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Matthew L. Jones, *The Good Life in the Scientific Revolution: Descartes, Pascal, Leibniz, and the Cultivation of Virtue*. Chicago: The University of Chicago Press, 2006. xvii + 384 pp. Bibliography and index. $27.50 U.S. (pb). ISBN 978-0-226-40955-9.

Review by Michael Wolfe, Pennsylvania State University, Altoona.

"Better living through mathematics" might make a good advertising slogan for Matthew Jones' very interesting new book if Madison Avenue handled its marketing. Serious-minded and well-reasoned, this important study unpacks intellectual history the old-fashioned and still quite worthwhile way by focusing on context and close *explication du texte*. As theological controversies raged and scholastic Aristotelianism declined, new directions of thought based on mathematical reasoning developed in seventeenth-century elite culture in an effort to formulate new epistemic foundations upon which to base rational thought and moral choice. With the exception of Sir Isaac Newton, who curiously wins only slight mention in the odd note, no three intellects stand out more in this crucial project of early modern philosophy than René Descartes, Blaise Pascal, and Gottfried Wilhelm Leibniz.[1] Their respective innovations in mathematics and metaphysical philosophy, as Jones carefully demonstrates in his fascinating analysis, held critical implications for humanity's capacity to remedy its faults and thus pave the way for a life of virtue.

In lesser hands, this story might devolve into a clumsy dialect, with Descartes and Pascal staking out antithetical positions on humanity's potential for perfection--one brimming with hope and the other decidedly not--with Leibnitz arriving as the all-crucial synthesizer who set the stage for the measured optimism of the eighteenth-century Enlightenment. In a nutshell, however, that is essentially where the argument goes. The book opens with two chapters on Descartes, focusing on lesser-known texts such as the *Géometrie* (1637). Jones reminds us of the profound influences the Jesuits had on Descartes, who studied under them at La Flèche; indeed, he presents the genesis of Cartesian rationalism in the broader context of Catholic Reformation theology. In the spirit of Loyola, Descartes enjoined individuals to steel their minds and thus prepare their souls with the bracing discipline of rigorous mathematical exercise. Individuals habituated to these new modes of deductive reasoning cultivated the discernment necessary to choose among philosophical doctrines and practices in order to pursue the good life or *honnêteté*. Though couched in the language of geometric proof, Descartes' vision of *honnêteté* cleaved closely to the Neostoic views then popular in erudite circles of his day.[3]

Descartes hoped his method of clear thinking would lead to educational reform that replaced mindless rote procedures of calculation with the habits of rational insight and moral discrimination gained through mindful practice of his new mathematics. He influenced Oratorians and Port Royal thinkers to devise new pedagogies based on elementary geometry. Even as it later lost its philosophical cache, Cartesianism thus became institutionalized in French school curricula to exert a powerful effect on subsequent generations of boys and, eventually, girls. It is doubtful Descartes would have been pleased with this outcome, for his famous subjectivist solution to the problems of knowledge sought to cultivate independent minds, not ratio-centric conformists.[4] The key to finding agreement among such liberated clear thinkers was to base all knowledge, be it intuitive or deductive, upon evidence on which the new mathematics compelled subjective individuals to agree. Descartes turned to classical rhetoric--particularly the notion of *ingenium*--as interpreted by scholastic thinkers to persuade his readers to embrace in their imaginations the "clear and distinct" knowledge proposed by algebraic calculations.[5]

For Descartes, the new mathematics became folded into the arts of mimesis to describe a material reality that was inherently mechanical and mathematically demonstrable to the mind. But contradictions persisted as the liberating new rhetoric and psychological subjectivism Descartes promoted effectively undermined the intellectual underpinnings of Tridentine theology, which sought to reaffirm the church's *magisterium*, not individual consciousness, as the touchstone for determining truth and the "good life."

Blaise Pascal wrestled with many of the same problems of faith and physics but arrived at radically different solutions. As he does with Descartes, Jones situates Pascal in a vibrant milieu of fellow thinkers, whose works he read and with whom he often conversed. Based on these exchanges, Pascal, too, thought good mathematics exercises the mind; but rather than reveal "clear and distinct" ideas to the skeptic, it enhanced one's ability to relate apparently disparate objects through a multiplicity of expressions. Instead of empowering individual subjectivity to arrive at certain truth, Pascal concluded that mathematical reasoning led *honnêtes hommes* to recognize and accept the limits of humanity's ability to know ultimate reality. The human intellect represented an amalgam of what Pascal called the mathematical mind (*esprit de géometrie*), the sound mind (*esprit de justice*), and the intuitive mind (*esprit de finesse*), as he sketched out in his celebrated *Pensées.* Although God structured the universe in mathematical forms, mathematics did not vouchsafe the underlying causes behind its operation. That which we dimly perceived could never be ultimately known, as mathematics revealed rather than bridged the ineffable, awful distance between humanity and God.[6] Where algebraic geometry led Descartes to discern "clear and distinct" knowledge, Pascal's celebrated arithmetical triangle opened up an unlimited proliferation of numerical relationships that forced the individual to keep in mind many principles without reducing or confusing them. Unlike Descartes, who called for mathematics to replace propositions explained by language, Pascal emphasized the paucity of the linguistic expressions used to relate these numerical relationships.

Descartes and Pascal parted company less on mathematics and more on differences over the nature of language. Pascal's ferocious attack in his *Lettres provinciales* on Jesuit scholastic philosophers and rhetoricians, upon whom Descartes relied so heavily, turned on their fallacious confusion of nominal definitions of essences with demonstrable propositions about them. The result, epitomized in the Jesuits' casuistical science of probabilism, was both hubris and delusion, not knowledge, however limited and artificial it might be. A nominal definition for Pascal served simply as a heuristic that modeled rather than captured the essence of the object it defined, be it a number, line, time, space, or God. The ensuing connections produced between objects of mathematics and of nature found their fullest expression for Pascal in the existence of the two infinities--one of greatness, one of smallness--between which individuals, like tiny "thinking reeds" (*Pensées,* frag. 347), bent to contemplate but not fully comprehend all that lies beyond human reason. If properly used, mathematics enables us to see the unutterable disproportion between our yearning desire and paltry ability to know ultimate truths, a paradoxical condition that Pascal likened to the monstrous. Given our existential condition, Pascal concluded, we really strive for consolation, not certainty, in the search for a good life. Such solace could only be found in doctrines that captured this paradox by pointing to forms of understanding beyond reason. For Pascal, touched to the core after his famous night of fire, only the mysteries of Christianity offered hope in the face of the abyss mathematics revealed.

The problem of whether the symbolic expressions found in language and mathematics could ever constitute legitimate knowledge formed the Holy Grail which Gottfried Wilhelm Leibniz believed he found with the invention of his calculus. Whereas Pascal saw proliferating mathematical relationships among objects in an infinite universe, Leibniz discovered in his quadrature of the circle a means of expressing an infinite series--triangles in the case of squaring the circle--as a progressive ratio rather than a fixed numerical quantity. Although Leibniz still insisted upon the symbolic character of these expressions, he thought that knowing the rule or *rationes* behind such progressions enabled properly trained individuals to intuit simultaneously many complex truths "clearly and distinctly" without the extraneous calculations necessitated by Descartes' method of geometrical construction. The calculus thus served as a "transmutative heuristic" (p. 177) that augmented the human deficiencies that Pascal considered both natural and immutable. Leibniz, on the other hand, saw his form of reducing an infinite series to a formula of value as the key to realizing the old Platonic dream of discovering the universal harmony inherent in the seemingly discordant diversity of phenomenal reality, the metaphysics of which he later explored in his *Monadology* (1714). Leibniz fervently believed society could be greatly improved if diverse perspectives could be harmonized into a unified form of comprehension. Past causes for human conflict and misery could be overcome and the way paved for a new harmonious Christian Europe. A novel, more powerful system of symbolic notation in mathematics thus became necessary, predicated on expressing a perspective from which one could see all at once.

Leibniz spent many years exploring the rich literature on perspective--in particular optical games and machines--to understand more fully the underlying natural laws and rules expressed in the calculus. His stated goal was to devise a "compendium," as he called it, of all the various representational techniques that communicated (and thus reconciled) many, many different things together into one expression. Although Leibniz conceded humans could still not obtain intuitive knowledge of complex things, they could through these means at least gain partial knowledge of their essences. In doing so, humans did not begin to see the world as God, who alone possessed all possible views simultaneously. Indeed, Leibniz used the analogy of bird's-eye views of cityscapes, which enabled one to regard a town from various sides, to clarify the differences between divine and human knowledge. The accumulation of human insights over time represented a vital, yet still meager, portion of all the necessarily infinite possibilities (and thus perspectives) available to God. While humans cannot become God-like, they worship God most fittingly when they strive to understand more fully (though never completely) the beauty of creation, its harmonies, and its underlying rules as expressed in modern science. Such an understanding based on improved formal systems of reasoning will bring about human improvement, Leibniz argued as he labored long and hard on devising inventories to aid experimental investigation and discovery. In the process, he made a number of singular contributions to Cameralist theory and practice, for Leibniz was both a utopian dreamer and a technocrat *avant la lettre*.

Matthew Jones offers a very rich and intricate exploration of the critical philosophical roots of modernity. He reminds us that the new forms of mathematical reasoning in the Scientific Revolution--the algebraic geometry of Descartes, the arithmetical triangle of Pascal, and Leibniz's accounts of differential and integral calculus--redefined in sometimes hopeful, sometimes disquieting ways humanity's capacity to know its own nature and the wider reality beyond it. The possibility--if not the urgency--of such knowledge bore directly on the moral choices humanity had to make if it ever hoped to cultivate virtue and realize a good life. Looking back from the early twenty-first century, we may with dismay be tempted to conclude that the new science promised too much.

NOTES

[1] Although it appeared after Jones' book went to press, the essays in Conal Condren, Stephen Gaukroger, and Ian Hunter, eds., *The Philosopher in Early Modern Europe: The Nature of a Contested Identity* (Cambridge, U.K. and New York: Cambridge University Press, 2006), focus on the themes of self-cultivation and personal subjectivity (*persona*) in the work of a number of other important early modern thinkers.

[2] See, in particular, Gerhard Oestreich, *Neostoicism and the Early Modern State*, trans. David McLintock (Cambridge, U.K.: Cambridge University Press, 1982); Mark Morford, *Stoics and Neostoics:*

Rubens and the Circle of Lipsius (Princeton, N.J.: Princeton University Press, 1991); and the essays in J.-P Moreau, ed., *Le stoïcisme au XVIe et au XVIIe siècle* (Paris: Albin Michel, 1999).

[3] In this respect, as he fully acknowledges, Jones builds upon the seminal work of Stephen Gaukroger, particular his *Cartesian Logic: An Essay on Descartes's Conception of Inference* (Oxford, U.K. and New York: Oxford University Press, 1989).

[4] See François Azouvi, *Descartes et la France: Histoire d'une passion nationale* (Paris: Fayard, 2001).

[5] Part of this crucial change occurred as a result of the shifting ontology of number, an aspect that Jones does not perhaps sufficiently stress. See on this subject the recent essay by Rivka Feldhay, "Mathematical Entities in Scientific Discourse: Paulus Guldin and His *Dissertatio de Motu Terrae*," in Lorraine Daston, ed., *Biographies of Scientific Objects* (Chicago: The University of Chicago Press, 2000), pp. 42-66.

[6] Still worth reading on this subject is Lucien Goldmann's *Le Dieu caché. Étude sur la vision tragique dans les Pensées de Pascal et dans le théâtre de Racine* (Paris: Gallimard, 1983), originally published in 1959.

[7] John Locke, while not employing mathematics, also raised questions about the reality and stability of words. See Hannah Dawson's study, *Locke, Language and Early-Modern Philosophy* (Cambridge, U.K. and New York: Cambridge University Press, 2007).

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