

much time to Semitic languages and literature, mainly Hebrew and Chaldean, and was for some time a member of the Royal Asiatic Society. His death occurred on 1906 June 4, in London. Mr. Rankin's wife died in 1884; he leaves three daughters and one son, D. J. Rankin, F.R.G.S., M.R.A.S.

He was elected a Fellow of the Society 1879 January 10.

EDWARD HENRY RICHES was born at Leicester 1844 March 21. He was the son of Alfred Smith Riches, who was for many years Solicitor to the University of Cambridge. Mr. Riches was headmaster of a large preparatory school at Dulwich for many years. In 1878 he retired and lived at Scarborough, then at Bournemouth, and afterwards at Weymouth, where he died. He was the author of a number of schoolbooks, and his algebra had a large sale. He contributed articles on Astronomy to the *Leisure Hour*; he was a good speaker, and gave lectures gratuitously for charitable purposes. He married the daughter of Professor Labatt, of Berlin. His wife died in 1901; he leaves one daughter. He died of cancer, at Weymouth, 1907 August 21.

He was elected a Fellow of the Society 1870 April 8.

LAWRENCE PARSONS, FOURTH EARL OF ROSSE, was born at Birr Castle, Parsonstown, King's County, on the 17th November 1840. He was the eldest of the four sons of the third Earl, the maker of the celebrated six-foot reflecting telescope. He was only five years old when this mighty instrument was completed, and at once revealed the existence of spiral nebulae. Lord Oxmantown (as he was during his father's lifetime) was educated at home, and his childhood and youth were therefore spent close to the observatory and workshops of his father, whose position as one of the leading men of science of his day brought him into contact with many distinguished men, whose acquaintance his son thus had the great privilege of making at an early age. Being brought up in close association with his father, it was natural that the son should become deeply imbued with the taste for mechanical engineering and laboratory work, which had enabled the third Earl to produce the great telescope without any help from the experience of previous makers of reflectors to guide him; and throughout his life Lord Rosse delighted in working in his own well-furnished workshop, and making various additions to the equipment of the observatory with his own hands. In due course he entered Trinity College, Dublin, and took his degree in 1864. Soon afterwards he began to take part in the observations with the 6-foot and 3-foot telescopes, and chose as the subject of his first scientific memoir the great nebula of Orion. This object had been very frequently examined at Birr Castle, and all the available material of drawings and descriptive notes (chiefly by Mr. Hunter, observer, 1860-64) was now worked up, verified, and used for the production of the well-known large and beautiful drawing published in the *Philosophical Transactions* for 1868. Though photography has now put an end

to the use of pencil and stump for the delineation of nebulae, the great drawing of the Orion nebula will always be of value as a faithful representation of its appearance in the largest telescope of the nineteenth century.

In October 1867 Lord Rosse lost his father, and succeeded to the title and estates. In the following year he took up the work by which he will no doubt be best remembered in the annals of astronomy—the investigation of the Moon's radiant heat. Some slight attempts at measuring this had been made by others, but Lord Rosse was the first to study the subject perseveringly, and his efforts were crowned with considerable success. In the focus of the speculum of three-feet aperture he placed two thermopiles with poles in reversed position, using at first piles made by Messrs. Elliott, but soon replacing them with others made by himself. His first results, showing the great possibilities of the method, were published in the *Proc. R.S.*, vols. xvii. and xix. In 1871–72, when he had secured the assistance of Dr. Copeland, the work was carried on more systematically, and resulted in the well-known memoir “On the radiation of heat from the Moon, the law of its absorption by our atmosphere, and of its variation in amount with her phases” (*Phil. Trans.*, 1873). In this paper it was shown that the heat varied very nearly as the light, becoming almost imperceptible toward new moon, and that barely twenty per cent. was transmitted by glass.

While thus breaking new ground in celestial physics, Lord Rosse did not as yet abandon the work on nebulae, on which the 6-foot reflector had been more or less regularly employed since the year 1848. In 1869 he applied a clock movement to this instrument which made it possible to take fairly accurate micrometer measures, even of difficult objects such as the satellites of Uranus, and enabled the observer to determine the relative places of the many new nebulae found with the telescope, of which formerly only very rough positions had been given by the observers. Encouraged by this success, he decided to replace the old altazimuth mounting of the 3-foot telescope by an equatorial mounting, which was carried out in the years 1874–76, the mounting and lattice tube being made, not as usual in his own workshop, but (mainly after his designs) by a Dublin contractor.* In the meantime the long series of observations of nebulae was systematically put together, examined and supplemented by new observations and measures, chiefly in order to re-examine the newly found objects, until the work was finally brought to a close in 1878. Other occupations prevented Lord Rosse from undertaking himself the preparation for the press of this work, but it contains many observations made by him. It was published in 1879–80 in the *Transactions* of the Royal Dublin Society. Though the rapid development of refracting telescopes of great power, and particularly the rise of astronomical photography of late years, have over-

* See his paper “On some recent improvements made in the mountings of the telescopes at Birr Castle” (*Phil. Trans.*, 1880).

shadowed the work done with the once famous "Lord Rosse's telescope," it will never be forgotten that we owe to it the discovery of the spiral form of nebulae, and that this form, which now is known to be characteristic of a large proportion of these objects, could for many years be perceived only by means of that instrument. It is perhaps to be regretted that it has not since 1878 been used for observing nebulae, as there are still several fields of work open in this direction for a very powerful instrument, notwithstanding the competition of the photographic plate. But Lord Rosse felt more drawn to other branches of astrophysics, and in particular he never lost sight of the subject of lunar heat, on which from time to time work continued to be done at his observatory. This was notably the case during the total lunar eclipses of 1884 and 1888, when the interesting observation was made, that though a rapid fall, almost to zero, took place during the first half of the eclipse, the heat after totality continued to be very much below the standard for full moon, even after the last contact with the penumbra. As it seemed unlikely that much further progress could be made with his apparatus, and under the unfavourable atmospheric conditions of his home, he designed a cheap and simple apparatus in order to encourage others to pursue his favourite study in more favourable localities. In this instrument, a 24-inch searchlight mirror of short focus, silvered on the front face, supplies the place of his 3-foot telescope. It was exhibited at the Franco-British Exhibition in London in 1908, where a leaflet describing it was distributed. He had hoped himself to exhibit another copy of this instrument at the Dublin meeting of the British Association, but his health, which had been declining for about two years, finally broke down shortly before that meeting, and he died on the 30th August 1908.

Although Lord Rosse did not publish any scientific papers during the last years of his life, his time was always fully occupied, both with scientific and other work. Since 1869 he was a representative Peer for Ireland, and from 1885 Chancellor of the University of Dublin. He was President of the Royal Dublin Society from 1887 to 1892, and of the Royal Irish Academy 1895-1900. Though of a very retiring disposition, and unwilling to appear in public, his feeling of duty made him devote much time to public affairs, not only as a representative of science (as, for instance, on the committee to investigate the danger threatening the Royal Observatory from the electric generating station at Greenwich), but also on local boards, and as a member of the Irish Church representative body. His genial presence will be missed at scientific meetings, where he was a very regular attendant.

Lord Rosse married in 1870 the Hon. Frances Cassandra Hawke, only child of the fourth Baron Hawke; he leaves two sons and a daughter. By his will he left £2000 in trust for the upkeep of his telescopes, while the instruments themselves were left to his sons and brothers, successively, and failing them, to the Royal Society.

He was elected a Fellow of the Society 1867 December 13, having been elected a Fellow of the Royal Society in the same year.

J. L. E. D.

JAMES LIDDERDALE SCOTT, son of the late Andrew Scott, was born in Edinburgh in 1848. At the age of twenty-one he joined a mercantile firm in Shanghai, and continued to live there until a few weeks before his death. At the age of forty, though a very busy man, he commenced the study of astronomy. Having carefully surveyed the various fields of work, he decided to devote such time as could be spared to the measurement of double stars. To this end he secured a 5-inch Grubb refractor, and, in spite of frequent interruptions through illness, made many valuable measures, which he sent to the British Astronomical Association. His later measures have been published in the *Monthly Notices*. These observations of southern doubles came at a most opportune time, and Mr. Scott, finding that he could do good work with his 5-inch, was anxious that it should be in the direction most needed. In 1906, being on a visit to England, he obtained a good working catalogue, and the results of his measures on his return to Shanghai appeared in the *Monthly Notices*, 1908 April. Mr. Scott did not live to see their publication, for, leaving China early in 1908, he succumbed to an illness, dying on board ship on April 16, at the age of sixty. He married, in 1881, Margaret, eldest daughter of F. Maclean, of Shanghai, who survives him. There was no issue.

He was elected a Fellow of the Society 1891 June 9.

WILLIAM H. E. THORNTHWAITHE was born 1850 June 26, at Alwyn Place, Canonbury, N. His practical ability in the art of optical science was manifested at an early age, and while serving in his father's workshop he produced some excellent work. He was not merely a master of his trade, but a practical and even eloquent exponent of it, being possessed of the happy gift of imparting knowledge and of interesting students in details. To these advantages he added a genial manner and a persuasive tongue. He was for twenty years a Liveryman of the Worshipful Company of Spectacle Makers, and finally Master. In this position he brought his influence to bear in furthering and completing the scheme initiated by the guild for the technical education of rising opticians. In 1897-8 he was Chairman of the Board of Examiners, and so highly were his services appreciated in this capacity, and in his zeal for the scheme in general, that his fellow Liverymen of the Spectacle Makers' Company, and a large number of members of the optical industry, joined in presenting him with an equatorial telescope made by Sir H. Grubb. This instrument he lent to the Northampton Polytechnic, where it is much appreciated. Mr. Thornthwaite was also a keen entomologist, and possessed a representative collection of British Lepidoptera. At the time of his death, which occurred suddenly on 1908 June 1, he was Chairman