during many years he spent most of his time upon music, including the composition of songs, pianoforte pieces, and anthems. He was also very fond of poetry, and took a keen interest in theological questions.

He had always been interested in astronomy, and about the year 1900, while residing at Earl's Court, he procured a portable telescope, and took up the serious study of the subject, with some assistance from Professor Fowler and Mr. W. Shackleton. He was especially attracted by celestial spectra, for which he used a Zöllner star spectroscope and an objective prism. In *Knowledge* for 1903 he gave a very useful description of the spectra of several of the brighter stars as seen with his small outfit. He also made spectroscopic observations of the Sun, making use of a small polar heliostat, which he afterwards presented to the Society.

After settling at Lansdown, Bath, in 1906, he built an observatory, equipped with a $3\frac{1}{2}$-inch Cooke equatorial. He was also provided with a 5-inch telescope having an altazimuth mounting, a 4-inch comet-seeker, and some smaller instruments. So far as his health permitted he continued to make observations, and derived enormous pleasure from what he was able to do. In the hope of encouraging the study of astronomy Mrs. Foote has generously lent the observatory and two of the smaller telescopes for the use of the pupils of the Royal School for Officers' Daughters.

In 1880 Mr. Foote married Alice Mary Robertson, who died in 1889, leaving him with two sons. In 1892 he married Janet Margaret Wilkinson, and had one daughter. His eldest son is engaged on Government work in Mexico, and the second son is in command of a destroyer in the Royal Navy.

He was elected a Fellow of the Society on 1900 May 11.

Joseph Alfred Hardcastle was the eldest son of Maria Sophia, the third daughter of Sir John F. W. Herschel, who married Mr. Henry Hardcastle, son of Mr. Joseph Alfred Hardcastle, M.P., in 1865. He was born on 1868 August 27, and was educated at Harrow, where he was head of the Modern side and won the Neeld Gold Medal for Mathematics in 1886. He further distinguished himself as a school-boy by passing the examination for the Indian Civil Service, but of this success he did not take advantage. He went up to Trinity College, Cambridge, in the same year (1887), but owing to family reasons left the University in 1888, and, proposing to follow a business career, learnt the art of brewing. In 1890, unfortunately, he was attacked by the complaint from which he suffered for the remainder of his life, and had to spend many winters abroad, in Egypt (where he worked in a bank at Alexandria), Switzerland, and Italy. In 1897 he returned to Cambridge with the hope of taking a degree, but ill-health compelled him again to leave the University without this being accomplished. In 1899 he married Theresa Selina Clive, youngest daughter of Sir Edward Clive Bayley, K.C.S.I.,

C.I.E., when he gave up business, and made astronomical lecturing and teaching his profession, the science always having had an attraction for him. He excelled in this branch of work, and made effective use of models and ingenious mechanical devices, which he planned and used with much skill, of which his lecture on Gyroscopic motion supplied a typical example. This lecturing and teaching work was very congenial to him, because it brought him into touch with so many human beings, and because, as he said, he was able to bring into their lives a new and absorbing interest. He always urged his pupils to make simple astronomical observations, and arranged schemes for this purpose with success. In 1901 he was placed on the staff of the Oxford University Extension Delegacy, and was a member of the Cambridge Extension Syndicate, being an "A" lecturer in each case. He also lectured for other organisations, and in this connection it may be mentioned that he was a candidate for the Gresham Lectureship in 1909, when the late Mr. Saunder was appointed, and it was felt by one who heard the competitive lectures which are given on such occasions, that the electors must have had some difficulty in making their decision.

Some years after his marriage Hardcastle spent some time abroad, and worked for a few months at the University Observatory, Oxford. In 1903 he went to live at Crowthorne, Berkshire, near Wellington College, in order to help Mr. Saunder in the lunar work in which the latter was engaged. Mr. Saunder, being aware of the inadequacy both in number and accuracy of the measured positions on which the standard maps of the moon are based, obtained from M. Loewy four negatives of the Moon taken under different librations with the equatorial coudé of the Paris Observatory, and arranged a scheme for the measurement of these which would result finally in a better knowledge of positions of the features of the lunar surface. The measures of these negatives, more than 20,000 pointings in all, were made by Mr. Hardcastle at his house in Crowthorne with a micrometer lent from the Oxford University Observatory, and in the published account of this work (*Mem. R.A.S.*, **47**, part 1), Mr. Saunder says that it is to his care and accuracy that the value of the whole is due. In 1902 Hardcastle joined the British Astronomical Association, and was elected Secretary in 1904 October. He held this position for six years, and his colleagues on the Council know with what energy he performed the duties of the office, not only in the part he took in the meetings, where he often contributed to the programme and discussion, but also in the internal organisation and management of the Association. His papers in the *Journal* of the Association are numerous, and all give evidence of his originality of thought and ingenuity. After 1910 his health scarcely permitted him to take any active part in the science. He gave up the Secretaryship of the Association, and refused the position of President, and though he was chosen to be a Vice-President, his attendances were few. His lecturing and teaching were almost given up, as travelling was difficult for him; but during these later years of his

life he accomplished the valuable work to be found in the *Monthly Notices* for 1914 June, which is a classification of the nebulæ shown on the series of 206 plates covering the whole sky, taken by Mr. Franklin Adams, and placed at his disposal by Sir Frank Dyson. He served on the Council of our Society from 1907 February to 1910 February, and again from 1912 to 1914. Very naturally he acted on the Committee of publication of Sir William Herschel's papers, and gave much efficient help. On the retirement of Dr. Dreyer from the Directorship of the Observatory at Armagh, Hardcastle, whose health had apparently improved, was chosen by Archbishop Crozier, Primate of Ireland, to succeed him, and was to have taken up the appointment in June last. The selection was an ideal one, but its actual realisation was tragic. Mr. and Mrs. Hardcastle with their family were on the point of starting for their new home when Hardcastle's complaint renewed itself, and he was not able to make the journey, but was obliged to go to his father's house at Oxted, where he died on November 10 last at the early age of forty-nine, and was buried at Oxted on November 13.

Alfred Hardcastle was a deeply religious man, and took an active part in the parochial and church life of the parish of Crowthorne. He was a delightful companion, and had a charm of manner that endeared him to all who met him. The high regard and esteem in which he was held by his pupils is touchingly expressed in an appreciative contribution to the *Journal of the British Astronomical Association* for 1917 December, written by two of them, Miss Blagg and Miss Cook, now both Fellows of this Society. He leaves a widow, a son, and one daughter.

He was elected a Fellow of the Society on 1902 January 10.

H. P. H.

William Ernest Hartley was born at Walsall, Staffordshire, in 1877, and was educated at King Edward's High School, Birmingham; and at Trinity College, Cambridge, of which foundation he was a Scholar. In 1899 he graduated as sixth Wrangler in the Mathematical Tripos. For several years subsequently he held the post of Demonstrator in Physics at the University of Aberdeen. In 1903 he was appointed Second Assistant at the Cambridge Observatory, and when Mr. Hinks left to take a secretaryship in the Royal Geographical Society, Mr. Hartley succeeded him as Chief Assistant, where he was placed in charge of the meridian-circle and employed on the re-observation of the faint supernumerary stars of the Cambridge Zone Catalogue, as well as in the preparation for press of the detailed observations of this Zone—a work which he completed a few months before his death. These tasks left him little time for original work. But he took a large share in a determination of the systematic motions of stars from the radial velocities, which indicated a close quantitative agreement between the radial velocities and proper motions in regard to the phenomena of star-streaming. He was also very successful as a teacher of practical