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**Leibniz and Dynamics: The Texts of 1692.** By Pierre Costabel. Trans. by R. E. W. Maddison. London: Methuen, 1973. Pp. 141. £3.00

Pierre Costabel's *Leibniz et la dynamique*, which first appeared in French in 1960 is now made more readily available to English readers through the translation of Dr R. E. W. Maddison, Librarian of the Royal Astronomical Society. The work reproduces two texts of Leibniz written in 1692, the manuscripts of which were discovered by Costabel inserted together among unclassified papers in the archives of the Académie des Sciences, Paris. The first memoir, the *Essay de dynamique*, is a copy of a manuscript published by A. Foucher de Careil in 1859 in volume I of the *Oeuvres de Leibniz*. The second is a variation of a text entitled, *Règle générale de la composition des mouvemens* which appeared in the *Journal des sçavans* for 7 September 1693. Although published elsewhere the two texts are of interest to students of Leibniz's dynamics and mathematics, and Pierre Costabel's detailed and valuable discussion places them in historical perspective.

The *Essay de dynamique* is a logically coherent exposition of the concept of 'force' ( $mv^2$ ) as an absolute real entity existing 'intact at every moment' and distinct from the Cartesian 'quantity of motion' which measures successive time-dependent motion. In contrast to earlier papers Leibniz presents his ideas in the form of definitions, axioms, postulates, and propositions. Costabel delineates the increase in sophistication in Leibniz's treatment of the semantic problems in the definition of 'force' in the 1692 *Essay* over his earlier discussions with Abbé Catalan and his 1690 *De causa gravitatis* (*Acta eruditorum*, May 1690). The structure of Leibniz's argument, that mechanical perpetual motion could result if Descartes' quantity of motion  $m|v|$  was conserved, is treated in detail. The appearance of the *Essay* in the files of the Académie des Sciences was the result of an abortive attempt by Leibniz to place it in the hands of Malebranche via the intermediaries Pelisson and Des Billettes.

Costabel stresses the intimate link between the *Essay de dynamique* and the accompanying *Règle générale de la composition des mouvemens*, by showing that Leibniz saw the problem of the motions acting simultaneously on a moving body as a problem in dynamics, treating the moving body not as a geometric point but as a material point endowed with mass. The motion of the center of gravity as a fundamental property of bodies, essential to an understanding of motion, was used by Leibniz in formulating his general rule. Costabel skilfully discusses the logical problems inherent in Leibniz's proof, and his debt to Huygens and Fatio de Duillier.

The value of this book as a history of the development of Leibniz's dynamics during the crucial period 1686–1692 is weakened by a curious failure on the part of Costabel to discuss or even mention the controversy between Leibniz and Denis Papin during the years 1689–91. The *Essay de dynamique* was a recasting of arguments laid out in the 1690 *De causa gravitatis*, first developed as a reply to Papin's 1689 *De gravitatis causa et proprietatibus observationes* (*Acta eruditorum*, April 1689). In both this exchange and the 1692 *Essay* the central issue was the possibility that mechanical perpetual motion could result from the conservation of Descartes' quantity of motion  $m|v|$ . The primary example of perpetual motion (proposition 4), and the substance of propositions 8 and 9 in the *Essay* had appeared in the 1690 reply to Papin. The response of Papin a few months later (*Acta eruditorum*, January 1691) challenged Leibniz's perpetual motion argument by questioning the possibility of transferring all of the 'power' from one of the bodies in the example to the other. This forced Leibniz to write another paper (*Acta eruditorum*, September 1691) defining (unsatisfactorily) the mechanisms of transfer. The *Essay de dynamique* repro-

duced by Costabel was sent to Pelisson on 8 January 1692. It is clearly a result of Leibniz's attempts to clarify and present in a coherent form the issues and arguments raised in his intellectual struggles with Papin.

That Costabel should make no mention of the influence of the Papin controversy on the content of one of his two 'texts of 1692' leaves an important omission in his otherwise competent and thorough analysis of a brief but crucial period in the development of Leibnizian dynamics.

CAROLYN ILTIS

◀ NINETEENTH AND TWENTIETH CENTURIES ▶

**Visionary Physics. Blake's Response to Newton.** By Donald Ault. Chicago and London: University of Chicago Press, 1974. Pp. xv+229. £6.25.

Blake's vehement rejection of 'Bacon & Newton & Locke' and his detestation of 'Newton's sleep' is familiar to students of literature, but the relationship between Blake and Newton has received little detailed analysis. In attempting to provide such an analysis, Professor Ault has written a remarkable book. This is not a conventional study of the influence of scientific ideas on literary expression, but is an attempt to provide an imaginative reconstruction of Blake's cosmology viewed as a visionary transformation of the Newtonian system. Ault suggests that Blake's 'visionary physics' was not simply a rejection of Newtonian physics but a complex inversion of the Newtonian world view. Ault emphasizes the dual nature of Blake's reaction to Newton's system, as a Satanic usurpation of imagination and as providing the materials for his own imaginative construction.

The difficulty with Ault's method is that Blake's system can hardly be meaningfully compared with Newton's. Newton's imaginative vision may have been obscure and esoteric, but it was expressed in mathematical form, whereas Blake's system took shape only on the level of poetic metaphor. This makes Ault's remark that he has sided with Blake, because Blake makes more sense to him than Newton, rather disconcerting to the historian. However, Ault is not essentially concerned with the historical relations between Blake and Newton, stating that 'all that is important is that it is possible to construct a historically viable model or intellectual framework from the perspective of which Blake's relationships to Newton make sense'. Ault avoids discussion of the historical problems of Blake's relationship to Newton, and to the often distinctly anti-Newtonian science of the late eighteenth century. While a historical understanding of Blake's response to Newton will require analysis of these problems, Ault has provided an imaginative analysis of Blake's poetic sensibility.

P. M. HEIMANN

**Conquest of Mind: Phrenology and Victorian Social Thought.** By David de Giustino. London: Croom Helm, 1975. Pp. viii+248. £6.00.

David de Giustino's book should do much to undermine the status of phrenology as a nineteenth-century historian's novelty item, and should make far more untenable phrenology's relegation to the purdah of 'fad and fallacy'. It ought to be clear by now that anyone writing the history of Victorian society, intellectual life, politics, medicine or science should at least be conversant with the language and basic tenets of the phrenological system, for if phrenology was not the single most important set of codified ideas of the period, it was