of his ability. He was supple of hand and quick in perception, and took care to perfect himself in qualities and dexterities which go to make the skilled and useful observer, circumstances which may not have been sufficiently appreciated.

Apart from his official work, Mr. Criswick had several other interests. He supplied the astronomical information to *Whitaker's Almanack* from its first volume in 1869 until that for 1916. He was a great Freemason, and took a very active interest in the affairs of that brotherhood. He was of sociable and amiable disposition, and popular among a circle of many friends. He married in 1877 Miss Elise Tudor Hassall of Mount Sorrell, Leicestershire, who survives him. They had no children.* Mr. Criswick died on 1916 January 26 within a few days of his eightieth birthday.

He was elected a Fellow of the Society on 1868 February 14.

H. P. H.

WILLIAM ELLIS, who died on 1916 December 11, was the son of Thomas Ellis, an assistant to John Pond, Astronomer Royal in the early part of last century. Thomas Ellis was a native of York engaged in a commercial occupation, but evidently had a liking for and some knowledge of astronomy, for in 1825, at the instigation of William Richardson, who was also a north-country man, and already a member of the staff of the Royal Observatory, he came to Greenwich to take up a similar position. On 1828 February 20 his elder son William was born, and at the age of thirteen, after education at local schools, William Ellis was attached to the temporary computing staff then employed on the reduction of the observations of the Moon made at Greenwich between 1750 and 1830 which Airy had organised after the completion of the similar reduction of the ancient planetary observations. When these special computations came to an end in 1848, Ellis, with some of the others, one of whom was Charles Todd, was transferred to the Astronomical Department of the Observatory. In 1852 Richard Carrington, who had been until then the observer at the Durham University Observatory under the Rev. T. Chevallier, resigned that office, and on the recommendation of Airy the position was offered to William Ellis, who went to Durham in 1852 March.

The observer at Durham at that time seems to have been free to choose his own line of work to a great extent, and Ellis continued the series of observations of position of small planets begun by Carrington, and of comets. His observations of Westphal's Comet at its first apparition in 1852 will be found in vol. xxxvii. of the *Astronomische Nachrichten*, where also some of his planetary observations are published. Whilst Ellis was at Durham his father died (1852 May 29), the vacancy at Greenwich being filled by the promotion of J. C. Henderson, who did not hold his office for long, but resigned in 1854 April. Charles Todd, who had been

* Henry Criswick, who is mentioned in the Introduction to Carrington's Sun-Spot volume as having helped in that work, was the younger brother of G. S. Criswick, and was for a time a computer at Greenwich.

transferred to the Cambridge University Observatory, was recalled to succeed Henderson in 1854 May. Another vacancy had occurred in the Greenwich permanent staff in 1853 April by the death of William Rogerson, who had been on Pond's staff, and W. Ellis returned to Greenwich to fill this in the following month, and at once took his place among the regular observers with the Transit-Circle and Altazimuth, the four being, when Todd left Greenwich, as he did shortly after, Henry, Dunkin, Ellis, Criswick. Henry* resigned and died in 1856, when W. T. Lynn joined the staff, and the four thus modified, with James Carpenter added, did the bulk of the routine work of the Observatory for nearly twenty years.

Todd left Greenwich in 1855, and his work, which had been the care of the newly introduced galvanic apparatus within the Observatory and the Time-Signals, was handed over to Ellis. When Henry resigned, the custody of the chronometers also passed into his hands, and thus what is now known as the Time Department was created. This remained in Ellis's charge until the end of the year 1874. During this period there was much extraneous work not in the immediate routine of the Royal Observatory that he was called upon to do, and even before that he had been with Mr. Dunkin one of the observers in the Harton Colliery pendulum experiment in the autumn of 1854. The galvanic determination of longitudes from Greenwich was work connected with his department, and in this way he took a share in the determination of the longitude of Edinburgh (1857–1858), Knightstown, Valentia (1862), and of Glasgow (1865). On these occasions Ellis made the arrangements for the signals and provided, with others, the error of the clock at Greenwich, but did not observe at the distant station. He helped similarly in the Trans-Atlantic longitudes made by American parties in 1866 and in 1873, and also in determining the longitude of Cairo in connection with the observation of the Transit of Venus in 1874. On this occasion he went to Porthcurno in Cornwall, the station of the Eastern Telegraph Company, to receive signals from Alexandria and Greenwich for comparison of the clocks at the two places.

At the end of the year 1874 Mr. James Glaisher having resigned the office of Superintendent of the Magnetic and Meteorological Department and left Greenwich, Ellis, at his own request, was transferred to that position, in which he earned considerable reputation. To estimate correctly the value of the contributions Ellis made to the science of earth magnetism and its connection with sun-spots, it is necessary to consider the history of the subject during the middle period of last century, which is briefly given in the following abstract from Mr. Ellis's writings:—

"It was said by Delambre that the observation of sun-spots was of little account, and that they were more curious than useful, but early in the nineteenth century (1826) Schwabe began his daily record of the solar surface, and

* This is Mr. John Henry Belville, whose name is known in connection with certain meteorological journals. He appears in the Observatory volumes as Mr. Henry.

in 1843 made his announcement of a probable decennial period. In 1841 certain observatories, of which the Greenwich Magnetic Observatory was one, were established in different parts of the world where observations of the elements of earth magnetism should be made for a period of three years. Interest was aroused in this work shortly after their establishment by the occurrence of a considerable magnetic disturbance which was recorded at Greenwich, and was found to have taken place at other observatories at distant places, beginning, as it would appear, at about the same absolute time. Work at these observatories was continued beyond the three years originally intended, and the results were put into the hands of General (Sir Edward) Sabine for discussion. In a paper communicated by him to the Royal Society in 1852, 'On the Periodical Laws discoverable in the Mean Effects of the Larger Magnetic Disturbances,' he remarked that Schwabe's observations of sun-spots showed variations similar in character to those that he had pointed out in the magnetic elements, but added, that although there was this remarkable effect, it was necessary to wait for further observations to see if it was confirmed. Lamont at Munich, Wolf at Zurich, Alfred Gautier, and others found similar results, but astronomers in general seemed to be not very interested in this matter, some indeed disbelieved it. In England only Balfour Stewart wrote on the subject, and his papers were for some reasons not convincing. Whilst in the Astronomical Department my attention had been drawn to the question as one deserving investigation, and when I took up the position of Superintendent of the Magnetic and Meteorological Department and looked daily at the photographic registers of the magnets, I found that in character they were quite different to those of the immediately preceding years, and looking farther back the question seemed to be no longer doubtful, and in course of time I made a graphical representation on a considerable scale of the variations of diurnal range of Declination and Horizontal Force, adding thereto the representation of the variation of sun-spots from the years 1841–1877. On showing this to Sir George Airy, he was charmed to find that the Greenwich observations for so long a period should in so definite a manner confirm the existence of relation between sun-spots and magnetism. The paper that I then prepared, entitled 'On the Relation between the Diurnal Range of Magnetic Declination and Horizontal Force as observed at the Royal Observatory, Greenwich, during the Years 1841–1877 and the Period of Solar Spot Frequency,' was presented by Airy to the Royal Society, and published in the *Philosophical Transactions*, 1880, part 2."

Mr. Ellis's remark as to the attitude of the astronomical world towards a possible connection between sun-spots and magnetism, or at any rate to Sabine's suggestion of a decennial period in the latter, is supported by remarks made by Airy in two papers on Terrestrial Magnetism presented by him to the Royal Society in 1863 and 1868 respectively. In the first he says, speaking of great magnetic disturbances: "There is no appearance of decennial cycles in their recurrence," and in the second, "If they point to any cycle at all, it is one of 6 or $6\frac{1}{2}$ years"; though, on the other hand, it is not to be denied that many persons must have had the possibility of such a connection in their minds, and that papers were written leading to this as a conclusion: but it seems that a definite relation between the phenomena of earth magnetism and sun-spots was not a household word in the world of science until after the publication of Mr. Ellis's Memoir of 1880. He extended the inquiry to include the period 1841–1896 in a paper in vol. lxii. of the *Proceedings of the Royal Society*, and in a third paper in the *Monthly Notices* for December 1899 the relation of magnetic disturbance to sun-spots was further considered.

A paper "On the Simultaneity of Magnetic Variations at Different Places on the Occasions of Magnetic Disturbance, etc." to the *Proceedings of the Royal Society* in 1892, is a valuable contribution to the subject.

The other branch of Mr. Ellis's department, Meteorology, also received much of his attention during the latter part of his life. He was elected a Fellow of the Meteorological Society in December 1875, served on the Council from 1878 to 1908, was elected President in January 1886, and held the office for two years. He contributed many papers to the Quarterly Journal of the Society, these being generally of the nature of tabulation and discussions of the observations made at Greenwich. On the occasion of an exhibition of barometers organised by the Society in the first year of his presidency he delivered an address on the history of the instrument, comprising a list of nearly two hundred known forms, which must have cost much research. He wrote much on minor points connected with the subject in Symons's *Meteorological Magazine*.

As to his contributions to the literature of our own Society, two Memoirs are to be found in the list under his name, one being an astronomical interpretation of the inscriptions on four old tablets discovered in Egypt, published in 1856. The other is a discussion, or collection, of results showing the periodic movement of the Greenwich Transit-Circle, and it is known that the extensive computations for the memoir in vol. xxviii., "On the Apparent Projection of Stars on the Moon's Disk in Occultations," published in Airy's name, was done by Ellis in his spare time at Airy's request. In the volumes of the Royal Society's list of papers there are in all about fifty entries to Ellis's name, which include those above specified, with others contributed to the *Monthly Notices*, the *Horological Journal*, *Nature*, and other publications, dealing chiefly with matters concerning Time and its determination and distribution, or Meteorology. Mr. Ellis retired from the service of the Royal Observatory at the end of the year 1893. He attained the age of sixty-five, when resignation is usually requested by the rules of the Government Service, earlier in that year, but was retained in order that he might complete a Greenwich publication that he had in hand, this being a compilation in tabular form of the observations of temperature made at Greenwich in the fifty years 1841–1890 that he had arranged. This collection of a mass of figures, and its freedom from error, was one of the things of which Ellis was proud. He was clever as a statistician and a computer, and in the early part of his life did extraneous work in the way of reducing the observations made by travellers for latitude and longitude. It fell to him in 1857 to supervise the reduction of Dr. Livingstone's observations as part of his observatory work, and later, at the request of the Geographical Society, the observations of Cameron, also made in African travels, and those of several others came into his hands. Towards the end of his life he often spoke with pleasure of the

confidence that Airy placed in him, and of his acquaintance with the leading men of his early days, Sheepshanks, De la Rue, and others, whom he felt honoured to have met on terms of friendship. Mr. Ellis was elected a Fellow of the Royal Society on 1893 June 1, soon after his paper "On the Simultaneity of Magnetic Variations, etc." He became a Fellow of our Society 1864 December 9, and was nominated an Honorary Member of the British Horological Institute in 1865. In 1873 he became a Member of the Institution of Electrical Engineers, and, as already said, a Fellow of the Royal Meteorological Society in 1875.

He was twice married, but had no children—on 1869 June 20 to Sarah Elizabeth Campion of Bellingham, Northumberland, who died in 1906, and secondly, on 1908 December 7, to a distant cousin, Margaret Anne Ellis of Settle, Yorkshire, who survives him. His younger brother died at sea in his youth, and his two sisters predeceased him. His portrait is to be found in the British Museum of Portraits—South Kensington Collection. Mr. Ellis died purely from the weakness of old age on 1916 December 11, being conscious and active in mind almost to the last.

H. P. H.

William Esson was born at Carnoustie, in Forfarshire, on 1838 May 17. He was educated at the Inverness Royal Academy and Cheltenham Grammar School. In 1855, before his seventeenth birthday, he matriculated at Oxford University on his election to a Bible Clerkship at St. John's College. In addition to all the possible honours in mathematics, he gained a First and a Second Class in the two Classical Honours Examination. In 1860 he gained a Fellowship at Merton College, and in 1897 he was appointed to the Savilian Chair of Geometry in succession to J. J. Sylvester.

He collaborated with Dr. A. V. Harcourt in investigations into the rate of chemical change, and for this work he gained the Fellowship of the Royal Society in 1869. After an interval of thirty years these researches were resumed, and a (third) paper on the subject appeared in the *Philosophical Transactions* in 1895. His other publications were neither numerous nor of great importance. He devoted his energies to lecturing and tuition as well as to administrative work, which grew more and more engrossing, and proved increasingly valuable to his College and to the University.

In 1875 June the Convocation of the University passed a statute establishing the University Observatory. Esson was elected a Visitor (at the same time with Bartholomew Price and Warren de la Rue), and at the first meeting of the Visitors he was elected their secretary. This office he held until his death, *i.e.* upwards of forty years.

He was elected a Fellow of the Society on 1863 February 13.

[The Council are indebted for the above notice to his friend Mr. H. T. Gerrans, M.A., Worcester College, Oxford.]