Review

Reviewed Work(s):

La mécanique de Lagrange: Principes et méthodes

by Wilton Barroso Filho

Review by: Craig Fraser

Source: *Isis*, Vol. 87, No. 2 (Jun., 1996), pp. 364-365

Published by: The University of Chicago Press on behalf of The History of Science Society

Stable URL: https://www.jstor.org/stable/236108

Accessed: 24-10-2024 01:46 UTC

17–18) is not recognized, although the fact that it is an allusion to Diderot is of vital importance for what follows immediately. Again, words like *harmonie* and *oscillation* are technical terms in the iatromechanical literature of the time and should be duly identified if one is to understand, for example, the point made concerning Leibniz on page 64. But there are also downright errors. For example, the name of the person referred to in note 38 (p. 51) is not Grobius, but Gaubius (whose importance for La Mettrie is duly acknowledged in Vartanian's edition and whose work is available in English).

Justin Leiber's introduction is superficial and naive. For example, Friedrich Albert Lange's *Geschichte des Materialismus* is characterized as "a Kantian work in which Lange displays materialism as a naive scientific dogma" (p. 6)—whereas Lange's significance is that he presented a materialistically physiological brand of Kantianism; Bertrand Russell is described as a "dualist" for no other reason than that he speaks of "mind" (p. 14). Moreover, Leiber does not really discuss *L'homme plante;* nor does he explain the relation between *L'homme machine* and *L'homme plante,* so it never becomes clear why the two works were put together in the first place. Finally, after all that has been said about clandestine manuscripts and the Spinozist tradition in France, I am astonished to find nothing on La Mettrie's relation to that tradition.

THEO VERBEEK

Gerta Beaucamp. *Johann Christian Polycarp Erxleben: Versuch einer Biographie und Bibliographie.* (Lichtenberg-Studien, 9.) 87 pp., illus., bibl., index. Göttingen: Wallstein-Verlag, 1994. (Paper.)

In contrast to his Göttingen classmate G. C. Lichtenberg, Johann C. P. Erxleben (1744–1777) will never be mistaken for a major figure in eighteenth-century science. In fact, one of his major claims to historical memory derives from the achievements of his mother, Dorothea Leporin Erxleben (1715–1762), who earned an M.D. from the University of Halle in 1754, an unprecedented accomplishment for a woman in German Central Europe. But the son merits notice too, if only for the combination of interests he represented, for he was a practitioner of natural history in the fullest sense of the word. Erxleben published scholarly articles on mineralogy and the taxonomy of insects and textbooks on chemistry and natural philosophy, and he lectured on a wide variety of subjects first as private lecturer and then as extraordinary professor at Göttingen. Erxleben's most notable accomplishments were in two areas: he developed the first courses in veterinary medicine at Göttingen, and his textbooks met with considerable success. So successful was his introductory textbook of natural philosophy, indeed, that it went through six editions (four of them edited and revised by Lichtenberg) and earned the period's highest publishing award: it was pirated by the Vienna publisher Trattner not once but twice, in two different editions.

Gerta Beaucamp's little volume combines two missions. First, it presents a brief biography of Erxleben. She is hampered in this task by the fact that Erxleben left only a modest literary estate upon his death and there appear to be few surviving letters from him in other repositories. This means that Beaucamp had to depend mostly on the external traces of his life: birth and death records, materials relating to his student days at Göttingen, including the *curriculum vitae* he composed for his graduation, official correspondence with the Hanoverian government about his teaching positions, and, last, his writings. The resulting narrative provides a helpful account of Erxleben's education, interests, and activities. Second, Beaucamp collects a bibliography of Erxleben's published and unpublished writings, along with locations of archival material relating to his scholarly career. I am in no position to judge the completeness of the results here, but she appears to have done her digging with thoroughness.

Scholars of eighteenth-century German science will find this a useful collection of information. What they should not expect to find, however, is much of a guide to secondary literature. In this respect, Beaucamp comes up a bit short. Her portrait of Erxleben does little to put him in the wider contexts of German intellectual life at midcentury, while the secondary literature she does draw on is quite antiquated. Nowhere, for example, does she acknowledge the existence of Karl Hufbauer's work when discussing the reception of Lavoisier's chemistry in Germany. Even more remarkable is her omission of the work of Andreas Kleinert, especially his article on the *Anfangsgründe der Naturlehre,* the textbook produced originally by Erxleben and revised by Lichtenberg. *Caveat lector!*

THOMAS BROMAN

Wilton Barroso Filho. *La mécanique de Lagrange: Principes et méthodes.* 331 pp., figs., bibl. Paris: Karthala, 1994. Fr 180 (paper).

Joseph Louis Lagrange's *Mécanique analytique* of 1788 provided a comprehensive textbook on statics and dynamics based on a general statement of the principle of virtual work. His best-known achievement in this treatise was to derive the invariant form of the differential equations of motion known as the Lagrangian equations. The *Mécanique analytique* also contained many other technical innovations, as well as historical summaries and discussions of the first principles of the subject. It would become a fundamental reference for subsequent research in exact science.

Lagrange's basic approach to mechanics originated in papers published between 1762 and 1782. In 1762 he developed dynamics from the principle of least action, a natural extension of his important and innovative work in the calculus of variations. A few years later he adopted a new approach based on the principle of virtual work or velocities, generalized to dynamics using a form of what is known today as d'Alembert's principle. At this stage he was interested in analyzing the motion of a rigid body, a problem that had arisen in his study of lunar libration. In the *Mécanique analytique* he developed the entire subject—equilibrium conditions, vibrating systems, fluid flow, rigid bodies, machines—from a framework founded on the virtual-work principle.

Wilton Barroso Filho's book provides a discussion of the earlier stages of Lagrange's mechanics as well as an account of his 1788 treatise. He identifies two themes in this story: Lagrange's distinctive algebraic style of theorizing, and his emphasis on reducing the subject to a few fundamental forms and principles. For a reader coming to the history for the first time he provides a useful and detailed introduction to the subject. However, his account tends toward the descriptive rather than the critical, avoiding technical questions that arise in a closer examination of Lagrange's science. For example, no attempt is made to appraise the formulation of the principle of least action in the 1762 Turin paper. As a small number of observers beginning in the nineteenth century have noticed, there are some serious difficulties with Lagrange's principle. He required that both the time of transit and the total live force (i.e., energy) remain unvaried in the variational process, restrictions that render the principle all but useless as a meaningful variational law. As a method for deriving the dynamical equations his procedure reduces to what in later mechanics would be called Hamilton's principle.

Barroso Filho describes in some detail a paper on the differential calculus published by Lagrange in 1759. Neglected in the historical literature, this paper is a rather conventional attempt to derive conditions in the multivariable calculus for a maximum or minimum in terms of the second derivative. Barroso Filho sees it as an instance in which Lagrange used an approach of successive generality, beginning with very simple problems and proceeding in stages to more complicated cases. He views it as preparatory to Lagrange's much more interesting and significant researches in the calculus of variations. It is difficult to know how far one should follow Barroso Filho in this judgment. A more direct and evident source for Lagrange's variational calculus is found in Leonhard Euler's *Methodus inveniendi lineas curvas* of 1744. This work, which founded the calculus of variations as a mathematical theory, contained those problems to which Lagrange first applied his new δ-algorithm. It receives only a brief mention (p. 76) in Barroso Filho's account.

Barroso Filho devotes two chapters to the principle of virtual velocities. To obtain his basic axiom Lagrange supposed—following Jean le Rond d'Alembert—that the applied forces form a system in balance with the inertial reactions; the static rule is then invoked to produce the desired fundamental relation. In this conception dynamics is regarded as a kind of generalized equilibrium. Norton Wise, in a study of British physics in the 1840s, has called attention to the pervasiveness of the image of the balance in Enlightenment scientific thought. Etienne Bonnot de Condillac's conception of algebraic analysis emphasized the balancing of terms on each side of an equation. The high-precision balance was a central laboratory instrument in the chemical revolution of Joseph Priestley, Joseph Black, and Antoine Laurent Lavoisier. A great achievement of eighteenth-century astronomy, Lagrange and Pierre Simon Laplace's theory of planetary perturbations, consisted in establishing the stability of the various three-body systems within the solar system. The *Mécanique analytique* may be viewed as the product of a larger scientific mentality characterized by a neoclassical sense of order and, for all its intellectual vigor, a restricted consciousness of temporal change.

CRAIG FRASER

A. Mandrino; G. Tagliaferri; P. Tucci (Editors). *Un viaggio in Europa nel 1786: Diario di Barnaba Oriani astronomo milanese.* (Biblioteca di Nuncius Studi e Testi, 12.) 225 pp., frontis., illus., figs., bibl., indexes. Florence: Leo S. Olschki, 1994. L 67,000 (paper).

In the spring of 1786, the Milanese astronomer Barnaba Oriani (1752–1832) began a five-month