

and the difference in tone obtained by using refracting or reflecting telescopes.

Mrs. F. Wilson submitted a catalogue of 61 clusters and nebulae observed with binoculars; details were given of the brightness and size of the objects, with a view to their being used for comparison by observers of comets.

Captain Carpenter described some navigation charts designed by Commander Carpenter. One of them showed the relation between speed, time, and distance; the other was formed by curves of declination, hour-angle, altitude, and bearing. It supplied a rapid method of finding the error of the compass, or identifying a star observed among clouds.

Naval Instructor M. A. Ainslie discussed the relative merits of diagrams and nautical tables, and the President described an instrument designed by Mr. W. B. Blaikie for the solution of spherical triangles.

Mr. Crommelin gave some particulars about the star which Prof. Barnard had found to have a large proper-motion; it had been identified as having been observed by Lamont in 1842, and the proper-motion was about 10" a year.

The President exhibited some slides of photographs of spiral nebulae, which had been sent to him by Prof. Seares. The photographs showed the centres of the nebulae to be yellower than the spiral arms.

Prof. Bickerton read a paper on "Mira and the Effects of an Oblique Collision between a Large Planet and a Dead Sun."

Report 19 of the Variable Star Section was received, describing the results of the observations of R Coronae, U Geminorum, and R Scuti in the year 1915. 644 observations had been obtained by 9 members of the Section.

William Ellis.

If happiness comes from finding congenial work, and doing that work well and successfully, William Ellis was surely a happy man. I, the writer, have had not infrequent opportunity of converse with him in the latter years of his life, and know that Mr. Ellis had few, if any, regrets for failure, but could look back on successes and on a long, well-spent life, in which he, by his own endeavours, had added much to the total of natural knowledge. Mr. Ellis was a careful calculator and an expert statistician, but, beyond that, he was a man of thoughtful and judicial mind. It was once said, by one well competent to say it, that what Mr. Ellis said was always worth thinking about. And this opinion was well founded and very general.

Mr. Ellis's connection with astronomy began with his earliest moments, for his father, Thomas Ellis, was an assistant in the

Royal Observatory, Greenwich, before him. Thomas Ellis was a native of York, and, having a liking for astronomy, through the instrumentality of William Richardson, who was also a North countryman, and already one of Pond's assistants, he gave up the commercial work in which he was engaged, and took up an appointment in the Royal Observatory in the year 1825. On 1828 February 20, his eldest son, William, the subject of this note, was born. William Ellis received his education at schools in Greenwich, but in 1841, when only thirteen years of age, he left school, and entered the Observatory on August 2 as a computer, to be employed on one of those extraneous enterprises which Airy arranged in the early years of his directorate. When these came to an end—about the year 1848—most of the persons engaged on this work left the Observatory, but Ellis and one or two others of the younger men were retained and absorbed into the astronomical department of the Observatory. He soon began to observe occasionally with the two instruments that preceded the present Transit-Circle, but in the year 1852 he left Greenwich to take up the position of observer in the Durham University Observatory—then under the direction of its founder, the Rev. Temple Chevallier—left vacant by the departure of Carrington, who was about to establish his Observatory at Redhill.

In the comparatively short time he was at Durham, Ellis made extra-meridian observations of small planets, which are to be found in the volumes of the *Astronomische Nachrichten* of the time, and also of Westphal's Comet at its first apparition, whose return, after 60 years, he was to live to see: but, whilst he was at the northern Observatory, two vacancies occurred in the staff of assistants at Greenwich—one by the death of his father on 1852 May 29, the other by the death of Mr. Rogerson; and to fill the second of these William Ellis was recalled from Durham in May 1853. He at once took his place among the four regular observers with the Transit-Circle, and continued to observe with that instrument, and also with the Altazimuth for 20 years. In 1855 when Charles Todd, who had charge of the galvanic apparatus connected with the chronograph and time-signals, left Greenwich to begin his famous career his work was transferred to Ellis. Later, when Mr. Henry (Belville) died, the business connected with chronometers was also given into his charge, and he remained Superintendent of the Time Department until 1874.

During this period several enterprises were undertaken, not immediately in the routine of the work of the Observatory, in which he took part. The first was the Harton Colliery Pendulum experiment in October 1854, for which Airy collected observers from various British observatories. Dunkin and Ellis were sent from Greenwich. Again, when differences of longitude from Greenwich were determined telegraphically, it fell to him to make the arrangements for the transmission and reception of

signals, though he never took part in a longitude-determination as an observer at the distant station. He was engaged, outside office hours, in two memoirs, to be found in the Royal Astronomical Society's publications—one (vol. xxv., p. 99, 1856) being an examination of some tablets, discovered in Egypt, which had some astronomical signification, but required much research for their elucidation; whilst the other was the well-known memoir on certain forms of Anomalous Occultations (vol. xxviii., p. 173), published in the name of Sir George Airy, but the details for which were prepared by Ellis.

But his name will be chiefly remembered in connection with the sciences of earth-magnetism and meteorology. In the year 1874 Mr. James Glaisher retired from the staff of the Royal Observatory, and Ellis, at his own request, succeeded him as Superintendent of the Magnetic and Meteorological Department. The history of the knowledge of the connection between sun-spots and earth-magnetism, as told by Ellis himself more than once in this Magazine, is briefly as follows:—Several observatories were established about the year 1840 in various parts of the world for the determination of the magnetic elements, and, in course of time, the observations made at these observatories, generally by officers of the Royal Artillery, came into the hands of General Sabine for discussion. The title of a paper of his "On Periodical Laws discoverable in the Mean Effects of the Larger Magnetic Disturbance," read before the Royal Society on 1852 May 6, indicates the beginning of our knowledge of a truth now well accepted. It was shown in this paper that the variation of the magnetic elements suffered a periodic increase and decrease, and Sabine remarked that the sun-spot observations between 1843 and 1848 showed periodic variations similar in character to those of the magnetic elements; but he added that the amount of observational material was then too limited to establish a connection between the phenomena, and this appears to have been a view generally held. Lamont, Wolf, Gautier, and others also pointed out relations between terrestrial magnetism and sun-spots; but there were some who thought these relations were fortuitous, or, at any rate, were not yet proven. Ellis appears to have been interested in these early hypotheses, and, soon after he took charge of the magnetic department, he was able to convince Airy that the Greenwich observations showed this relation very definitely, and he then prepared a paper "On the Relation between the Diurnal Range of Magnetic Declination and Horizontal Force as observed at Greenwich during the Years 1841–1877 and the Period of Solar-spot Frequency," which was presented by Airy to the Royal Society in Ellis's name, and published in the *Philosophical Transactions*, 1880, part ii. This discussion of so long a series of observations was accepted by most people as a proof of connection between sun-spots and magnetism, which was strengthened by subsequent papers of a similar kind published