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which had been answered incorrectly, but he had also written out complete solutions of all those which he had not attempted. It must have taken him several hours, and shows the interest which he took in students and how he liked to help them.

In 1884 Gray was appointed to the Chair of Physics in the newly-founded University College of North Wales at Bangor. He had as colleagues two other old Glasgow students: Henry Jones, the distinguished philosopher, subsequently Sir Henry Jones, Professor of Moral Philosophy, and Gray's colleague at Glasgow University; and James J. Dobbie, afterwards Sir J. J. Dobbie, the Principal of the Government Laboratory. In 1896 he was made a Fellow of the Royal Society, and received the Hon. Degree of LL.D. from Glasgow University. While in Wales, he championed the cause of the higher education of women, and took a leading part in the foundation of the County School for Girls in Bangor. At this time he was also an enthusiastic mountaineer, and made weekly excursions with some of his colleagues into the Welsh hills. He was a strong swimmer, and rarely missed his morning bathe in the Menai Straits.

In 1899 he was installed Professor of Natural Philosophy at Glasgow University, a post which he resigned in 1924. During this period his strong personality, ability as a teacher and unwearying patience in explaining difficulties endeared his memory to many thousands of students. On the death of Lord Kelvin in 1907, Gray delivered an eloquent oration in his memory. He later expanded this into a book called 'The Scientific Work of Lord Kelvin.' It gives an excellent account of the life and activities of his famous predecessor.

Gray planned the present Natural Philosophy Institute of the University of Glasgow, a task which absorbed all his energies for several years. It was opened 18 years ago by the King and Queen, then Prince and Princess of Wales. He made special arrangements for the comfort of the students—in particular, the methods of ventilating and keeping at an equable temperature the large lecture rooms and laboratories are admirable. He also arranged an historical collection of Kelvin's apparatus in the Institute, but he felt that much of the interest of this collection would soon pass away, as the coming generation would not be able to picture the exciting times there had been when each improvement in the apparatus was perfected by Kelvin.

Gray wrote many books, published several addresses and communicated many papers to the Royal Societies of London and Edinburgh. His first book, entitled 'Absolute Measurements in Electricity and Magnetism,' was published in 1883. It deals almost exclusively with work of a fundamental character which was being carried out at that time by workers assisting Sir William Thomson. The first volume of an expansion of this work appeared in 1888 and a second volume in 1893. These works proved most helpful to physicists in National Laboratories when determining our electrical standards. In 1921

a final edition of 'Absolute Measurements' appeared. He once said that the writing of this book was difficult owing to—if not the discouraging—at least the Laodicean attitude of scientists to absolute measurements. In 1895 he published, in conjunction with George Ballard Mathews, a 'Treatise on Bessel Functions.' In this book practical applications are always kept in view. The treatise, which became a classic, was revised by Prof. Gray and Dr. T. M. MacRobert in 1922.

In 1898 appeared a treatise on 'Magnetism and Electricity,' and in 1901 a volume on 'Dynamics and Properties of Matter.' In 1911, in conjunction with his son, Prof. J. G. Gray, he published a treatise on 'Dynamics.' This book was written for students of physics and engineering, and contains a very large number of interesting examples, complete solutions of many of which are given. In 1919 appeared 'A Treatise on Gyrostatics and Rotational Motion.' This book is a monument to the vigour and industry of the author, as well as to his thorough knowledge of the subject.

In 1912 the writer had occasion to write to Gray to ascertain his opinion on the proposed use of the word "Kelvin" to denote the unit of electrical energy. In particular, he asked him what he thought Lord Kelvin's feeling would be likely to be if he were alive. He replied: "I have no hesitation in saying that I think the idea would not be distasteful to him, but the contrary. That view I base on my general reading of Lord Kelvin's character and disposition. He certainly did like recognition and appreciation (no blame to him for that!), and I am sure that any legitimate mode of perpetuating his name and fame which his colleague-workers in electrical science had insisted on inaugurating would have been gratefully received during his lifetime." Personally, however, Gray was strongly opposed to the giving of the names of eminent scientific men, *nomina clara et venerabilia*, as designations for practical electrical units. On another occasion, when criticising parts of 'Thomson and Tait' he wrote: "You will understand that I yield to no one in respect for the genius and memory of my great teacher and predecessor."

He was very interested in Einstein's Theory and had intended to give lectures on the subject. He thought it a pity that it was generally presented in the form of the "theory of tensors." In a letter written in 1923 he says: "Some of the conclusions of the Theory—*e.g.*, as to the magnitude of the universe—are hardly translatable out of the non-Euclidean geometry without a dislocation of our reason. I cannot follow the conclusions . . . by the methods of common sense, if such methods be applicable. They almost seem to outrage all our old ideas." The Einsteinians were very sane people, but it was difficult to reconcile some of their results with sanity. "I don't know what to think."

Prof. Gray was very happy in his home life. He is survived by his widow, three sons and four daughters. There was an interesting family gathering when he and his wife celebrated their golden wedding five years ago. He was

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glad when his second son James gave up engineering and followed in his footsteps—a decision which has since been justified by the excellent work he has done in gyrostatics and his appointment as Professor of Applied Physics in the University of Glasgow. In his later years he loved to spend his vacations in the Perthshire Highlands, where golden eagles are still to be seen. The remembrance of his happy, kindly and active life will be treasured by his many old pupils.

A. R.