Right Rev. CHARLES GRAVES, Bishop of Limerick. 1812–1899.

Charles Graves was born in Dublin on November 6, 1812. He was the youngest son of Mr. John Crosbie Graves, of the Irish Bar, Chief Police Magistrate of Dublin, and Helena, daughter of the Rev. Charles Perceval. He received his early education at a private school near Bristol. He entered Trinity College, Dublin, in 1829, and obtained a scholarship—a distinction at that time given only for classical proficiency—in 1832; he graduated, in 1834, as the First Senior Moderator and Gold Medalist in Mathematics and Mathematical Physics of his year. He was elected to a Fellowship in 1836, and took deacon's orders in the same year. He was appointed the Professor of Mathematics in the University of Dublin, in succession to the celebrated James McCullagh, in 1843. He married, in 1840, Selina, daughter of Dr. John Cheyne, Physician to H.M. Forces in Ireland. Graves was made Dean of Clonfort in 1864, and was promoted to the Bishopric of Limerick, Ardfert, and Aghadoe in 1866, during the viceroyalty of Lord Kimberley, being one of the last bishops appointed before the disestablishment of the Irish Church. His manners were characterised by dignified courtesy, and, in his hours of relaxation, by a genial and cordial ease and freedom. His wide culture, keen intelligence, and conversational powers made him a most attractive and agreeable companion. His calm judgment in practical affairs, combined with his fine tact and temper, have been justly and highly commended. By his liberal feeling towards those who differed from him and his kindness of disposition he won the esteem and regard of all, and especially of the people of the diocese over which for thirty-three years he presided, without distinction of sect or party—sentiments which were exhibited in a marked manner on the occasion of his funeral.

In 1841 he published a translation of the two elegant memoirs of Chasles 'On the General Properties of Cones of the Second Degree and of Spherical Conics.' In the copious notes which he appended to this translation, he gave a number of new theorems of much interest, at which he arrived by Chasles's mode of treatment. Amongst these may be mentioned his extension of the construction of an ellipse, as traced by a pencil which strains a thread passing over two fixed points, by substituting for those points a given ellipse, with which the locus described is confocal. This he deduced from the more general theorem on Spherical Conics; the latter being arrived at from its reciprocal theorem,

viz., if two spherical conics have the same cyclic arcs, then any arc touching the inner curve will cut off from the outer a segment of constant area. It may be here observed that Bertrand, in his great treatise on the Integral Calculus, attributed the foregoing theorem of Graves to Chasles, who had subsequently arrived at it by an independent investigation. In a long appendix to the volume Graves gave a method of treating curves on a sphere corresponding to the Cartesian method on the plane, arcs of great circles taking the place of right lines. This theory he worked out in detail, supplying expressions analogous to the fundamental formulæ of plane analytic geometry, such as those for tangents, normals, osculating circles, evolutes, &c., and for the transformation of spherical co-ordinates. The whole was the fruit of Graves's independent research, though after the preparation of the Appendix he discovered that Professor Gudermann had partly anticipated his method, and that the properties of spherical curves had been previously studied by Mr. Davies, who, however, used only polar co-ordinates, whilst those principally employed by Graves were rectangular. This memoir was greatly admired by Sylvester and other mathematicians, but their high expectations of its fertility have not been fulfilled.

This was the only mathematical book which Graves published. His other investigations were either embodied in the lectures which he delivered as Professor of Mathematics in the University, or in papers read before the Royal Irish Academy. Having been elected a member of that body in 1837, he filled successively the offices of Secretary of the Council and Secretary of the Academy, and was elected its President in 1861. About the same period, Sir William R. Hamilton, McCullagh, and Humphry Lloyd were also members, and the meetings were often made the occasion of announcing the results of the spirit of scientific investigation which then so remarkably prevailed in the University of Dublin.

While Hamilton was explaining to the Academy in a series of communications his new Calculus of Quaternions, several contemporary mathematicians were led to conceive systems more or less analogous to his, and like it, involving new imaginaries. Graves proposed a system of Algebraic Triplets of this kind. But it must be said of it, as of the other similar systems, that it could not lay claim to anything like the power and flexibility of the Quaternions, and was not, indeed, so much a working method as an interesting mathematical curiosity. Other papers of his, published by the Academy, related to the theory of differential equations, to the solution of the equation of Laplace's functions, and to curves traced on surfaces, particularly on surfaces of the second degree. He gave a simple geometrical proof, published also in 'Crelle's Journal,' of Joachimsthal's theorem, viz., *that at all points of a line of curvature on an ellipsoid, the product* PD *is constant,*

where P *is the central perpendicular on the tangent plane, and* D *is the diameter drawn parallel to the element of the line of curvature.* He also gave some very valuable applications of the Calculus of Operations to the Calculus of Variations, and especially arrived at a simple proof, by the Operational Method, of Jacobi's celebrated theorem for distinguishing between maxima and minima values in the application of the Calculus of Variations to single integrals.

On the death of Hamilton in 1865, Graves delivered from the Presidential Chair of the Academy an eloquent *éloge* of that eminent man, containing an interesting account of both his scientific labours and of his literary attainments.

Graves had much literary and artistic taste and cultivation, and to these were, no doubt, largely due the symmetry and beauty both of method and of results which are marked characteristics of his mathematical work.

As a member of the Academy, he devoted much time and thought to antiquarian subjects in connection with Ireland. It is a striking evidence of his versatility and varied accomplishments, that the eminent antiquary, George Petrie, having died shortly after Graves had paid the above recorded tribute to Hamilton's memory, he pronounced a *éloge* on him also, and was able to give as clear and competent a survey of the archæological researches of the one as he had done of the scientific investigations of the other.

A subject which he studied with special zeal was that of the Ogham inscriptions, so numerous in Ireland. He applied to the characters employed in them the accepted methods for the decipherment of writings, known or presumed to be alphabetical, and in this way confirmed the interpretation of these symbols which is given in some of the old Irish books. He then proceeded to give readings and to prepare renderings of a number of the actual inscriptions on cromlechs and other stone monuments. The subject is still surrounded with difficulties, and many archæologists have been led to entertain the view that the inscriptions, at least in some cases, are intentionally cryptic.

Graves brought before Government, in a special publication, the importance of having the old Irish laws, commonly called the Brehon Laws, edited and translated by competent scholars. The suggestion was adopted, and, when the project was taken in hand, he was appointed a member of the Commission charged with carrying it into effect, and held this office till his death, which took place on July 17th, 1899.

Graves was elected a Fellow of the Royal Society in 1880, and the Honorary Degree of D.C.L. was conferred on him by the University of Oxford in 1881.

B. W.