorganic) and the 'natural' (organic) were two sides of the same coin – were constantly crossing the line between those fields of knowledge that we have come to separate rather strictly. With *Divine Machine*, Smith proves that if biology was not a distinct domain of enquiry in Leibniz's time, 'this is because it was everywhere' (p. 3).

Focusing on three grand themes in natural philosophy (the relation between structure and motion, generation, and the question of species), first, Smith establishes that Leibniz was much more of an empiricist than is generally granted or even acknowledged. Following his preference for 'a Leeuwenhoek' who tells him what he sees, over 'a Cartesian', who tells him what he thinks, Leibniz seized mainly on contemporary scientific discoveries to develop his thoughts on the phenomena of life. Second, in contrast to other scholarly writings, Smith takes Leibniz's written metaphors and similes at face value ('Leibniz means what he says', p. 5). In this way, Smith finds a way out of the ongoing realist-versus-idealist debate among scholars by proposing that in Leibniz's philosophy of biology, the realist and the idealist aspects are in fact compatible.

The first two parts of the book trace the roots and influences of Leibniz's specific take on animal economy and mechanical philosophy, ranging from medicine and anatomy to microscopic discoveries. It speaks for Smith's engaging style and his ability to explain complex issues that Leibniz's view on the animal as a 'Hydraulico-Pneumatico-Pyrotechnical Machine of Quasi-Perpetual Motion' in Chapter 2 does not smack of hardcore mechanism. As it was, Leibniz's theory radically reconfigured existing notions of the 'animal machine' and is also a good example of the many shades to mechanical philosophy that existed at the time. With his bold move towards the idea of an animal as self-moving in a goal-directed fashion (the 'divine machine' of the title), Leibniz presented a break from the traditional Cartesian *bête-machine* and opened up more complex and comprehensive enquiries about animal life. Alongside the concept of infinitesimally small animal machines within animal machines, Leibniz further introduced a new conceptualization of microstructures in which corporeal substances are not to be understood as pure mechanical devices, but encapsulate an idea of living functionality that goes way beyond Descartes's reductionist mechanical philosophy. Identifying him as a 'monadological immaterialist', Smith situates Leibniz between the mechanist and the vitalist camps, establishing the concept of monads as yet another novel aspect of his philosophy.

The third part discusses Leibniz's view on generation, one of the great themes in early modern natural philosophy that was played out in the debates between epigenesists and preformationists. The latter were challenged at the time by the discovery of fossils, and Smith's analysis of the

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debates about fossils in the seventeenth century is one of the most engaging parts of the book. From the premise that they were 'games of nature' (creatures wrongly imposed on the wrong form or material) to Leibniz's claim that 'nature does not play', fossils brought up the question of spontaneity in nature and creation.

This aspect is also taken up in the final part of *Divine Machines* that tackles the question of species generation and classification. Again, in contrast to the common focus on the debate between Leibniz and John Locke on the philosophy of language, Smith explores here the particular problem of species boundaries within the context of Leibniz's philosophy of biology. Ranging from animal language to monstrous births, from Leibniz's views on the botanical method to his 'species realist' stance against contemporary nominalism, this part reveals once more Leibniz's original contribution to natural philosophy.

Divine Machines does not exclusively focus on Leibniz; throughout his discussions of Leibniz's writings and thoughts, Smith constantly invokes the work of other seventeenth-century (and earlier) natural philosophers. Identifying and engaging with the eclectic mix of theories and influences out of which Leibniz's philosophy created something new, Smith thus offers a broader historical context than the title suggests. But with *Divine Machines*, Leibniz himself emerges as a fascinating example of the early modern obsession with the grand questions about life, and is for this reason certainly of interest to historians of science and medicine.

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Rebecca Messbarger, **The Lady Anatomist: The Life and Work of Anna Morandi Manzolini**. Chicago and London: The University of Chicago Press, 2010. Pp. xiv+234. ISBN 978-0-226-52081-0. £35.00 (hardback).
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Messbarger's account of the life of eighteenth-century anatomical modeller Anna Morandi Manzolini opens with an evocative description of her extraordinary self-portrait: a wax bust of the modeller adorned with jewellery and a fine dress, daintily dissecting an (equally waxen) human brain. Beneath the taffeta, the smile and the fake pearls, a restorer reveals the frayed fabrics, the model's cracks and spills. As the portrait was restored, Rebecca Messbarger went on a mission to recover the life of Bologna's lady anatomist. Like Morandi's self-portrait, biographical accounts of her have seen various fortunes. The modeller has been presented in a range of narratives which accommodate chroniclers' own assumptions about a woman's proper place in science and art. For some of her eighteenth-century contemporaries, Morandi was merely the dutiful helpmate of her modeller husband, Giovanni Manzolini, plagued by melancholy and professional rivals. More recent histories have included her in the list of eighteenth-century female celebrity scholars such as natural philosopher Laura Bassi and mathematician Maria Gaetana Agnesi. However, Messbarger reminds us that Morandi's situation was in many respects very different from those of Bassi and Agnesi, who were born into wealthy families. The biography carefully uncovers Morandi's humble background, and her role as the sole breadwinner of the family as head of a private anatomy school and anatomical modelling workshop after the early death of her husband. *The Lady Anatomist* details Morandi's struggle for recognition against local competition, most notably from rival wax modeller Ercole Lelli, and against popular theories of female intellectual inferiority. The biography shows that despite Morandi's eventual local acceptance and international fame as an anatomist and modeller, she continued to be plagued by financial difficulties. These eventually led her to send her eldest son Giuseppe to an orphanage after her husband's demise, and forced her in her declining years to seek the help of a noble patron, the enterprising Count Ranuzzi, who profitably exploited Morandi's international acclaim.

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