things, even if we find them useful and practically indispensable:

One reason is that typically the presumed existence of such entities renders inconsistent either the theory in which they occur or another related theory. Given that consistency is one of the more important virtues of scientific theories, any entity that renders the best available theory inconsistent is unlikely to be indispensable to that theory (no matter how useful it is) because there exists a better theory (i.e., a consistent theory) that does not quantify over the entity in question. (p. 99)

This better, consistent theory presumably combines the virtues of the ‘best available’ theory and the value we get from the added fictions. But in what sense does the improved theory exist? Typically, it does not exist in the sense that actual scientists have formulated such a theory. If they had, the theory with the idealizations and fictions would not be the ‘best available’. So here Colyvan seems to opt for supposedly improved scientific theories that scientists could develop over the actually accepted best theories.

Overall, this book is provocative and interesting, and we look forward to more substantial articles treating its main thesis and arguments. One important, lasting value of the book is that it presents a clear picture of what the Quinean world view is like, since Quine’s own pronouncements on indispensability are scattered throughout his writings. While reading this book, it seemed to us that Colyvan was biting bullet after bullet. But we recognize that what looks like a bitten bullet to one philosopher can seem like a natural, smooth, and nearly obvious thesis to another.

Department of Philosophy
The Ohio State University
350 University Hall
230 N. Oval Mall
Columbus, Ohio 43210
USA

JULIAN COLE
STEWARD SHAPIRO


Stephen Gaukroger tells us that this book is a companion to his Francis Bacon and the Transformation of Early Modern Philosophy (Cambridge: Cambridge University Press, 2001), the two projects going together in that both Descartes and Bacon ‘see natural philosophy as the core of the philosophical enterprise’ (p. vii), in contrast with the scholastic and humanist concerns with metaphysics and moral philosophy respectively. Gaukroger reads Descartes as a natural philosopher for whom metaphysics exists only to legitimize his natural philosophy and rule out its rivals. This reading, which gets spelled out via an interpretation and partial reconstruction of Descartes’s Principia Philosophiae, involves Gaukroger in two main claims.
The first is that Descartes's metaphysics is not a method of discovery and is not something from which substantive natural philosophical conclusions can be inferred; rather, it was produced afterwards in order to guarantee the acceptance of that natural philosophy, so that metaphysics is taking its questions from natural philosophy. (In this vein, Gaukroger quotes Descartes telling Burman that he ‘should not devote so much effort to the Meditations and to metaphysical questions … [or] to dig more deeply into these questions than the author did … [For] it is sufficient to have grasped them once in a general way, and then to remember the conclusion’ (p. 65, citing Charles Adam and Paul Tannery (eds), Oeuvres de Descartes, 2nd edn, Paris: Vrin, 1974–86, vol. 5, p. 165).) I find Gaukroger’s argument here convincing and its conclusion helpful.

The second main thesis, rather more difficult to formulate precisely, holds that we should de-emphasize metaphysics in thinking about Descartes (just as we have already learned to de-emphasize epistemology), and pay rather more attention to his guiding concern of formulating a comprehensive system of natural philosophy. Gaukroger suggests that a principal reason for the literature’s emphasis on metaphysical questions is the mistaken belief that Descartes’s metaphysics provides the foundations on which his physics is constructed. While the relative importance of that belief in guiding metaphysical readings of Descartes is debatable, the suggestion that we should pay rather more attention to Cartesian natural philosophy than we do is well-taken. Although this suggestion has been around for some time, it still gets rather more lip service than due respect; moreover, when attention is placed on Descartes’s natural philosophy it is almost always the physics which is at issue. Readers alarmed by Gaukroger’s easy reference to how problematic Descartes’s metaphysics is may, I fear, pay less heed to these sensible suggestions than they should. Indeed, Gaukroger tends to minimize Descartes’s concern with metaphysics rather more than is necessary to make his point: the issue is not so much the relative unimportance of metaphysics as the centrality of natural philosophy.

These two principal claims are argued for mainly implicitly, through giving a careful and reasonably detailed survey of Cartesian natural philosophy. This sort of overview of Descartes’s philosophy is something we badly needed, and it is fortunate that it has been taken up by someone with as much knowledge of Cartesian science—and in fact early modern science generally—as Gaukroger. He begins with a brief overview of Descartes’s natural-philosophical work before the Principia; this mainly rehearses material from his earlier Descartes: An Intellectual Biography (Oxford: Clarendon Press, 1995), and tends to be rather slow going by comparison with the later parts of the book. Next, Gaukroger looks at the scholastic textbook background in an attempt to provide an explanation of why Descartes—who had so scornfully rejected scholasticism earlier—chose to present the material of the Principles in a traditional textbook form. Of greatest interest here, I found, was the discus-
sion of pre-Cartesian debates about the relationship between theology, metaphysics and natural philosophy, debates which aim to figure out what determines the questions asked by metaphysics and what the constraints on acceptable answers are. Here I found myself wishing for a more extended treatment.

This more or less introductory material is followed by a series of chapters devoted to each of the four parts of the *Principles*, as well as two which reconstruct the planned but never written fifth and sixth parts, on living things and on man. The discussion of Part I focuses mainly on the doctrines of clear and distinct perception and of substance, the two main features not simply carried over from *Le Monde*. While it would have been nice to have more detail, especially concerning the central notion of essence, this section serves the purposes of the book reasonably well. Indeed, one ought not expect extended metaphysical grappling in a book which argues that we greatly overestimate the importance of metaphysical issues in Descartes's thinking.

Two main themes emerge in the discussion of Part II of the *Principles*: the way Cartesian natural science combines matter theory with mechanics; and the relationship between kinematical and dynamical considerations in Descartes's physics. Gaukroger argues that Descartes's earlier works develop a physical theory in terms of an underlying dynamics, while in the *Principia* Descartes attempts to rewrite the already developed physical theory in terms of a new, more stringent, more economical vocabulary, which has recourse only to geometrically definable notions (p. 113). This is required for the physical theory to be justified by the clear and distinct perceptions central to Descartes's project of legitimization. Since kinematical considerations were always present to some degree, Gaukroger argues, what's new in the *Principia* is the attempt to make the theory work in terms of kinematics alone. Gaukroger takes this attempt to be only partially successful, for, he argues, the dynamical underpinnings resurface in the fourth rule of motion and the discussion of centrifugal force.

Gaukroger then turns briefly to Descartes's account of the visible universe, paying special attention to the development and resources of vortex theory. One point of interest is the following. It is often suspected that Descartes's avoidance of any direct proclamation that the earth moves is designed to avoid the problems Galileo faced. Gaukroger argues that this suspicion is entirely ill-founded: the doctrine of relative motion on which Descartes's move is based is entirely central to his project, and in any case, there is so much else in *Principia* III—such as the account of the death of stars—which would have been unacceptable to the Roman Inquisition that self-protective motives cannot credibly be ascribed to Descartes here. The discussion of *Principia* IV is equally brief, which is a shame, for the material on the earth—including tides, magnetism, static electricity, and so on—is the least discussed by scholars of anything in the *Principia*. One of Gaukroger's aims here is to show how Descartes trades off between mechanistic, quantitative explanations and purely qualitative matter-theoretic ones. Hence he draws attention to Descartes's purely qualitative
explanations, such as the explanation of the qualities of glass in terms of the shape of its corpuscles, as well as to explanations like the explanation of magnetism which bring the two together. This Epicurean tendency in Cartesian science is seldom discussed and Gaukroger’s account of it is very helpful.

Finally, Gaukroger gives a reconstruction of the missing discussion of living things and man. Cartesian physiology is supposed to provide a mechanist alternative to teleological or hylomorphic accounts and to accounts which rely on qualitative differences within matter. The two main cases Gaukroger considers for the success of this alternative are fetal development and perception, but my concern is exclusively with the latter. Gaukroger argues that the ‘beast machine’ doctrine is widely misunderstood: ‘Descartes does not deny that there are [sentient and cognitive states in animals] but rather attempts to offer a mechanist account of them’ (p. 181). The key here is understanding what ‘sentient and cognitive states’ are supposed to be. Gaukroger glosses cognition as ‘… those cognitive processes working by means of a cognitive representation …’ (p. 184). This rules out reflex action but is otherwise unhelpful since it is no clearer what a cognitive representation is than what cognition is. At times Gaukroger’s accounts suggests that a ‘cognitive representation’ is simply a trace on the surface of the pineal gland. If this is so, then the claim that animals sense and cognize is controversial only semantically, for it is not in dispute that animals have ‘ideas’ in the sense of physical traces in the brain. To call this the thesis that animals cognize strikes me as somewhat misleading, since ‘cognition’ is awfully close to the ‘thought’ Principles I.9 requires awareness—something which animals lack even on Gaukroger’s reading. But if by ‘cognitive representation’ Gaukroger means something intentional produced by or concomitant with that physical trace, then it is hard to see how his Descartes could really be said to have produced a plausible explanation of it in mechanist terms—or, for that matter, that he intended to do so.

Despite this worry—and a rather more minor one about how the initial, and intriguing, framing of the project in terms of Bacon and the reshaping of cognitive values falls out of the picture—the book is much recommended. *Descartes’ System* performs a badly needed job proficiently, and everyone who cares about Descartes or early modern natural philosophy should read it. Let me conclude by noting that it would be a very good choice for more advanced students coming to the study of Descartes: in addition to being the best extant way to get a basic understanding of Descartes’s natural philosophy, Gaukroger’s over-arching argument would be a nice corrective to the ‘metaphysics and epistemology’ focus which Descartes is often approached with. Furthermore, it is to be praised for the readability engendered by Gaukroger’s clear prose and careful organization.

Corcoran Department of Philosophy
University of Virginia
Charlottesville, VA 22904
USA

Antonia Lolordo