the complexities of the organisation of biological systems, and he retained his interest in these problems to the end.

Blackman's other major contribution to botany was the effect he had on those who had the privilege of listening to his lectures and on those who had the even greater privilege of doing research under his guidance. His lectures were masterly presentations of experimental results marshalled in such a way as to illuminate his theme. Much of the material was drawn from investigations made under his guidance, while that garnered from biological literature often appeared in a completely new form after having been subjected to his analytical mind. To experience to the full the discipline of his ways it was necessary to work on a problem under his guidance; his was a precise mind which gently indicated the right path. To see one's presentation of the results of an investigation analysed and then synthesized into a new form was indeed an education. He performed this service for many others who sought his advice.

Blackman was a member of the staff of the Cambridge Botany School from his appointment as demonstrator in 1891 until his retirement from the readership in botany in 1936, and as such he undertook a full share of the administrative work of the department. This, together with his wise advice, which continued after his retirement, contributed largely to its smooth running. He was a perfect colleague, and he had the gift of inspiring all, both staff and assistants, to give of their best. When the time came for the extension of the Botany School in 1933, he devoted as much thought to the planning of the new facilities as he had done to the running of the old department. He not only formulated his own requirements down to the smallest detail but also stimulated others to proceed in the same way.

When, in recognition of the active school which had developed under Blackman's inspiration, a Sub-Department of Plant Physiology was created in 1931 with the aid of a benefaction from the Rockefeller Fund, he naturally took charge, and but for complications of age and date of retirement he would have become the first professor of plant physiology in Cambridge. On relinquishing the readership his old students and associates presented him with his portrait, painted by Henry Lamb, which now hangs in the Botany School.

Elected a fellow of the Royal Society in 1906, he was awarded a Royal Medal in 1921, and gave the Croonian Lecture in 1923. He was president of the Botany Section of the British Association in 1908 and president of the Section of Plant Physiology at the International Botanical Congress held in Cambridge in 1930.

He devoted much time and thought to the affairs of St. John's College, of which he was steward for several years and in which he lived as a bachelor fellow until 1917. His advice on a wide range of subjects, including the preservation of old buildings, the erection of new ones, pictures, plate and many others, was sought and respected.

In 1917 he married Elsie Chick. They planned and built a house and surrounded it with a garden which gave them and their friends great pleasure, and provided opportunities for the exercise of his artistic and botanical interests. Mrs. Blackman and their son survive him.

Blackman had the same approach to all problems. He collected the facts and considered them carefully and dispassionately before giving his opinion. It was done so thoroughly and unobtrusively that there was a temptation not to notice the care that he had bestowed. He was as gentle as he was wise. To those who knew him well Blackman was a great man.

G. E. Briggs
F. T. Brooks

J. W. Sandström

Johan Wilhelm Sandström, meteorologist and oceanographer, who died in January 1947, was born on June 6, 1874. He was chief of the Meteorological Division of the Meteorological and Hydrological Institute of Sweden during 1919–39.

After leaving school, Sandström began life in a factory, but he came under the notice of I. Bendixson, professor of mathematics in the University of Stockholm. Bendixson managed to arrange that Sandström should have time off to go to lectures at the University. He took a keen interest in the promising young man, and the development of Sandström's mathematical talent was largely due to Bendixson's influence.

In 1898 Sandström became a pupil of V. Bjerknes, and his first substantial contribution to meteorology was a paper in the *Meteorologische Zeitschrift* (April 1902) on the "Relation between Temperature and Wind in the Atmosphere under Stationary Conditions", in which he applied to this problem a development by Bjerknes of Kelvin's classical paper of 1869 on vortex motion. Sandström arrived at the conclusion that in Europe, cyclones usually have a cold centre and anticyclones a warm centre, and he indicated the significance of the 'thermal wind', though he did not give it that name, which came nearly sixteen years later. He noted also, what has recently been rediscovered, that North American cyclones are in a much earlier stage of development than European cyclones.

Sandström next collaborated with Helland-Hansen in computing exhaustive tables for the application of Bjerknes' circulation theory to the currents of the ocean. He was also joint author with V. Bjerknes of the first volume of "Dynamic Meteorology and Hydrology", published by the Carnegie Institution of Washington in 1910—the first instalment of a treatise designed to present in an ordered and rational form the principles and development of meteorology and hydrography from the point of view of a mathematical physicist. The treatise was completed by the publication in 1932 of the magnificent three volumes on "Physical Hydrodynamics with applications to Dynamical Meteorology", in which V. Bjerknes had the assistance of J. Bjerknes, T. Bergeron and H. Solberg. But Sandström's help and encouragement had been outstanding and were fully recognized by V. Bjerknes, who acknowledged in the preface that without it he would scarcely have ventured on this great work.

Later in life, Sandström was occupied almost entirely with investigation into the Gulf Stream and its influence on climate. He was not content to use only theory and the observations of others: he made expeditions to test for himself the application of his theory. He prepared a very complete memoir embodying the results of his work. A part of this memoir is being printed by the Swedish Academy of Science and was in the press at the time of his death.

Sandström was a big, genial man. One of his colleagues describes him as a man "with a very vivid and vital interest in Nature and in the problems suggested by natural phenomena. His theoretical ability, which was combined with a good amount of common sense, was so much more remarkable as he was largely a self-educated man, having risen from the position of an aid in a mechanical factory to being the assistant and collaborator of scientists like Svante Arrhenius, Otto Pettersson and Vilhelm Bjerknes."

Meteorologists in England who knew Sandström either personally or through his writings will join with their colleagues in Sweden in mourning the loss of a great pioneer. E. GOLD

WE regret to announce the following deaths:

Prof. Louis Cobbet, formerly professor of pathology in the University of Sheffield, on March 10, aged eighty-five.

Major M. W. K. Connolly, an authority on the land mollusca of Africa, on February 26.

Prof. Llewelyn G. Owen, formerly professor of mathematics in the University of Rangoon, on February 23.

Mr. H. A. S. Wortley, principal of University College, Nottingham, on February 21, aged sixty-one.

NEWS and VIEWS

A Giant Sunspot

A GIANT sunspot group, one of the largest on record, crossed the sun's disk between March 3 and 17, with central meridian passage on March 10·2. Excepting one or two days, the prevailing cloudy skies gave little opportunity for detailed observations, but the following facts may be given. The maximum area of the group, consisting mainly of a pair of great spots, was 4,300 millionths of the sun's visible hemisphere. This exceptionally large area is less than that of the February 1946 spot (4,900 millionths) but greater than that of the July 1946 spot (3,950 millionths). The average area during disk passage of the present spot may, however, be less than that of the July spot (3,750) and is certainly less than that of the February spot (4,400 millionths). Two geomagnetic disturbances, not of great intensity, occurred while the present spot crossed the disk, namely, March 8–9 and March 15–16. Their provisional ranges at Abinger kindly communicated by the Astronomer Royal were

	D	H	V
1st storm	60′	270γ	220γ
2nd storm	30	150	120

The latitude of the spot group was 22° south, but the tilt of the sun's equator at this epoch of the year brought the group to within 15° of the centre of the disk at central meridian passage. Yet no great magnetic storm occurred about one day after central meridian passage, for which statistical results suggested a high probability. It is significant, however, that radio fade-out data, at any rate in Greenwich daylight hours, indicated that no intense solar flare (like those of February 6 and July 25, 1946) occurred when the spot was within the central half of the sun's surface turned towards the earth. Practically on the same solar meridian as the recent spot was another naked-eye group in latitude 13° north, and with maximum area about 1,400 millionths.

Effect of the Moon on Radio Wave Propagation

FROM time to time, some observational evidence has been forthcoming suggesting that the strength of signals received from radio transmitting stations over fixed paths is under certain conditions dependent upon the position of the moon at the time of observation. In particular, H. T. Stetson has investigated this matter, and in 1944 (*Terr. Mag. and Atmos. Elec.*, **49**, 9) described the results of the analysis of some eight years measurements taken at Boston on the strength of signals received from the Chicago broadcasting station. Contrary to his expectations, the evidence strongly indicated that the strength of the signals was dependent upon the age of the moon, although the effect was of a complex nature. It will also be recalled that in a paper published in 1939 (*Proc. Roy. Soc.*, A, **171**, 171), E. V. Appleton and K. Weekes showed the existence of a lunar tide effect in the height of Region E of the ionosphere. The tide was found to be semi-diurnal, with an amplitude variation of about $\pm$ 1 km. If these results are interpreted according to the simple theory of the formation of the ionized regions, they indicate a relative air-pressure oscillation several thousand times the measured relative pressure oscillation at ground level.

In a recent communication to the Editors, Mr. P. A. de G. Howell, 77 Glandovey Road, Fendalton, Christchurch, N.W., New Zealand, claims to have observed during 1938–39 and 1944–45, a correlation between the variation in long-distance transmission conditions at short wave-lengths and the phases of the moon. It was observed that there was a minimum of background noise and high signal strength with little tendency to fade for about two or three days on either side of full phase, these conditions changing to a maximum of noise with poor signals and fading around the time of new moon. The cycle of occurrences is easily confused with those associated with the solar period of similar duration, with which, however, it moves in and out of phase as the months progress. While both Dr. Stetson and Mr. Howell suggest that the effects are the result of changes in ionization in the earth's upper atmosphere, it is clear that the whole subject requires further investigation before definite conclusions can be reached as to the cause of the effect.

Population Trends and the World's Resources

DR. C. L. BERTRAM has presented in a minimum compass the main known facts of the relationship of population and human needs to the availability of animal and vegetable raw materials and foodstuffs (*Geogr. J.*, **107**, Nos. 5 and 6, May–June 1946). He accepts Carr-Saunders' estimates that the world's population has increased fourfold in the last three hundred years—from 545 million in 1650 to 2,057 million in 1933. Only Africa (100 million to 145 million) has failed to take part in this remarkable increase. Although probably three quarters of the world's people are farmers or their dependants, the majority of these do not get sufficient food to maintain health. Seventy-five per cent of Asia's 1,150 million people have a diet far below the standard for health: even the best-nourished countries, such as