Boussinesq, Joseph Valentin | Encyclopedia.com

(*b*. St.-André-de-Sangonis, Hérault, France, 15 March 1842; *d*. Paris, France, 19 February 1929)

mechanics, theoretical physics.

Boussinesq came from a family of small farmers, and his first lessons were given by the village school-teacher and by his uncle, a priest. He then attended the small seminary at Montpellier. After receiving the *baccalauréat*, he became an assistant master in a private school but was not responsible for teaching the children. When he obtained his *licence ès sciences* in 1851, Boussinesq went on to teach at the Collège d'Agde, then at Le Vigan, and later at Gap. Self-taught in scientific matters, he nevertheless was able, in 1865, to present a report on capillarity to the Académie des Sciences. In 1867 his thesis on the spreading of heat won him his *docteur ès sciences* as well as the goodwill of the academician and mathematician Barré de Saint-Venant. Boussinesq then became a professor at the Faculté des Sciences in Lille in 1873, and later he was assigned the chair of physical and experimental mechanics in Paris, followed by those of mathematical physics and of the calculus of probabilities. He was elected to the Académie des Sciences in January 1866 and eventually became its dean; at his death he was its oldest member.

Boussinesq led a simple, secluded life dedicated entirely to science and meditation on philosophical and religious problems, particularly on the conciliation of determinism and free will. He humbly admitted "the smallness of the ensemble of our unclouded knowledge lost in an ocean of darkness."

Faithful to mechanistic thought, which seeks kinematic representations, Boussinesq started with the principle of the conservation of energy and the principle that the accelerations of the points in an isolated system depend solely upon its static state and not on the velocities. He combined a great imaginative boldness with submission to experimental results. One of his conclusions was that simplicity is indispensable in scientific organization and that intuition is a valuable guide. Boussinesq loathed the introduction of such monsters as continuous fonctions without derivatives and of non-Euclidean space. Hostile to relativist innovations, he remained loyal to classical mechanics and sure of the reality of the ether. He did, however, make important contributions to all branches of mathematical physics except that of electromagnetism.

Boussinesq brought the theoretical study of ether closer to the study of experimental hydrodynamics in his researches on light waves and the theory of heat. His work on hydraulics was considerable; and with extraordinary insight he was able to use a method of legitimate approximation that made it possible to carry out intricate calculations concerning the study of whirlpools, liquid waves, the flow of fluids, the mechanics of pulverulent masses, the resistance of a fluid against a solid body, and the cooling effect of a liquid flow.

Although Boussinesq approached mathematics only in order to apply it practically, he was led to some interesting analyses in seeking the solution of particular problems. In the field of elasticity he obtained some intuitive results when considering certain potentials (logarithmic potentials with three variables, spherical potentials with four variables). In 1880 Boussinesq came upon nonanalytic integrals of hydrodynamic equations. He also found some asymptotic solutions of differential equations corresponding to cases of physical indetermination.

Boussinesq left a considerable amount of work. Besides the hundred or more papers he submitted to learned societies, he published several scholarly and abstruse books, full of original ideas but unorganized and often obscure. By virtue of the spirit of his research he can be considered one of the last figures of classical science in the nineteenth century.

BIBLIOGRAPHY

Among Boussinesq's works are *Étude dynamique d'un effect de capillarité* (Paris, 1865); "Propagation de la chaleur (Ellipsoïde des conductibilitiés linéaires),", his thesis (1867); "Essai sur la théorie des eaux courantes, précédé d'un rapport sur le mémoire, suivi d'additions et d'éclaircissements," in *Mémoires présentés par divers savants à l'Académie des Sciences de l'Institut National de France*, XXIII, no. 7 (1872) and XXIV, no. 2 (1875); *Essai théorique sur l'équilibre des massifs pulverulents comparé à celui des massifs solids et sur la poussée des terres sans cohésion* (Brussels, 1876; 1885); *Leçons synthétiques de mécanique générale, introductions au cours de mécanique physique* (Paris, 1883); "Applications des potentiels à l'étude de l'équilibre et du mouvement des solides élastiques," in *Annales de l'École Normale Supérieure (1885); and Cours de physique mathématique*, 4 vols. (Paris, 1901–1929). The correspondence between Boussinesq and Saint-Venant is in the archives of the Academy of Sciences, Paris.