15 fall on a Friday". His tables for the visibility of the new moon enabled him to place this problem on a more scientific basis, but he never came to a conclusion which he proclaimed infallible. In his last article he prefers A.D. 33, April 3.

In 1915 Fotheringham published a very learned work on Marco Sanudo, the Venetian prince who conquered the whole of the Grecian Archipelago in 1205–6 for his native city in wars with Genoa. To do this piece of work he had to use Italian, Byzantine Greek and French sources. He showed himself master in this department of medieval history, a strictly philological investigation. But astronomy was claiming more and more of his attention, particularly the history of that subject, and he was naturally drawn to Babylonian astronomy. I supplied him with the texts of the observations of the risings and settings of Venus during the reign of Ammizaduga, tenth king of the First Babylonian Dynasty. The book which we published together, "Venus Tablets of Ammizaduga", contains his *opus magnum*. I cannot enter into details here, but suffice it to say that he and his colleague Carl Schoch undertook to construct tables by which the new moons and risings of Mercury, Venus, Mars, Jupiter and Saturn can be fixed back to 3507 B.C. in the case of the moon, 2099 Mercury, 2999 Venus, 2148 Mars, 2153 Jupiter, 2123 Saturn. By elaborate astronomical control of the calendar and by the Venus tables, Fotheringham's calculation for the sixth year of Ammizaduga at 1916–1915 B.C. was agreed to by Schoch after long discussion; Schoch, recognized as the most brilliant constructor of historical planetary tables, at first opposed this calculation, but was finally convinced. (So far as I know, astronomers were convinced by Fotheringham's work, with the exception of Neugebauer.)*

Fotheringham also devoted much time to the work of the Babylonian astronomers Naburianos and Cidenas, whom he regarded as the principal sources on which Greek astronomy was founded. In the last months of his life he made a brilliant interpretation of figures on Babylonian astrolabes which had baffled Assyriologists to the present day. He studied the voluminous publications of Greek astronomical texts, "Catalogus Codicum Astrologorum Græcorum", and was able to prove that much of it was borrowed from Babylonia.

Fotheringham was now recognized as a man of unique knowledge; in fact, no man living combined his immense classical knowledge with astronomy and chronology. His fame spread in intellectual centres all over the world and his correspondence was heavy. He left a minute catalogue of all his books and articles, together with a list of all the inquiries he received on chronology and astronomy. The list of inquiries runs to more than 350, and includes most of the eminent names of archæologists of the last three decades in all lands. This notice is only a very restricted résumé of the work which J. K. Fotheringham accomplished. The printed testimonials which he submitted from various astronomers when he stood for the Savilian professorship at Oxford fill 34 pages. One of them states concerning his work on the secular acceleration of the sun and moon, "Fotheringham's theory is the only one which definitely solves the problem and means the death blow to the gravitation theory (as applied to eclipses) and will be the theory of the future", and this scholar pronounced Fotheringham to be the most brilliant mathematical astronomer of his age. He had a profound influence in Germany and America; in fact, he was far better known abroad than he was in Great Britain. I must for my own part assert that I was always fully aware of his almost unlimited ability. His death has completely deranged my plans. He was a typical Oxford product, modest, accurate and profound. One can readily believe after working with him more than twenty-five years that he was never angry about anything in his life. Many were his disappointments in academic promotion, and worst of all he suffered constantly from poor health. All these things he bore like a Christian gentleman, a title which gave him more satisfaction than any other.

S. LANGDON.

*Neugebauer's objection to Fotheringham's dating of the First Babylonian Dynasty seems to be subjective and unscientific, for he himself adopted Fotheringham's values for the acceleration of Venus and the moon.

An astronomical correspondent writes as follows:

Dr. J. K. Fotheringham's interest in astronomy developed from the study of ancient chronology. In order to be able to study astronomical chronology he took some lessons in spherical trigonometry and elementary mathematical astronomy from the late Prof. H. H. Turner, and afterwards received some further help in the use of lunar tables and the calculation of eclipses from Prof. J. B. Dale, of King's College, London, and Dr. P. Cowell, superintendent of the Nautical Almanac Office. With this modest preparation for astronomical studies, he proceeded to write a series of papers, in which his knowledge of ancient chronology had full scope, which are of great astronomical importance. In these papers he discussed the occultations of stars by the moon preserved in Ptolemy's "Almagest", the equinox determinations of Hipparchus, and ancient observations of solar and lunar eclipses. The result of these investigations was to establish that the sun has a secular acceleration of 3·0″ per century per century, and the moon has a secular acceleration of 21·6″ per century per century. Lunar theory predicts a secular acceleration for the moon of 12·2″. The residual acceleration, 9·4″, for the moon, and the whole of the secular acceleration of the sun cannot be accounted for by gravitational theory. It is now generally accepted that these secular accelerations are attributable largely, if not entirely, to the action of tidal friction, more especially in narrow seas such as the Irish Sea and the Bering Straits.

From these studies, Fotheringham was led on to the study of the discordances between the observed positions of the moon and the positions computed from pure gravitational theory. Newcomb had allowed for the major discordances by the introduction of an empirical periodic term. This so-called "Great Empirical Term" was incorporated by Brown

into his "Tables of the Moon". But there remained minor fluctuations, which showed some correlation with the departures of the sun, Mercury and Venus from their predicted positions. Fotheringham made a careful analysis of the departures of the moon and sun from pure theory, and showed that there was a fairly constant ratio between the departures for the two bodies, the explanation of which is to be found in fluctuations in the earth's rate of rotation. Though other investigators were working on the same problems at the same time, Fotheringham's contribution was an important one.

In a further paper, Fotheringham made a study of precession, galactic rotation and equinox correction, in which he made a determination of the rotation of the galaxy, and revised the values of the precessional constants. This paper lost some of its importance through the discovery by Oort in the following year of the differential rotation of the galaxy. From this paper Fotheringham was led to the investigation of the mass of Venus. He believed that he had established that there was a fluctuation in the mass of Venus. These results have not been accepted by astronomers. Fotheringham was apt to be led astray by his failure to appreciate the value of observations and the systematic errors to which they were liable. This was due to his lack of any observational experience and to the limitations of his astronomical knowledge. That he was able to obtain the results that he did with so inadequate a training is greatly to his credit.

Other astronomical work of Fotheringham's included a study of the earliest visibility of the moon to the naked eye, which is of chronological importance because, in both the Babylonian and the Jewish calendars, the beginning of the month was fixed by observation of the moon; a restoration of the calendars of Meton and Calippus; discussions of the new star of Hipparchus and of the dates of the birth and accession of Mithridates. He also made a contribution to astronomical history in a monograph on Cleostratus, in which a complete text of the fragments of his work was given, and the nature of his contributions to astronomy was discussed.

WE regret to announce the following deaths:

Dr. J. J. Davis, curator of the Herbarium, University of Wisconsin, known for his work on parasitic fungi, on February 26, aged eighty-four years.

Dr. S. F. Grace, senior lecturer in applied mathematics in the University of Liverpool, author of works on hydrodynamics and tides, on April 30, aged forty-one years.

Prof. E. Perroncito, formerly professor of parasitology in the University, and professor of general pathology and director of the Royal School of Veterinary Medicine, Turin, aged eighty-nine years.

Prof. Stephen Soudek, professor of applied zoology in the Agricultural College, Brno, known for his work on pests of agriculture and forestry, on February 20, aged forty-six years.

News and Views

Magnetic Disturbances and Auroras

As reported in NATURE of May 1, p. 752, considerable magnetic disturbance, presumably related to an active region of the sun containing some big sunspots, began on April 24, and this terrestrial disturbance or series of disturbances was continued until about April $29^d\ 0^h$ U.T. The activity, as recorded at the Greenwich magnetic station at Abinger, includes four distinct disturbances or 'storms', of which the most active periods and extreme ranges in horizontal force have been kindly supplied by the Astronomer Royal, as follows:

April 24^d	21^h to April 25^d	2^h U.T.		280γ
25	16	26	1	300
26	18	27	5	395
27	19	29	0	> 305

The greatest ranges at Abinger over the whole period of disturbance were 50′ in declination, 500γ in horizontal force and 355γ in vertical force.

IN a letter addressed to the Editor, Father J. P. Rowland, *S.J.*, director of the Stonyhurst College Observatory, directs attention to these four storms and suggests that the last, which was of longest duration and produced the most rapid oscillations in the traces, might perhaps be attributable to the largest of the groups of sunspots (with central meridian passage on April 24·6) which extended some 14° in longitude on the sun's surface. The ranges of the magnetic elements recorded at Stonyhurst (about 200 miles north-north-west of Abinger) during this period of magnetic activity were 93′ in declination and $>620\gamma$ in horizontal force, thus exceeding any recorded ranges at Stonyhurst since February 1929. In another letter, Mr. J. McWilliam describes a notable display of the aurora which he saw about midnight when ten miles south of Grantham and which was still visible, though less striking, when seen from Sheffield about two hours later. The display was seen even though there was brilliant moonlight. (As previously mentioned, on p. 752, Mr. Hawke reported this display in *The Times* of April 27, and information of another about midnight on April 26–27 comes from Mr. Housman, of the Seaton Observatory, Workington.)

THE Royal Observatory, Greenwich, was informed by the British Broadcasting Corporation that a brilliant aurora was reported from Halifax, Nova Scotia, on the night of April 27–28. During this last