Lamb, Horace | Encyclopedia.com

Complete Dictionary of Scientific Biography COPYRIGHT 2008 Charles Scribner's Sons
7-9 minutes

(*b*. Stockport, England, 29 November 1849; *d*. Manchester, England, 4 December 1934)

applied mathematics, geophysics

Lamb's father, John, was a foreman in a cotton mill who had a flair for inventing. Horace was quite young when his father died, and he was brought up by his mother's sister in a kindly but severely puritan manner. At the age of seventeen he qualified for admission to Queen’s College, Cambridge, with a scholarship in classics but proceeded to a mathematical career. He gained major prizes in mathematics and astronomy and became second wrangler in 1872, when he was elected a fellow and lecturer of Trinity College. After three further years in Cambridge, he went to Australia as the first professor of mathematics at the University of Adelaide. He returned to England in 1885 as professor of pure mathematics (later pure and applied mathematics) at Owens College, Manchester, and held this post until his retirement in 1920. He married Elizabeth Foot; they had seven children.

Lamb was one of the world’s greatest applied mathematicians. He was distinguished not only as a contributor to knowledge but also as a teacher who inspired a generation of applied mathematicians, both thorough personal teaching and through superbly written books. As a young man he was noted as a hard worker, shy and reticent; in later life he played a prominent part in academic councils. He also possessed considerable literary and general ability and enjoyed reading in French, German, and Italian. He liked walking and climbing and was one of the early climbers of the Matterhorn.

Like his teachers, Sir George Stokes and James Clerk Maxwell, Lamb saw from the outset of his career that success in applied mathematics demands both through knowledge of the context of application and mathematical skill. The fields in which he made his mark cover a wide range—electricity and magnetism, fluid mechanics, elasticity, acoustics, vibrations and wave motion, statics and dynamics, seismology, theory of tides, and terrestrial magnetism. Sections of his investigations in different fields are, however, closely linked by a common underlying mathematics. It was part of Lamb’s genius that he could see how to apply the formal solution of a problem in one field to make profound contributions in another.

To the scientific world in general, Lamb is probably most widely known for his word in fluid mechanics, embodied in his book *Hydrodynamics*, which appeared first in 1879 as *A Treatise on the Motion of Fluids*, the title being changed to *Hydrodynamics* in the second, much enlarged, edition of 1895. Successive editions, to the sixth and last in 1932, showed a nice assimilation and condensation of new developments and increasingly included Lamb’s own important contributions. The book is one of the most beautifully arranged and stimulating treatises ever written in a branch of applied mathematics—a model which modern scientific writers are often adjured to emulate.

In addition to solving numerous problems of direct hydrodynamical interest, as well as others of direct interest to electromagnetism and elasticity theory, Lamb applied many of the solutions with conspicuous success in geophysics. his much—quoted pap of 1904gave an analytical account of the propagation, over the surface of an elastic solid, of was generated by various assigned initial disturbances. The cases he studied bear intimately on earthquake wave transmission, and this paper is regarded today as one of the fundamental contributions to theoretical seismology. Modern attempts to interpret the finer details of earthquake records rest heavily on it. Another famous paper, published in 1882, analyzed the mode of oscillation of an elastic sphere. Th is paper is a classic in its completeness, and it recently rose to new prominence when free earth oscillations of the type Lamb had described were detected for the first time on records of the great Chilean earthquake of 1960. In 1903 he gave an analysis of two—dimensional wave motion which showed why the record of a earthquake usually has a prolonged tail.

Lamb's contributions to geophysics were by no means confined to seismology but extended too the theory of tides and terrestrial magnetism. In 1863 Lord Kelvin, using theory on fortnightly tides, came to the historic conclusion that the average rigidity of the earth exceeds the rigidity of ordinary steel. A significant point in Kelvin's theory, not well evidenced at the time, later came to be questioned. In 1895 Lamb gave an argument which placed the theory on a new basic and made Kelvin's conclusion inescapable. In 1915, in collaboration with Lorna Swain, he gave the first satisfactory account of the marked phase difference of tides observed in different parts of the oceans and seas, thereby settling a question which had been controversial since the time of Newton. In 1917 he worked out the deflection of the vertical caused by the tidal loading of the earth's surface.

In 1889 Arthur Schuster raised the question of the cause of diurnal variation of terrestrial magnetism. Lamb thereupon showed that the answer was immediately derivable from results he had published in 1883—that the variation is caused by influences outside the solid earth. He showed further that the magnitude of the variation is reduced by an increase in electrical conductivity below the earth's surface.

In addition to *Hydrodynamics* and numerous research papers, Lamb wrote texts, some of them still used today, on infinitesimal calculus, statics, dynamics, higher mechanics, nd the dynamical theory of sound. his polished expositions led to his sometimes being called "the great artist" of applied mathematics.

Lamb continued to be active after his retirement; he was for example, a key member from 1921 to 1927 of the Aeronautical Research Committee of Great Britain. He was elected a fellow of the Royal Society in 1884 and later received its Royal and Copley medals. He received many honors from overseas universities and academies and was knighted in 1931.

BIBLIOGRAPHY

Lamb wrote the following books: *A Treatise on the Motion of Fluids* (Cambridge, 1879)—the 2nd (1895) through 6th 1932) eds., geratly enl., are entitled *Hydropdynamics: Inffinitesimal Calculus* (1897), *Statics* (1912), *Dynaics* (1914), *Higher Mechanics* (1920), all published by the Cambrdige University Press, with several editions; and *The Dynamical Theory of Sound* (London, 1910). He contributed the article "Analytical Dymamics," in the *Ebcyclopaeida britanica* supplement (London, 1902) and the article "Schwingugne elastischer Systeme, insbesondere Akustick," in *Encyclopädie der mathematischen Wissenschaften* (Leipszig, 1906).

Lamb's great contributions in th Field of hydrodynamics are incorporated in hi book bearing that title. His most important papers in other fields are: "On the Vibrations of an Elastic Sphere," in *Proceedings of the London Mathematical Society*, **13** (1882), 189–212; "On Electrical Motions in a Spherical Conductor," in *Philosophical Transactions of the Royal Society*, **174** (1883), 519–549; "On Wave—Propagation in Two Dimensions," in *Proceedings of the London Mathematical Society*, **35** (1903), 141–161; "On the Propagation of Tremors over the surface of an Elastic solid," in *Philosophical Transactions of the Royal Society*, **203** (1904), 1–42; "On a Tidal Problem" (with Lorna Swain), in *Philosophical Magazine*, **29** (1915), 737–744; "On the Deflection of the Vertical by Tidal Loading of the Earth's Surface," min *Proceedings of the Royal Society*, **93A** (1917), 293–312.

References to several further papers of Lamb and further details of his life and career may be found in *Obituary Notices of Fellows of the Royal Society*, **1** (1935), 375–392.

K. E. Bullen