Before Voltaire: The French Origins of "Newtonian" Mechanics, 1680–1715. By *J. B. Shank*.

Chicago: University of Chicago Press, 2018. Pp. xii+444. $55.00 (cloth); $10.00 to 55.00 (e-book).

The central figure in J. B. Shank's book is the French priest and mathematical savant Pierre Varignon, who wrote a series of memoirs around 1700 that established the paradigm for analytical mechanics as it was pursued in the eighteenth century. Decades later Voltaire would extol Isaac Newton as the exemplar of Enlightenment mathematical science, an evaluation that overlooked the achievement and significance of French work early in the century. Shank's aim is to document the crucial period of development from 1680 to 1715 in which the new Leibnizian calculus became an essential tool and led the way to the creation of French analytical mechanics. The book explores the evolving intellectual, cultural, and political circumstances associated with this development. Shank draws on relevant historical literature, especially the writings of Niccolò Guicciardini on Newton and Michel Blay on Varignon, but does not engage directly with the subject on the level of theorems or solutions to problems. The book is exhaustively researched, highly informative, and a valuable contribution to the history of early modern exact science. It is a worthy successor to the author's earlier book on Voltaire and the dissemination of Newtonianism in France.

Shank's book is divided in three parts. Part 1 examines the Académie Royale des Sciences and the creation of an institutional infrastructure for scientific research. An important figure here was the Oratorian Jean-Paul Bignon who spearheaded a series of changes beginning in 1691 and culminating in reforms of 1699 that contributed to a more meritocratic and less courtly ethos for doing science. Shank refers to Bignon as "an astonishingly understudied figure" (84). The second part examines the broader intellectual context of mathematical science at the end of the century. A thinker who looms large here is Nicolas Malebranche, who embodied Oratorian rational and liberal thinking and was a central figure in contemporary Cartesianism. In his *Recherche sur la verité* Malebranche expounded an arithmetic form of mathematical Cartesianism, with some strikingly modern resonances, although this tendency was attenuated in his later writings. Shank contends that Malebranche through his position in the public sphere exerted a major influence on French scientific culture in the years around 1700.

The third part turns to an examination of the creation and reception of analytical mechanics. Included here is an extended account of the opposition Varignon and supporters of the new infinitesimal mathematics encountered in the Paris Academy. Leaders of this opposition were Jean Gallois and his younger and more vigorous colleague Michel Rolle. An important figure in modulating the debate was the perpetual secretary of the Academy Bernard de Fontenelle. The dispute had several facets, involving on the one hand differences between the methods and outlook of the ancients and the more innovative approach of the moderns, on the other conflicting perceptions of the character and significance of Newton's *Principia mathematica*. The various twists and turns of the "querelle des infiniment petits" are laid out in detail, with particular attention to the academic political dimensions of the conflict, the public culture of science, and the role Jesuit negative attitudes to infinitesimal mathematics played. In places it is difficult without more details of Rolle's criticisms to get a sense for the underlying issues. For example, a memoir by Varignon from 1799 on the solution of equations (discussed on 264) was opposed by Rolle, but there is not enough information about the contents of Varignon's memoir or Rolle's criticisms to understand the nature of their disagreement. Although Rolle is depicted as a committed algebraist, there are no concrete examples of his mathematical work, and the overall picture of him as a mathematician remains somewhat murky. Shank does assert that Rolle wanted nothing to do with Descartes's analytic geometry. This fact alone would have made him a highly marginal figure within contemporary mathematics, quite apart from any objections he may have had to infinitesimals. In any case, by 1706 there was a rapprochement of sorts between Rolle and the infinitesimalists, a cease-fire that was in no small part brokered by Fontenelle. For all the importance of political and contextual factors, at the end of the day the consolidation of analytical mechanics owed its success to its robust mathematical character and the novel solutions it generated to problems in geometry and physics.

Although the book's primary focus is on mathematical physics rather than on mathematics as such, the two subjects were interwoven at a more basic level than they are in modern science. Shank calls attention to the distinctive historicist turn in the history of mathematics over the past half century, a development that has extended well beyond the historiography of the early calculus. He mistakenly believes that the use of formulas by Varignon and his contemporaries amounted to a radical step in the direction of a pictureless abstract mathematical science. In fact, the early calculus relied heavily on diagrammatic representations and intuitions of spatial continuity. Nowhere is this more evident than in Varignon's writings themselves, as I have discussed elsewhere ("Mathematics," in *The Cambridge History of Science*, vol. 4, *Eighteenth-Century Science*, ed. Roy Porter [2003], 305–27). The geometric cast of the new analysis circa 1700 allowed it to be experienced intellectually as an interpreted, meaningful body of mathematics. By contrast, the algebraic calculus of Leonhard Euler and Joseph-Louis Lagrange that appeared in the second half of the century was rooted in the formal study of functional equations, algorithms, and operations on variables. The values that these variables received, their numerical or geometrical interpretation, was logically of secondary concern. Lagrange's curious conception should in turn be contrasted with the more conceptual and intensional mode of reasoning that was characteristic of classical real analysis, the field that developed in the nineteenth century and became the foundation of modern calculus. In a certain sense the nineteenth-century foundation was more closely aligned intellectually to the early calculus of the Académie des Sciences than it was to its immediate Eulerian and Lagrangian antecedents.

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In Pursuit of Politics: Education and Revolution in Eighteenth-Century France. By *Adrian O'Connor*. Studies in Modern French History. Edited by *David Hopkin* and *Máire Cross*.
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Introducing his book on the debates about public instruction in late Enlightenment and Revolutionary France, *In Pursuit of Politics*, Adrian O'Connor considers for a moment whether he might be tracing "the history of a failure" (14): the story of innovative schools that went unbuilt, national plans that never got off the page, and political impasses never surmounted. Eighteenth-century France echoed with pronouncements about national education that bequeathed relatively little educational infrastructure to the future. O'Connor opens his book's prologue on "The educational 'system' of eighteenth-century France" with the blunt assessment "There was no 'system' of education in Ancien Régime France" (18). The same might be said at the end of the final chapter, when the Bouquier