Although he cannot be said to have been fond of sports, he occasionally played cricket in minor events for his county, was a fair lawn-tennis player and a good skater. His favourite forms of recreation, however, were undoubtedly rowing, sculling and Canadian canoeing, and this is not surprising in one who had lived for many years close to so beautiful a river as the Wye.

Mr Anthony married, in 1892 at Montevideo, Frances Mary, sixth daughter of Edward Vincent Heward of Rugby, by whom he has an only son, Charles Warington Anthony.

He was elected a Fellow of the Society in 1901 January 11.

ARNOLD BUXTON was elected a Fellow of the Royal Astronomical Society in 1922 February. His greatest interest in astronomy centred on the mathematical problems connected therewith, but he devoted a fair amount of time, with the aid of the 12-inch reflector at the Penylan Observatory, Cardiff, to educating school parties and members of the public in this subject.

He was educated at Merton College, Oxford, taking his degree in 1914, and was exceptionally well qualified in mathematics. He joined the Army in 1917 and served for a while in the Royal Garrison Artillery but was later posted to the Munitions Inventions Department at Portsmouth.

On returning to civilian life after the first World War, he became a Lecturer in Mathematics at the City and Guilds College, London, which position he held from 1919 September to 1921. Later, in 1921, he was appointed Head of the Mathematics Department at the Technical College, Cardiff, a post which he held until his death. Whilst at this College, he was Acting Principal from 1945 to 1946 and Vice-Principal from 1947 onwards.

He published a number of papers on the theory of optical systems, and his last publication, in the *Philosophical Magazine* for 1947, concerned a method of ray-tracing through thick lenses and across aspherical surfaces.

His loss will be regretted by his many friends, in particular those of the Cardiff and District Astronomical Society, with whose activities he was closely associated just prior to his death.

T. W. WILLIAMS.

PHILIP HERBERT COWELL was born at Calcutta on 1870 August 7. He was educated in England, first at a private school at Stoke Poges, whence he went to Eton as a King's Scholar. At an early date he showed unusual mathematical ability, gaining the Tomline Prize in Mathematics at school and proceeding to Trinity College, Cambridge, with an entrance scholarship. He graduated as Senior Wrangler in 1892, the third on the list being the late Mr S. S. Hough, who became H.M. Astronomer at the Cape. In the following year he was placed in Class I Division I of Part II of the Mathematical Tripos and in 1894 he was elected a Fellow of his College.

In the meantime his studies had turned to astronomy. In 1891 he was awarded the Sheepshanks Exhibition and three years later the Isaac Newton Studentship. His interests were confined to mathematical astronomy, and his earliest research dealt with the investigation of the motion of the Moon by the method introduced by G. W. Hill. The importance of Hill's work had earlier been pointed out by Sir George Darwin to E. W. Brown, who was four years senior to Cowell, and the same influence undoubtedly determined the direction of Cowell's work. Cowell and Brown met in 1894, while Brown was on a visit to Cambridge, and Cowell assisted in the proof-reading of Brown's volume on *Lunar Theory*. The research for which Cowell was awarded a fellowship of his college was on the calculation of the inclinational terms of the Moon's motion, including the part of the motion of the node which contains the square of the inclination as a factor. This work was published in *The American Journal of Mathematics*, which contained Hill's original researches.

In 1896 Cowell was appointed to the newly created post of a second chief assistant at the Royal Observatory, Greenwich. It was soon found that he had neither the taste nor the aptitude for devising or even using instruments but that he excelled in all matters relating to reducing observations and analysing them. When junior members of the staff were on leave he took charge of their departments and improved the systems of reduction. Amongst his work at this time was an improved method of reducing meridian zenith distances, involving the construction of new tables for refraction based on the Pulkova constants.

The serious difference between the observed and computed positions of the Moon then attracted his attention. Airy had devoted a great deal of time to reducing the Greenwich observations from 1750 onwards and comparing them with tabular values based on his own formula. Observations from 1847 to 1901 had been compared with Hansen's Tables, but for one period of 20 years the wrong sign had been used for one term, while for observations from 1883 onwards corrections determined by Newcomb had been applied. To use the previous reductions effectively it was necessary to reduce them to a common system, and this implied a great deal of work, especially in the case of the early observations. At the time Cowell undertook his discussion it was known that a number of corrections were required by Hansen's Tables, including terms dependent on the action of the planets and on the figure of the Earth. It was known that in a general way the Moon followed the predicted path, but because of the discordances between theory and observation it was thought possible that the theory was not as perfect as it might be. Cowell's work went far to demonstrate that the theory was essentially correct both as regards the inclusion of all the important periodic terms and the coefficients of these terms. The results are given in a series of papers, one of which is to be found in practically every part of the *Monthly Notices* from 1903 November to 1905 June. For the terms of short period Cowell generally used only the observations of 1847–1901, but for longer periods he used the observations back to 1750. The principal papers of the comparisons are in *M.N.*, **65,** p. 108, where the results in longitude are given for 145 terms, and *M.N.*, **65,** p. 721, where the results are given for 101 terms in latitude. For the discussion of terms in latitude Brown's Theory was available, and the enhanced agreement between theory and observation was very noticeable, indicating not only the great accuracy of Brown's Tables but also the accuracy of the coefficients obtained by Cowell from observation.

To complete his discussion of the long-term motion of the Moon, Cowell then turned to the data supplied by ancient records of eclipses. For the secular acceleration of the Moon he found a coefficient of $10''\cdot9$, which agrees closely with that found by other investigators. He found in addition another term which he at first identified as acceleration in the motion of the lunar node but later attributed to acceleration in the motion of the Sun. In this view he differed from Newcomb, who placed less reliance on results derived from records of ancient observations, the interpretation of which may be uncertain.

The work by which Cowell is probably best known was done in cooperation with and at the instigation of the late Dr A. C. D. Crommelin. In 1907, when astronomers were looking forward to the return of Halley's Comet in 1910, Cowell and Crommelin undertook the task of predicting its return. The observations made in 1835 fixed the orbit at that time, but to be able to predict the position in 1910 accurately it was necessary to determine the mean motion in 1835 from the observations made at the return of 1759 as well as that of 1835. To complete the work it was therefore necessary to calculate all the perturbations suffered by the comet between 1759 and 1910.

While the calculations connected with Halley's Comet were still being carried out, the discovery of a moving object near Jupiter in 1908 presented new problems to the Greenwich astronomers. After the fact had been established by Dr Crommelin that this was a satellite of Jupiter, it was clear that the solar perturbations could amount to 10 per cent of Jupiter's attractions, and no theory was available which could take account of these analytically. Cowell decided to apply the method of mechanical quadrature to compute the motion direct from the differential equations in rectangular coordinates. Although this merely involved the application of formulae known from the time of Newton, it had not been thought of before. Previously the major portion of the forces had always been allowed for analytically, and mechanical integration had only been necessary for relatively small forces which produced "perturbations" of the orbit determined analytically. As the calculation of perturbations is at best rather complicated, even when they are small, Cowell decided, with great success, to treat all the forces in the same way.

The success of this simple solution for the gravitational problem in the case of the eighth satellite of Jupiter led Cowell and Crommelin to compute the motion of Halley's Comet between 1759 and 1910 by the same method. Before the end of 1908 they had predicted the time of perihelion as 1910 April 16·61, later corrected to April 17·01. The actual time proved to be 2·68 days later. A final revision indicated that errors of computation and application of the attraction of known bodies could not account for more than a fraction of a day.

In 1910 Cowell was appointed Superintendent of H.M. Nautical Almanac Office. He reorganized the work of that establishment and effected a very considerable saving in the cost of carrying out the calculations. At that time Cowell was the outstanding British expert on dynamical astronomy, and it was hoped that his work would lead to a revival of the study of that subject in this country. During the final illness of Sir Robert Ball in 1913, Cowell gave lectures at Cambridge, and it was confidently expected by his friends that he would be elected to a professorship. This was not to be, and Cowell continued to direct the work of the Nautical Almanac Office until he retired in 1930, when he went to live quietly at Aldeburgh in Suffolk. He died of cardiac asthma on 1949 June 6.

Cowell was a great organizer of computing and was himself a very fast and accurate computer. He did all his work by hand, never using a calculating machine. Since his time the calculating machine has been developed to undertake an enormous volume of work which it would have been impossible to undertake by hand. As it happens, the calculating machine is admirably suitable for and is being extensively used for computing the motion of bodies in the solar system by the method he developed for the eighth satellite of Jupiter and Halley's Comet.

For his lunar work Cowell was elected a Fellow of the Royal Society in 1906 and for that and his later work he was awarded the Gold Medal of our Society and given an honorary D.Sc. of Oxford. After 1914 he never attended any scientific meetings and as he lived at Aldeburgh after 1930 he was personally known to very few Fellows of the Society. He was however warmly attached to Trinity College, Cambridge, and went regularly to the Commemoration celebrations. In 1901 he married Phyllis, daughter of Holroyd Chaplin. She died in 1924. There were no children.

He was elected a Fellow of the Society on 1896 February 14.

J. JACKSON.

MARY ACWORTH EVERSHED was the fifth child in a family of seven born to Captain Andrew Orr, Garrison Artillery, and Lucy Acworth. She was born at Plymouth Hoe on 1867 January 1, while her father was stationed there. Captain Orr died only three years later and thereafter the family lived at their grandfather's rectory, first at Wimborne and later at South Stoke, near Bath. Although " Mindie ", as she was always known, never went to school, she received a good home tuition and was always eager to read all she could find and showed creative talent in writing stories, songs and verses. At the age of 20 she was taken abroad to Germany and Italy. It was in Florence in 1888 that her keen interest in Dante began, which later bore fruit in her book *Dante and the Early Astronomers*. From 1890 to 1895 she was with her mother and three sisters in Australia. In the latter year she returned to England and joined the recently formed British Astronomical Association. Astronomy had been one of her many young interests, but from this time on it became her chief field for serious work. In 1896 appeared her *Easy Guide to Southern Stars*, the need for which had impressed her in Australia. She observed variable stars and went to Norway for the solar eclipse of 1896 and to that of 1900 in Algiers. She also went in later years to the eclipses of 1922 (Wallal), 1927 (Yorkshire) and 1936 (Aegean Sea). Negotiations were under way for her to work at the Dunsink Observatory under E. T. Whittaker, when Astronomer Royal for Ireland (who had married a cousin of hers), when her life was even more firmly welded to astronomy by her marriage to John Evershed in 1906.

Soon after their marriage, Mr and Mrs Evershed left for Kodaikanal Observatory, where Evershed was taking up the post of Assistant Director and in 1911 succeeded C. Michie Smith as Director. The happy partnership produced most fruitful solar research ; in particular, a noteworthy study of the distributions and motions of prominences appears under the joint names of Mr and Mrs Evershed in *Mem. Kod. Obs.*, Vol. 1, Pt. II, 1917. Her one paper in *Monthly Notices*, **73**, 422, 1913, deals with sunspot prominences, and can still be read with much profit since the advent of ciné-photography. It was also at Kodaikanal that Mrs Evershed wrote *Dante and the Early Astronomers*. She accompanied her husband to New Zealand and to Kashmir on expeditions for testing astronomical sites.

In 1923, on retirement from India, the Eversheds returned to England and set up their new home at Ewhurst on the slopes of Pitch Hill overlooking the Sussex Weald, a beautiful site that will be remembered by many astronomers who