Borda, Jean-Charles | Encyclopedia.com

(*b*. Dax, France, 4 May 1733; *d*. Paris, France, 19 February 1799)

physics, mathematics.

Borda was the tenth child and the sixth son of the sixteen children of Jean-Antoine de Lacroix. His parents were both of the nobility, and his parental ancestors had been in the military since the early seventeenth century. Borda began his studies at the Collège des Barnabites at Dax, then continued at the Jesuit College de la Fleche. He entered the École du Genie de Mezieres in 1758 and finished the two-year course in one year. Borda scorned religion, at least in his youth, and he never married. While commanding a flotilla of six ships in the Antilles in 1782, Borda was taken prisoner by the English. After this misfortune, his health declined steadily. He was elected a member of the Paris Academie des Sciences in 1756(and of its successor, the Institut de France), the Academie de Bordeaux in 1767, the Academie de Marine in 1769, and the Bureau des Longitudes in 1795. Borda is a major figure in the history of the French navy. He attained the rank of *capitaine de vaisseau*, participated in several scientific voyages and in the American Revolution, and in 1784 was named *inspecteur des constructions, et de l'École des Ingenieurs de vaisseau*.

Borda's most important contributions are his work in fluid mechanics and his development and use of instruments for navigation, geodesy, and the determination of weights and measures. In a series of theoretical and experimental memoirs he studied fluid flow reactions and fluid resistance as applied to artillery, ships, scientific instruments, and hydraulic wheels and pumps. Specifically, he demonstrated that Newton's theory of fluid resistance was untenable and that the resistance is proportional to the square of the fluid velocity and to the sine of the angle of incidence. He introduced the Borda mouthpiece and calculated the coefficient of fluid contraction from an orifice. Borda's use of the principle of conservation of *vis viva* was important as a precursor of Lazare Carnot's work in mechanics.

Borda's development of a surveying instrument, the *cercle de reflexion*, contributed to the French success in measuring the length of the meridional arc. He participated in the work on a standard system of weights and measures, and designed the platinum standard meter and the standard seconds pendulum. He contributed memoirs on the calculus of variations and, in connection with his *cercle de reflexion*, developed a series of trigonometric tables. Borda's importance to science lies in his skillful use of calculus and experiment, unifying them in diverse areas of physics. This led Biot to state that one owes to Borda and Coulomb the renaissance of exact physics in eighteenth-century France.

BIBLIOGRAPHY

1.Original Works. A complete bibliography of Borda's memoirs is contained in Mascart (see below). His various papers on fluid mechanics are contained in the *Mémoiresde l'Académie des sciences* for the years 1763 and 1766–1769. For a description of his *cercle de reflexion*, see *Description et usage du cercle de réflexion avec différence méthodes pour calculer les observations nautiques, par le Chevalier de Borda* (Paris, 1787; 4th ed., 1816).

II. Secondary Literature. The most important treatment of Borda's work is the massive 800-page study by Jean Mascart. *La vie et les travaux du Chevalier Jean-Charles de Borda*, published as a volume of the *Annales de l'Universite de Lyon*, n.s., **2** , Droit, Lettres, face. 33(Lyons-Paris, 1919). The best contemporary essay is S. F. Lacroix, *Éloge historique de Jean-Charles Borda*(Paris, *ca*. 1800). For a recent summary of Borda's work in fluid mechanics, see R. Dugas, *histoire de la mécanique* (Paris, 1950), pp. 292–300.

C. Stewart Gillmor