Peter Guthrie Tait | Encyclopedia.com

Complete Dictionary of Scientific Biography COPYRIGHT 2008 Charles Scribner's Sons
5-7 minutes

(b, Dalkeith, Scotland, 28 April 1831; *d*. Edinburgh, Scotland, 4 July 1901)

physics, mathematics.

Tait was the son of the former Mary Ronaldson and John Tait, who was secretary to the duke of Buccleuch. He was taught first at Dalkeith Grammar School and, after his father's death, at a school in Circus Place and later at the Academy, both in Edinburgh. With his mother and his two sisters Tait lived in Edinburgh with an uncle, John Ronaldson, who introduced the boy to geology, astronomy, and photography. It is interesting to note that the order in the mathematics section of the Edinburgh Academical Club Prize for 1846 was first Tait, then Lewis Campbell, and third J. C. Maxwell. (In the following year Tait was second to Maxwell.) Tait entered Edinburgh University in 1847, and after a session there went in 1848 to Peterhouse, Cambridge, where his tutor was William Hopkins. He graduated as senior wrangler and first Smith's Prizeman in 1852. (Second in the tripos was another student at Peterhouse, W. J. Steele, with whom Tait collaborated on his first book, *Dynamics of a Particle* [1856]. Steele died before completing his portion of the book.)

In 1854 Tait left Cambridge, where he was a fellow of his college, to become professor of mathematics at Queen's College, Belfast. His colleague there was Thomas Andrews, with whom he collaborated in research on the density of ozone and the results of electrical discharge through gases. Other colleagues were Charles Wyville Thomson, who later was scientific leader of the *Challenger* expedition, and James Thomson, brother of William, Lord Kelvin, and discoverer of the effect of pressure on the melting point of ice. Tait's debts to Andrews were undoubtedly great, for the latter introduced him to experimental physics; but he did not, as is occasionally said, introduce Tait to Hamilton's calculus of quaternions, which had occupied Tait while he was at Cambridge.

Tait succeeded J. D. Forbes as professor of natural philosophy at Edinburgh in 1860 and held the chair until shortly before his death. In 1857 he married Margaret Archer Porter, the sister of two Peterhouse friends. One of their four sons, the best amateur golfer of his day, was killed in the Boer War.

At Edinburgh, Tait was confirmed in his recently found liking for experimentation by the duties required of him. In 1862, for example, he wrote a paper jointly with J. A. Wanklyn on electricity developed during evaporation. In 1867, having been greatly taken by Helmholtz's paper on vortex motion, he devised an apparatus for studying vortex smoke rings, thereby giving Kelvin the idea of a vortex atom. His study of vortices was the starting point of a highly important pioneer study of the topology of knots. Tait continued to experiment on thermoelectricity, publishing extensively on the subject and on thermodynamics as a whole. In 1873 he presented a first sketch of his well-known thermoelectric diagram to the Royal Society of Edinburgh. In 1875 he experimented with James Dewar on the behavior of the Crookes radiometer and gave the first satisfactory explanation of it. Between 1876 and 1888, using superb equipment of his own design supplied by the Admiralty, Tait did research on the corrections that it would be necessary to apply to the findings of the *Challenger* expedition regarding deep-sea temperatures. This work led to important experimental studies of compressibility and the behavior of materials under impact. In the same connection Tait wrote a classic paper on the trajectory of a golf ball (1896). The fourth in an important series of papers on the kinetic theory of gases (1886 – 1892) contained, according to Kelvin, the first proof of the Waterston-Maxwell equipartition theorem.

Tait's life was marked by several controversies, two of which reached a wide public. He felt himself committed to quaternions, having promised Hamilton, only a few days before the latter's death, to publish an elementary treatise on the subject. The work appeared in 1867 and was followed by new editions in 1873 and 1890. Tait disliked intensely the vector methods of J. W. Gibbs and Oliver Heaviside, and in a long exchange of polemics tended to have the worst of the argument. In his controversial *Sketch of the History of Thermodynamics* (1868), a highly prejudiced and pro-British account, the reputations of J. R. Mayer and Clausius suffer, while Kelvin and Joule are often praised at their expense.

BIBLIOGRAPHY

C. G. Knott, *Life and Scientific Work of Peter Guthrie Tait* (Cambridge, 1911), lists 365 papers and 22 books written wholly or partly by Tait. The last two books listed are collected volumes of Tait's *Scientific Papers* (Cambridge, 1898 – 1900). His best-known work was vol. I of *Treatise on Natural Philosophy* (Oxford, 1867; Cambridge, 1878, 1883), written jointly with Sir William Thomson and widely known as "T and T′." A promised vol. II failed to appear. Tait and Thomson also collaborated on an elementary version.

Knott's biography, which refers to all the important obituaries, is itself the fundamental biographical source, although very uncritical. See also J. H. Hamilton Dickson, in *Dictionary of National Biography*, 2nd supp., III (1912), 471 – 474; and A. Macfarlane, "P.G.T.," in *Bibliotheca mathematica*, 3rd ser., **4** (1903), 185 – 200. For the controversy over the history of thermodynamics, see D. S. L. Cardwell, *From Watt to Clausius* (London, 1971), 282 – 289.

J. D. North