

Darwin, Sir Charles Galton

(1887–1962)

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Sir Charles Galton Darwin (1887–1962)

by Elliott & Fry, 1942

Darwin, Sir Charles Galton (1887–1962), physicist, was born on 19 December 1887 at Newnham Grange, Cambridge, the eldest of the two sons and two daughters of [Sir George Howard Darwin, FRS \(1845–1912\)](#), and his wife, Maud (1861–1947), daughter of Charles du Puy, of Huguenot descent, from Philadelphia. He was a member of the widespread Darwin–Wedgwood family; [Charles Robert Darwin](#) was his grandfather. One of his sisters, Margaret, married Sir Geoffrey Keynes, surgeon and writer, and the other, [Gwen Raverat](#), described in *Period Piece* (1952) the family's happy early life when five Darwin first cousins, including Frances, later Cornford, the poet, were especially close Cambridge companions.

Darwin was a scholar at Marlborough College (1901–6) and at Trinity College, Cambridge (1906–10), where he read for the unreformed mathematical tripos, becoming fourth wrangler in part one in 1909 and obtaining a first class in part two in 1910. He joined Ernest Rutherford in Manchester as Schuster lecturer in mathematical physics in 1910, the period of the discovery of the atomic nucleus. Darwin wrote, *inter alia*, a paper on the collision of alpha particles with light nuclei which helped Rutherford in work which led to the discovery of artificial nuclear disintegration. He then worked with H. G. J. Moseley on the diffraction of X-rays and in 1914 published two papers which were described as landmarks in the history of X-ray analysis of crystals.

In the First World War Darwin commanded a section in one of the royal engineer units organized to detect enemy guns by sound ranging and won the MC. Late in 1917 he was attached to the Royal Flying Corps for work on aircraft noise. From 1919 to 1922 he was fellow and lecturer at Christ's College, Cambridge, and in this period he and R. H. Fowler wrote joint papers about the basis of classical atomic statistics and their relation to thermodynamics, introducing the useful concept of 'the partition function'. In 1922 he was elected a fellow of the Royal Society. In the same year, while a visiting professor at the California Institute of Technology, he began work on optical properties, especially those involving magnetic fields. In 1924 he was appointed first Tait professor of natural philosophy at Edinburgh University, but, although an outstanding lecturer, he did not establish a school of theoretical physics.

Darwin himself worked on the applications to magneto optics of the then new Bohr–Sommerfeld quantum theory of atomic structure. When he spent short periods at Niels Bohr's institute in Copenhagen in 1927 and 1928 he was excited by the ferment of ideas there and returned to write important papers. The first, in 1927, usefully suggested the way free electrons behave. Then, on 1 February 1928, Paul A. M. Dirac's first paper on his new relativistic electron appeared. Darwin immediately realized its significance and a month later had produced a paper which made Dirac's theory accessible to ordinary physicists and greatly hastened its general acceptance. He also used the theory to derive for the first time the correct explanation of the fine structure of the hydrogen spectrum. Two further papers analysed the magnetic moment, and the diffraction, of the relativistic electron. Subsequently he worked out in detail for non-relativistic Schrödinger electrons the very important case of a collision between two electrons and then considered other examples of the uncertainty principle. At intervals over the years he continued to spend time on a purely classical problem concerning the effective electric field acting on an electron in an ionized medium. In 1925 Darwin married Katharine, daughter of Francis William Pember, a lawyer, who was the warden of All Souls College, Oxford, from 1914 to 1932. She was the granddaughter of Edward Henry Pember and was herself a mathematician. They had one daughter (a crystallographer) and four sons (an electronic engineer, a civil engineer, a Foreign Office lawyer, and a zoologist).

Darwin returned to Cambridge in 1936 as master of Christ's College but in 1938 he became director of the National Physical Laboratory (NPL). He successfully reorganized the NPL for urgent war work and in 1941 was seconded to Washington for a year as first director of the British office set up to improve Anglo-American scientific war co-operation—a crucial post which he filled with energy, sound scientific judgement, and diplomatic skill. He was involved in liaison over the atomic bomb, and was one of the few to realize that it presented problems different in kind, as well as in explosive power, from conventional weapons. On returning to Britain he became scientific adviser to the War Office. When he went back full time to the NPL Darwin was concerned with the reconversion for peace and with reorganization and new creations among the laboratories of the Department of Scientific and Industrial Research. Foreseeing the great potentialities of electronic computers, he created in the NPL two new divisions, mathematics and electronics. The successful collaboration of these divisions produced Pilot ACE, the first electronic digital computer available to British industry.

Darwin retired from the NPL in 1949. Thereafter he continued to write some scientific papers but his chief interest became population problems and eugenics. In his book *The Next Million Years* (1952) he considered the long-term future of mankind. He contributed the notices of Sir W. H. Bragg and D. R. Hartree to the *Dictionary of National Biography*. Before and after retirement he was in demand for committee work. For example, he was a member of the University Grants Committee for a double term, from 1943 to 1953. From 1941 to 1944 he was president of the Physical Society and from 1953 to 1959 president of the Eugenics Society. He and his wife enjoyed foreign travel and among his missions was a visit as scientific adviser to Thailand in 1953 on behalf of the United Nations Educational, Scientific and Cultural Organization.

Darwin was knighted in 1942. He received honorary degrees from Bristol, Manchester, St Andrews, Trinity College (Dublin), Delhi, Edinburgh, Chicago, and California. He was an honorary fellow of Christ's College (1939) and of Trinity College, Cambridge (1953). He received the royal medal of the Royal Society in 1935 and was a vice-president in 1939. He also received the Makdougall Brisbane prize from the Royal Society of Edinburgh. He was a foreign member of the *Hollandsche Maatschappij der Wetenschappen* of Haarlem, and an honorary member of the French Physical Society and of the American Philosophical Society.

Sir George P. Thomson, who wrote the Royal Society memoir of Darwin, suggests that Darwin's most useful work was as an interpreter of the new quantum theory to experimental physicists and that he was especially fitted for this because of his exceptionally wide range of understanding and a most unusual capacity for seeing the essential idea in a maze of

complicated mathematics or conflicting experiments. This capacity of seeing essentials equally helped him at the National Physical Laboratory and in his work in the two wars.

Darwin was physically large, cheerful, and tolerant. The two portraits of him are very similar and were painted by his cousin Robin Darwin. He was warm and sympathetic to those who knew him well but students and some of his staff at the National Physical Laboratory felt awe as well as admiration for him. He had wide curiosity. He was proud of his family connections and devoted to his immediate family. He died on 31 December 1962 at Cambridge in the house where he was born, which subsequently became part of Darwin College. His wife survived him.

Sources

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Likenesses

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Wealth at Death

£135,731: probate, 25 March 1963, *CGPLA Eng. & Wales*