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Janis Langins, *Conserving the Enlightenment: French Military Engineering from Vauban to the Revolution*. Cambridge Mass.: The MIT Press, 2004. xi + 532 pp. Figures, notes, bibliography, and index. \$55 U.S. (cl). ISBN 0-262-12258-8.

Review by Douglas C. Baxter, Ohio University.

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Janis Langins provides a splendid examination of the eighteenth-century *corps du génie*, or the Royal Corps of Military Engineers concerned with fortification.[1] Although he provides a lengthy background in part one, "The Setting," which describes the history of French military fortification from its Renaissance roots, through the triumphs of the marquis de Vauban, to the corps's institutional setting in the first part of the eighteenth-century, as well as a description of engineering activities in war and peace (part two, "Life and Death in the Corps"), these are only backdrops to his real focus. Langins is primarily interested in the crisis faced by the corps in the 1770s and 1780s, the crucial decades before the Revolution, when the corps faced its harshest critic, Marc-René, the marquis de Montalembert, who accused the corps of hide-bound conservatism and even urged its abolition. The corps survived this attack and two military engineers, including Lazare Carnot, even played an important role in saving the Revolution as members of the Committee of Public Safety.

Yet, while Langins spends much time in describing the institution of the military engineers, his real interest is the interface of technology and society. He deftly explores the scientific minds of these fortification engineers, their military and engineering ideals, and their acceptance of the scientific principles of the Enlightenment, in order to examine how the engineers met the challenge of changes in science and warfare in Old Regime France. Consequently, while he has examined a wide variety of archival sources at the Archives Nationales, the Bibliothèque Nationale, the Bibliothèque de l'École Nationale des Ponts et Chaussées, the Musée des Plans-Reliefs at the Invalides, and especially the military archives of the Service Historique de l'Armée du Terre (SHAT) at Vincennes, his point of departure is not administrative correspondence, but the "often ephemeral technical papers, memoranda, engineering texts, and syllabi," (p. 5) as well as the polemical works, produced in the debate with the marquis de Montalembert. Overall, given his solid command of military technology and the art of fortification, Langins successfully wears two hats, that of military historian and historian of science. He concerns himself with the wider relation of the military to society, as well as the interaction of science and technology.[2] Langins ends his book with thoughtful comments about changes in the science of engineering today, reflecting upon the work of Thomas Parke Hughes, and others.[3]

Langins begins his account with the origins of military engineering in Renaissance France. Foreign, that is Italian, soldier-architects soon gave way to French-speaking engineers such as Jean Errand de Bar-le-Duc (the so-called father of French fortification) at the beginning of the seventeenth century, and culminating in the giant among Louis XIV's engineers, Sébastien Le Prestre de Vauban, who overshadowed all others by the number of his fortifications, his successful sieges, his experience gained during his long life, and especially his close relationship to Louis XIV and his war minister Louvois. Langins provides a careful description of the major features of Vauban's military architecture as it evolved (the so-called three systems), emphasizing geometrical shape, depth of defense, and outlying bastions, although Langins reminds us that Vauban's importance in this domain lies in his engineering achievements, not as a systematic writer on fortification. Nonetheless, throughout the eighteenth century, Vauban's work, or perceptions of his work, became the canon for military fortification and was vigorously defended by the corps. Langins also rightly credits Vauban with being the real father of the

engineering corps. For example, Vauban was a crucial innovator in requiring examination in mathematics and drawing before admission to the corps. This emphasis developed into the important military school at Mézières, founded in 1748, which taught the principles of engineering and served to introduce physics and advanced mathematics to the engineers, although, for a good part of the century, military engineers required little more than a grasp of arithmetic, because few fortifications were built in the early eighteenth century and those were designed by the director general of fortification and largely left to contractors. The military engineers ended up with routine tasks such as oversight of construction and financial management. While this mundane work was at odds with the spirit of military glory, their talent, hard work, attention to detail, and experience fostered bureaucratization and increased professionalism that made them a loyal arm of the state. Indeed, Langins rightly acknowledges, this attention to detail, training, and work ethic are the heart of modern engineering (pp. 407-408).

Langins real interest is the challenge that the military engineers faced in the 1770s-1780s. This period of "turmoil," as he terms it, intersected with larger crises going on in the army as well as in old regime society as Enlightenment principles such as merit and progress challenged the role of the aristocratic elite and the nature of government. Military engineers faced that modern cliché, an identity crisis. They sought to be recognized as army officers as well as engineers, although traditional line officers often sneered at their pretensions. In addition, they faced rivalry from the corps of civil engineers, graduates of the prestigious *École des Ponts et Chaussées*, often employed at public construction sites, particularly in coastal regions. Indeed, this corps of civil engineers enjoyed considerable advantages over the fortification engineers because of their direction by the *Contrôle générale des finances*, the corps' own talented leadership, and their construction experience across France. At the end of the old regime, this corps even obtained the privilege of port construction over the corps of military engineers. The military engineers by contrast never achieved the higher echelons of military administration in the war department and faced at least five major administrative reorganizations from their formation in 1691 to the Revolution in 1791.

At the same time changes in warfare occurred. Under the impetus of military failure in the Seven Years' War, the army sought to reform itself. The military began to standardize and integrate its weaponry using the ideas of Jean-Baptiste Gribeauval, culminating in more mobile field artillery. It also came to accept the ideas of Jacques Guibert in tactics. Guibert supported fighting wars of movement rather than defensive fortifications. Such tactics devalued the importance of the corps at the same time that the Enlightenment's confidence in the Scientific Revolution produced an ideal of scientific engineering involving greater knowledge of mathematics. Although most military engineers actually used little mathematics, engineers came to prize the language of mathematics, which Langins persuasively argues provided a foundation for the future advances of nineteenth-century engineering. The Enlightenment with its belief in progress and modernity also undermined the traditional guild mentality of the corps that emphasized its unique expertise and a code of secrecy. Younger military engineers began to chafe at the dominance of the older leadership.

Reform in the engineering corps, however, was unsuccessful, despite the challenge of a talented amateur, the marquis of Montalembert. For Langins, Montalembert's defiance is a key to understanding the predicament of eighteenth-century engineers. The marquis, an army officer and "armchair engineer," criticized the older ideas of military architecture attributed to Vauban, proposing the elimination of bastions and their replacement by a perpendicular trace, increased cannon covered by casements, multiple story gun towers, and a ring of smaller forts surrounding a major fortification. Perhaps his most original contribution was that firepower, the artillery, was the key component in fortification. His ideas were a mixture of the marquis's own inventive mind and earlier, often foreign, antecedents. Montalembert attacked the corps as hidebound conservatives caught up in the old ways and resistant to change. Worse, he argued, they had become a selfish corporate body who manipulated ministers to maintain their own privileged status. Montalembert was willing to try new ideas, but he also had friends

at court and a skill for bureaucratic infighting. An eloquent writer, the marquis vigorously argued his ideas. The corps, although it replied in tracts and pamphlets, fared less well in the debate. Proponents argued for experience, but like Montalembert accepted the idea that military engineering was a science intelligible to reason. Both appealed to the Royal Academy of Sciences where Montalembert had an advantage as an associate member. Montalembert had less success when given an opportunity to try out his ideas in practice. He designed a fortification for the Isle of Aix near Rochefort, but he faced difficulties in the actual construction, in part due to his lack of attention to detail, resulting in delay and cost overruns, as the work dragged on from 1779-1783.

The argument continued on into the Revolution, with Montalembert once again condemning the corps as incompetent, self interested, and now in league with traditionalist ministers. Montalembert attracted supporters such as the marquis de Mirabeau and the young military engineer Lazare Carnot. Montalembert was even asked to direct an overhaul of the corps, but the changing course of revolutionary events doomed this to failure. Moreover, when Carnot came to power, he was more interested in the strategy of aggressive warfare, not defensive fortifications, for after the success of revolutionary armies in the summer of 1794, the French were on the offensive and there was little need or money for fortifications. Montalembert's time had passed. Despite his ability to find new allies in revolutionary France, he brought about no major change in fortification design. As Langins puts it, the corps had won its battle against his ideas. Revolutionary warfare, however, brought important change to the corps. Before the Revolution, the corps consisted of a technical elite of officers without its own troops, but during the Revolution it evolved into a unit with soldiers similar to other army units. At the same time, its military duties also changed. Gone were the glorious days of Vauban when building defensive fortifications brought the corps its fame. Now, while it continued to bring its technical knowledge to sieges, it played an auxiliary role in warfare because the battlefield mattered more in the new war of movement.

Langins concludes that military engineers were socially conservative like other military officers, yet younger engineers were frustrated with the old regime and willing to accept reform. Langins believes that this conservatism was part of what he calls a "pessimistic moral vision" that he sees as the core of a military elite: attention to detail, distrust of grand schemes, and fatalism. By nature interested in operation--organizational management, rather than design--military engineers were wary of Montalembert with his grandiose vision and lack of concern for detail (p. 408).

Langins's final (and fourteenth) chapter is the most theoretical of the work. He argues that his findings modify the work of Ken Alder on artillery officers during the Revolution, namely, that artillery officers successfully imposed their vision of rationality, meritocracy, and service to the state, on the Revolution. Langins takes the position that the effect of military engineers was more limited. They were essentially conservative and leery of innovation although accepting Enlightenment ideals. In Langins's opinion, engineers--by nature--are never rebels, for they are forced to consider the social and the material, the role of technology in society and the humans involved (pp. 426-27). Finally, in a brief coda, Langins looks to the state of engineering at present, commenting on recent scholarship that suggests modern engineering is facing a crisis today, as it once faced a crisis in the eighteenth century. While this is beyond the realm of a historian, Langins' comments are lucid.

Overall, this is a well argued and perceptive work. One might question whether Langins spends too much time--one hundred and fifty pages--on the history of military fortification in seventeenth and early eighteenth centuries before his late century crisis. In some ways, Langins appears to be writing two books, one a survey of military engineering, largely based upon secondary sources, while the other, much the larger part of the work, focuses on the challenges of Montalembert. Yet, for most readers, this survey, while overly detailed, helps one better understand the crisis of the 1770s and 1780s. Langins's

focus is not on the Revolution itself, although he does carry on the pamphleteering debate between Montalembert and his critics in the corps up to Montalembert's death in 1800, and ends with a brief assessment of changes in the corps. Certainly, Langins's account is modern and up-to-date, and far more detailed than Anne Blanchard's classic 1979 work on the corps, which concentrates on a social analysis of members of the corps, although it does provide an institutional survey.[4]

Although Langins offers a comprehensive list of secondary sources, some items are missing that might have strengthened his work. Langins, at two different points (pp. 68-69, 126), comments on the relationship of military engineering to gardens at Versailles, without citing the work of Chandra Mukeriji on the military architecture enshrined at Versailles, which would have complemented Langins nicely.[5] In the same way, Langins mentions in passing the "Military Revolution" debate in connection with Geoffrey Parker's contribution, without reference to more recent work than 1990. Indeed there is no mention of the prolific Jeremy Black or his many writings on the military scene in the eighteenth century.[6] Moreover, Langins appears to accept the traditional picture of seventeenth-century absolutism, without acknowledging its critics.

None of these petty considerations distracts from what is in essence a well written and intelligently argued study of eighteenth century military engineers. It will remain a standard work on the subject and it deserves a wide readership.

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## NOTES

[1] Langins reminds us "engineering has never been a coherent profession," (p. 5), referring to the varying specialties that have evolved through time. These divisions characterized old regime France. In addition to the various architects, inspectors of works, and contractors involved in design and construction, that one could loosely call mechanical engineers, the government established a number of elite engineering corps dominating the civil and military sectors. The chief civil engineers constituted the *corps des ponts et chaussées* (road and bridges engineers), although there was also the *corps des mines* (mining engineers). Naval engineers existed as well as topographers (*ingénieurs géographes*), attached to the foreign ministry. In the war department there also existed artillery engineers, so well studied by Ken Alder, in *Engineering the Revolution: Arms and Enlightenment in France, 1763-1815* (Princeton: Princeton University Press, 1997). Langins is concerned with the fortification engineers, who concerned themselves with the construction of defensive fortifications as well as the art of siegecraft. He uses the term "military engineers" for this latter group, and his terminology is followed in this review.

[2] Langins has a joint appointment in the history department and Institute for the History and Philosophy of Science and Technology at the University of Toronto. For a cogent recent discussion on the trends in military history today, see Jeremy Black, *Rethinking Military History* (London and New York: Routledge, 2004).

[3] The technical historian Thomas Parke Hughes has written extensively on technological change; see particularly his *Rescuing Prometheus* (New York: Random House, 1998). For Langins, the most eloquent advocate of the changing engineering world is Rosalind Williams. See her article, "All that is solid melts into air': Historians of technology in the information revolution," *Technology and Culture* 41 (2000): 641-668

[4] Anne Blanchard, *Les ingénieurs du roy de Louis XIV à Louis XVI: étude du corps des fortifications* (Montpellier: Université Paul Valéry, 1979).

[5] Chandra Mukeriji, *Territorial Ambitions and the Gardens of Versailles*. (Cambridge; New York: Cambridge University Press, 1997).

[6] On the Military Revolution, see Clifford J. Rogers, *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe* (Boulder, Co.: Westview Press, 1995). Rogers includes Colin Jones's important article, "The Military Revolution and the Professionalisation of the French Army under the Ancien Regime." Jeremy Black's many works include his brief overview, *A Military Revolution? Military Change and European Society 1550-1800* (Atlantic Highlands, N.J., Humanities Press International, 1991), and *European Warfare, 1660-1815* (New Haven and London: Yale University Press, 1994).

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