In 1902 Joly became Secretary of the Royal Irish Academy, and brought out a new edition of Preston's *Theory of Light*. In 1904 he was elected a Fellow of the Royal Society, and in 1905 a *Manual of Quaternions* appeared from his pen, in which the Hamiltonian manner of establishing the laws of Quaternions is replaced by one leading much more easily and directly to the desired goal.

Joly took a considerable part in scientific life in Ireland ; he was a member of the Council of the Royal Dublin Society, and a Trustee of the National Library of Ireland ; at the time of his death he was President of the International Society for the Study of Quaternions. For Trinity College he performed many services, especially in connection with projected reforms.

His knowledge of literature, especially of Dante and Italian literature, was profound ; and he excelled in the physical life also, being an excellent mountaineer and a member of the Alpine Club.

His death from fever on the 4th of January, 1906, at the early age of forty-one, is a great loss to science.

He is survived by Mrs. Joly, a daughter of the late R. W. Meade, Esq., and by three children.

THOMAS EDWARD KNIGHTLEY was born in 1824. He adopted the profession of architect and practised in London ; amongst his principal works are the new buildings for the Birkbeck Bank and the Queen's Concert Hall, Langham Place. He was district surveyor for Hammersmith for forty years ; he held other public appointments, and was on the Court of the Cordwainers' Company. He was elected a Fellow of the Society on the 13th of March 1896, but never took any active part in astronomical work. He died on the 4th of September 1905.

WILLIAM ROBERT MAURICE WAUGH, a Congregational minister who throughout his long life was deeply interested in astronomy, was born the 25th of July 1818 in London. His observational work related chiefly to the planets, especially *Jupiter* ; but he took much interest in other astronomical work, particularly observations of star colours, and he was for a long period the director of the Coloured Star Section of the Liverpool Astronomical Society, a society which he joined in 1887. His knowledge of all branches of astronomy, and of most branches of physics, was very extensive, and he was an excellent lecturer on scientific subjects. He was for several years Director of the *Jupiter* Section of the British Astronomical Association, and his own observations formed an important part of the work recorded in the Memoirs of that section. He was an excellent draughtsman, and his drawings of *Jupiter* were marked by great accuracy of detail and delicacy of finish. He contributed the additional matter on *Jupiter* to the fourth edition of Webb's *Celestial Objects*. His observatory at Portland, Dorset, contained a

12½-inch reflector and a 4½-inch refractor, mounted equatorially.

Mr. Waugh was elected a Fellow of the Society in 1888, and died the 25th of November 1905.

Sir William James Lloyd Wharton was born in London in 1843, the son of Mr. R. Wharton, County Court Judge of York, and entered the Navy at the age of 14. In 1865 he became lieutenant, and in 1872 commander, being appointed to surveying service in the Mediterranean and the East African coast; an investigation of currents in the Bosphorus which followed brought him to notice as a scientific officer, and his authorship of the standard work on *Hydrographical Surveying* led to his appointment in 1884 to the office of Hydrographer to the Admiralty, which he held until failing health compelled his retirement in 1904. He was elected a Fellow of the Royal Astronomical Society in 1877, and of the Royal Society in 1886, and served for many years as one of the representatives of the Royal Society on the Joint Permanent Eclipse Committee. In 1895 he was promoted to the rank of rear-admiral (retired), and in 1897 received the honour of a K.C.B.

Sir William Wharton's interest in astronomy was manifested by the persistent exercise of his influence with the Board of Admiralty towards obtaining from time to time accession to the means and appliances of the Royal Observatories at Greenwich and the Cape of Good Hope.

He observed successfully the transit of *Venus* in 1874 at Rodriguez, and again in 1882 in the Straits of Magellan; whilst the skill with which he observed with sextant and artificial horizon renders the numerous astronomical positions determined by him in many parts of the world unchallengeable for their accuracy.

He died at the Cape Observatory while staying there as the guest of Sir David Gill during the visit of the British Association to S. Africa. Lady Wharton and several children survive him.

Otto Wilhelm von Struve was born on the 7th of May 1819 at Dorpat. When he was a child seven years of age the Gold Medal of the Royal Astronomical Society was awarded to his father, Wilhelm Struve, who was Director of the Dorpat Observatory—an honour destined in after years to be conferred on himself, and, in the still more distant future, on his son.

His official connection with astronomy began in 1837, when he commenced to serve as assistant to his father in double-star work at the observatory; at the time he was still a student at the university. Meanwhile the Russian Government, guided by the elder Struve, had established the national Russian Observatory at Pulkowa; and, soon after taking his degree, Otto Struve was appointed, with C. A. F. Peters, to the office of Assistant Astronomer there. His energies were now devoted chiefly to