SOME GALWAY PROFESSORS
OF MATHEMATICS AND
OF NATURAL PHILOSOPHY

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The first professor of mathematics at Queen's College, Galway was John Mulcahy, LL.D., (1810?-1853), who held the chair from 1849 until his death. He was a graduate of Trinity College, Dublin, and received a gold medal as best answerer in science in the B. A. degree examinations of 1829. According to [5], he was one of only two Roman Catholics appointed to the Faculty of Arts when the Galway college opened. He wrote a textbook, entitled *Principles of Modern Geometry*, published in Dublin in 1852. A second revised edition appeared in 1862. (*Principles of modern geometry, with numerous applications to plane and spherical figures; and an appendix, containing questions for exercise. Intended chiefly for the use of junior students.*) This book was recommended by Boole for purchase by the library of Queen's College, Cork in 1852 (see [7, pp.102-103]).

Mulcahy was succeeded by George Johnston Allman (1824-1904), who retained the professorship until 1893, when he retired. He was the son of William Allman, Professor of Botany at Trinity College, Dublin. His best known work is the book *Greek Geometry from Thales to Euclid*, published in 1889 in the Dublin University Press Series. This book was highly esteemed by contemporary historians of mathematics. It is based on a paper written in six parts in *Hermathena* between 1877 and 1887. Allman also wrote articles on Ptolemy, Pythagoras and Thales for the 9th edition of the *Encyclopaedia Britannica*. For obituaries of Allman, see Proc. Roy. Soc. London **78 A** (1907), p. xii, and Nature **LXX** (1904), 83.

Allman's successor was Alfred Cardew Dixon (1865-1936), who held the chair until 1901, when he was appointed to the chair of mathematics in Queen's College, Belfast. In his article, [13], James Ward has given some biographical details about Dixon. Dixon wrote one textbook, *The Elementary Properties of Elliptic Functions*, published in 1894 by Macmillan & Co.

Dixon was succeeded by Thomas John l'Anson Bromwich (1875-1929) in 1902 and Bromwich held the chair until 1907, when he took up a permanent lectureship at St John's College, Cambridge. Bromwich's best known contribution to mathematics is the book *An Introduction to the Theory of Infinite Series*, published in 1908 by Macmillan & Co. This was based on lectures on elementary analysis given at Galway. A revised second edition was published in 1926 and this has been reprinted several times. He also published another book, *Quadratic Forms and their Classification by Means of Invariant Factors*, in 1906. This book is an early example in English of the more abstract methods introduced into algebra by researchers such as Kronecker and Weierstrass. It is particularly concerned with the simultaneous reduction of two quadratic forms, a problem which, in its modern presentation, requires almost the full repertoire of the theory of a single linear transformation. In his obituary of Bromwich, Proc. Roy. Soc. London, **129 A** (1930), i-x, G. H. Hardy expressed the opinion that Bromwich's best work had been completed by 1908. The obituary makes interesting reading, as it gives a critical assessment of Bromwich's work and is certainly no mere eulogy. Bromwich seems to have worked both as a pure and applied mathematician, although not at the highest levels, according to Hardy. A slightly different form of the obituary was published in the Journal of the London Math. Soc. **5** (1930), 209-220. In this obituary, unlike the first, Hardy points out that Bromwich died by suicide. (See also *Collected Papers of G. H. Hardy*, vol. 7, 732-743.)

The next Professor of Mathematics was William A. Houston, who held the chair from 1908 until 1912.

After Houston, the next Professor of Mathematics is Michael Power who held the chair for over 40 years, from 1912 until his retirement in 1955. He obtained his B.A. in 1907, M.A. in 1908,

and M.Sc. in 1909.

There have been several distinguished holders of the chair of natural philosophy in Galway, some of whom did considerable work in mathematics, and we would like to discuss the first five of them briefly.

The first Professor of Natural Philosophy was Morgan William Crofton (1826-1915), who held the chair between 1849 and 1852. Crofton's career is interesting and we shall give some details about it, largely based on the obituary in the Proceedings of the London Math. Soc. (second series) 14 (1915), pp. xxix-xxx, and on [4].

Morgan Crofton was born in Dublin, and was the eldest son of Rev. W. Crofton, Rector of Skreen, in Co. Sligo. This is remarkable, as Crofton senior must have been the successor of George Gabriel Stokes's father, who was rector of Skreen until his death in 1834. Morgan Crofton obtained his degree from Trinity College, Dublin, topping the list of Senior Moderators in Mathematics ahead of G. J. Stoney (about whom, more below) in 1847. According to the obituary in the Proc. LMS, Crofton was denied the chance to stand for a fellowship at Trinity, as he had become a Roman Catholic. (This information is somewhat at variance with that contained in [4, p.96], which states that Crofton resigned the Galway professorship in 1853, about which time he entered the Catholic Church. According to [4, p.97], Crofton's son, Father William Crofton, S.J., wrote: "my father was not with Newman in Dublin, but he was instructed and received into the Church by Newman himself in the early 'fifties at Birmingham".) In any case, Crofton received a prize in the Fellowship Examination at Trinity in 1848.

After leaving Galway, Crofton worked in various Jesuit educational establishments in France. He seems to have come to England and got to know J. J. Sylvester, who was Professor of Mathematics at the Royal Military Academy in Woolwich. On Sylvester's recommendation, Crofton was appointed an instructor in mathematics at the Academy and he succeeded Sylvester as professor in 1870, holding the professorship until 1884. J. D. North's article on Sylvester in Vol. XIII of the *Dictionary of Scientific*

Biography mentions that one of Sylvester's last published papers, in the 1890's, on Buffon's needle problem, had been motivated by conversations with Crofton in the 1860's but that Crofton had already published identical material in 1868 (*On the theory of local probability*). The Royal Society's Catalogue of Scientific Papers lists 18 papers by Crofton, almost entirely on pure mathematics, especially probability theory, geometry and the calculus of operations. Some of his ideas on probability theory are discussed by John Venn in [12]. His teaching at Woolwich was directed towards mechanics and engineering mathematics, in keeping with the Army's needs, and he wrote one textbook for the Academy on applied mechanics, [2], as well as contributing to another one, [3].

Crofton retired from Woolwich in 1884 and became a member of the Mathematical Staff of the newly formed University College, Dublin. He cannot have done much teaching, as he continued to reside in England, and came over to Dublin mainly as an examiner in mathematics. He clearly collaborated with John Casey, also a member of the Mathematical Staff at University College, Dublin, on geometrical questions, as several of the exercises in Casey's books are attributed to Crofton. (There are 13 exercises in [1] that bear Crofton's name and Casey acknowledges his debt to Crofton in the preface to [1].) Crofton retired in 1895 and died in Brighton in 1915. He was awarded an honorary Doctorate in Science by Trinity College, Dublin in 1898.

Crofton wrote a substantial article on Probability for the 9th edition of the *Encyclopaedia Britannica*, which is still worth looking at. Interestingly enough, the article on Probability for the 11th edition of the *Encyclopaedia Britannica* was also written by a person with Trinity College, Dublin connections, Francis Ysidro Edgeworth (1845-1926). Edgeworth obtained a scholarship in classics from Trinity in 1862, but took his degree at Oxford in 1869. He wrote much initially in moral science and was later a pioneer worker in mathematical statistics, probability theory and economics.

Crofton was succeeded as Professor of Natural Philosophy in Galway in 1853 by George Johnstone Stoney (1826-1911), whom we have seen was second behind Crofton in the list of Senior Mod-

erators at Trinity College in 1847. He was the uncle of the physicist George Francis Fitzgerald, noted in connection with the Lorentz-Fitzgerald contraction. Stoney held the professorship until 1857, when he resigned to become Secretary of the Queen's University in Ireland. Although he died in London, Stoney is buried in the graveyard of St Nahi's Church, Dundrum, Dublin, where his tomb bears the inscription *Felix qui potuit rerum cognoscere causas.* Several other members of the Stoney family are also buried there.

Stoney wrote numerous scientific papers, and was especially interested in properties of spectral lines and also the measurement of fundamental physical units. He is best known for having coined the name *electron*, which arose in connection with the unit of electrical charge on an atom. Articles about Stoney may be found in [9], [10] and Vol. XIII of [6]. [10] in particular gives several references to Stoney's life and work.

Stoney's successor in the professorship was Arthur Hill Curtis, (1827?-1886?), who held the position from 1857 until 1879. He was also Registrar of Queen's College, Galway from 1877 until 1879. In 1880, he became Assistant Commissioner of Intermediate Education. He may possibly have died in 1886, as there are no further references to him in Thom's Directory after this date. There are some parallels in the early careers of Crofton and Curtis, as Curtis also topped the list of Senior Moderators in Mathematics at Trinity College, Dublin, this time in 1849, and both were Lloyd Exhibitioners (1846, 1848) and Bishop Law's Prizemen (1848, 1850) at Trinity. Curtis was also the first recipient of the MacCullagh Prize in Mathematics in 1855, for an essay on the subject of physical optics. The prize had been funded by subscriptions raised in memory of James MacCullagh, a former Professor of Mathematics and of Natural Philosophy at Trinity College, who had committed suicide in 1847. (A sum of £977 10s. 4d. was raised to fund the prize.) MacCullagh's research work was concerned mainly with mathematical models of the aether and the geometry of surfaces of the second order. See, for example, [11]. It is interesting to observe that four of the first scientific papers of Curtis were devoted to the geometry of surfaces, one in particular relating to MacCullagh's work (*A geometrical proof of Professor MacCullagh's theorem on*

the polar plane, Quart. J. Math 1 (1857), 134-141, this paper having been written in 1855). It seems likely that MacCullagh's work influenced Curtis's early research. Papers written by Curtis after 1860 have titles reflecting an interest in physical questions, in keeping with his position in Galway. He published a book, *A Mathematical Deduction of the Principal Properties of the Gyroscope,* in Dublin in 1862.

Curtis was followed in the professorship by Joseph Larmor (1857-1942), who held the chair from 1880 until 1885. Larmor is a major figure in late 19th century physics, having contributed important ideas in electromagnetic theory and early relativity theory. He was especially interested in the motion of matter through the aether and wrote a related book, *Aether and Matter,* in 1900. He was an important administrator in scientific bodies and edited various collected editions of scientific papers (those of Stokes and Fitzgerald, for example). He succeeded G. G. Stokes as Lucasian professor of mathematics in 1903 and held this position until his retirement in 1932. He also served as M.P. for Cambridge University from 1911 until 1922. An article about Larmor, with bibliography, may be found in Vol VIII of [6].

The final Professor of Natural Philosophy in Galway whom we shall describe is Alexander Anderson (1858-1936), who succeeded Larmor in 1885 and retired in 1934. He was also President of Queen's College, Galway from 1899 until his retirement. He wrote many papers on a variety of physical topics. The present writer owns several of Anderson's books, on such subjects as electricity, optics, geomagnetism, elasticity and the electron. For further information about Anderson, we refer to the article [8].

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GEORGE GABRIEL STOKES 1819-1903
AN IRISH MATHEMATICAL PHYSICIST

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The name of Stokes, a contemporary of Kelvin and Maxwell, has become well known to generations of international scientists, mathematicians and engineers, through its association with various physical laws and mathematical formulae. In standard textbooks of mathematics, physics and engineering we find Stokes' Law, Stokes' Theorem, Stokes' Phenomenon, Stokes' conjecture and the Navier-Stokes equations. George Gabriel Stokes has long been associated with the University of Cambridge, where he spent all of his working life, occupying the Lucasian Chair of Mathematics from 1849 until his death in 1903. This prestigious chair was once held by Isaac Newton, and is currently occupied by Stephen Hawking, who has reached a wide audience outside mathematics with his "Brief History of Time". What is not well known is that Stokes was born in Skreen, County Sligo, where his father was Rector of the Church of Ireland, and received his early education there and in Dublin. Like William Thomson, later Lord Kelvin, who is often associated with Scotland (he occupied the chair of Natural Philosophy in Glasgow University) rather than with Belfast, where he was born, the contribution of Stokes has not been fully recognized in Ireland. Kelvin at least had a statue outside Queen's University, but Stokes lacked any memorial in the land of his birth. Perhaps this is a commentary on the importance which Irish society attaches to scientific vis-a-vis literary achievement. The situation was rectified, however, with the unveiling by former EU Commissioner for Agriculture, Mr Ray MacSharry, of a memorial at Stokes' birthplace in Skreen on Saturday 10th June 1995 as part of a meeting organized at Sligo RTC by the Institutes of Physics and of Mathematics and its Applications,