

tions due to the rotation and revolution of the earth, all weather changes are caused chiefly by variation of solar radiation, the next step was clearly to bring it into practice for forecasting. This has now been done for Central Argentina with promising results, but the ideal of daily measures of solar radiation is not yet attainable, because more stations are required. Even at Calama, which is nearly cloudless, good observations are not always possible on account of haze.

The concluding paragraph of the report states: "The ideal arrangement for this solar work would be to carry it on in co-operation with the Smithsonian Astrophysical Observatory. If the work at several widely separated observatories could be directed by one capable institution, so that the methods could be uniform and the results comparable, and then if it could be collected and weighted at the central office before cabling to the various weather surfaces of the world, probably a complete and reliable day-to-day record of the solar changes could be obtained which would be of the greatest value to practical meteorology. If the Smithsonian Institution is unable or unwilling to do this work, then it is hoped that observatories will be established by several countries and some direct method of exchange instituted." W. W. B.

### Cotton Industry Research.

THE British Cotton Industry Research Association, which was incorporated in June, 1919, has just issued its first annual report. The association is comprised of 1408 individual members representative of all branches of the cotton industry, and its council includes not only members of the great firms engaged in the industry, but also those representing the various associations of operatives.

The association has appointed as its director of research Dr. A. W. Crossley, who took up his duties last Easter. A large mansion some five miles from the Manchester Exchange, standing in 13½ acres of ground, has been bought for the purposes of the association, to which it is proposed to add extensive buildings, for which it is intended to raise a special fund of 250,000*l.*, to accommodate the various departments of chemistry, physics, colloids, botany, and technology, and to appoint as heads of these departments highly qualified men of science. In order to bring to the notice of the members all available information of work done in the past, Dr. J. C. Withers, of London, has been appointed to direct the abstracting and indexing of scientific and technical matters in connection with the Records Bureau, and the council, in co-operation with the Textile Institute, has arranged for the publication of abstracts from English and foreign papers dealing with matters relevant to the textile industries. It is proposed to establish an extensive library of standard scientific works of reference and of scientific and technical journals. A scheme of education falls within the scope of the association, and already certain Oldham and other mills have arranged to provide scholarships in some branch of science for students who are desirous of becoming members of the staff of the association. The plan of research is intended to cover the qualities of the cotton cuticle and the influence thereon of different reagents employed in mercerisation, bleaching, etc.; the effect of reagents on the strength and elasticity of the fibre, yarn, and fabric; the character of the change due to mercerisation; the nature of tendering in the various types of fibre; the variation in the physical properties of sized

yarn with change in the colloid properties of the material used; the action of the dyeing process, with critical regard to the established purity of materials; the nature of the dye solution, and the chemical change in the latter during the dyeing process; finally, the devising of methods for obtaining exact information as to the length of staple, the behaviour of fibres under stress and strain, the degree of variation in counts and in the diameter of yarn, relative twist, the degree of resistance of yarn to weaving friction, etc. Arrangements have been made for co-operation with the Empire Cotton-Growing Committee (Board of Trade), and in co-operation therewith the Research Association has made a grant of 250*l.* for 1919-20 to a student of botany at Oxford in aid of botanical research in the subject of cotton-growing. The joint committee has likewise arranged for two other students to take up like work in the ensuing session. The income of the association is derived from a call upon the members to the extent of about 9000*l.* and a Government grant from the Department of Scientific and Industrial Research of 7000*l.* The Department has shown the greatest interest and given all possible help in the furtherance of the objects of the British Cotton Industry Research Association.

### Sugar Cultivation in India.

THE existing world-shortage of sugar lends special interest to all experimental work directed towards any advance in the quantity and quality of this essential crop. Sugar-growing and its improvement are attracting an increasing amount of attention in India, the area under sugar-cane having risen from 2,184,801 acres in 1909-10 to 2,808,204 acres in 1917-18, while in addition the date-palm and palmyrapalm occupied 184,412 acres in the latter period ("Agric. Statistics for India," 1917-18, vol. i.). More than half the sugar-cane is grown in the United Provinces, chiefly Agra, and the Punjab accounts for about one-fifth. Palm-sugar, on the other hand, is chiefly associated with Madras, Bengal, and Upper Burma, little being produced elsewhere. The output of sugar for 1918-19 was 2,337,000 tons (Report on Progress of Agriculture in India for 1918-19), but, as this was insufficient to meet home requirements, a large quantity had to be imported. Before the war India was able to produce a surplus of sugar for export, but as this can no longer be done the Government is investigating the possibility of reorganising and developing the sugar industry of the country, and a strong committee has been appointed to determine future policy in this direction. Dr. Barber, who has worked much on the problem, considers that a case has been made out for the foundation of an Imperial Sugar Bureau, of which the "whole duty will be to collect and collate the results obtained in various directions, and thus be in a position to assist the isolated efforts in different parts of the country with sound advice, based on experience gained by a general survey of the work done in India now and in the past and that accomplished in other countries" (Annual Report of the Board of Scientific Advice for India, 1918-19).

Throughout India much work is being done on the improvement of the sugar-cane and on the selection and breeding of varieties suitable for different conditions and localities. At the cane-breeding station at Coimbatore, under the direction of Dr. Barber, a large number of hybrids have been raised and are under observation, some of the seedlings proving very resistant to red rot and smut, two of the most serious

diseases of sugar-cane. As a result of this work it has been possible to pass out a number of seedlings for further testing on a large scale in different places. The trial of new varieties is also carried out in Madras and the United Provinces, for the old ones which have hitherto been grown are rapidly losing favour with the cultivators, and it is necessary to find new and improved varieties to replace them. When imported canes are used it is necessary constantly to renew the stock from the country of origin. Soil and climate have a marked effect on the canes, and varieties that are markedly superior in one area often deteriorate rapidly in quality if transferred elsewhere, and, consequently, experience gained from experimental work in one part of the cane-growing tract is often of doubtful value for another area. This fact makes a strong argument for an increase in the number of sugar research stations in order that the most suitable stocks may be determined for the various localities.

Newly broken up land does not give very satisfactory results, but it should be left for at least a year before planting. If a proper rotation of crops is used, an increase of as much as 5 tons of cane per acre can be obtained. Manurial experiments in Assam have shown that the use of phosphatic fertilisers gives an average increase of 2-3 tons per acre, and in Pusa it is found that rape-cake, farmyard manure, and nitrate of soda can all be utilised with profit. In Madras it is estimated that careful manuring will raise the crop from 25 to 30 tons per acre, which is probably the limit for that particular climate.

Apart from the actual selection and cultivation, special attention is being devoted to the handling of the sugar-cane in order to avoid damage and deterioration. Canes are often stored by windrowing, and tests made over a period of several months show that this does not lead to any appreciable decrease in the quality or amount of sugar obtainable from equal weights of the original and the windrowed cane, but that after a certain time has elapsed deterioration sets in. Experiments suggest that this deterioration is not dependent upon the length of storage, but that the falling off of the quality is probably due to a seasonal rather than a biological factor.

Special methods have been devised at Coimbatore (*Agric. Journ.*, India, xv., part ii.) for the transport of cane for short distances and overseas. In the latter case it is advised that the pieces of cane be pickled in Bordeaux mixture for a short time in order to avoid the introduction of disease from one locality to another. Charcoal-dust, teak sawdust, and wood-shavings all make satisfactory packing materials.

Attention is now being directed to the use of the palmyra-palm as a sugar producer (*Agric. Journ.*, India, xv., part i.). Toddy is made in Bihar from the sweet juice of this palm, but as less than 10 per cent. of the trees are tapped it is probable that the manufacture of sugar would pay. The process of tapping needs special care to obtain the best results. The tips of the flowering stalks are cut off after the male and female inflorescences have been squeezed or otherwise injured to irritate them into producing a good flow of sweet sap. The insides of the collecting pots are coated with lime to preserve the juice and prevent fermentation. The crude sugar obtained from this juice contains lime, which is removed by passing a current of carbon dioxide through the sugar solution until all the lime is precipitated, and a cheap white sugar can then be prepared. It is suggested that as the production of sugar from the wild date-palm has so far been satisfactory, it would be well worth while to give the palmyra-palm industry a fair trial.

W. E. BRENCHLEY.

## University and Educational Intelligence.

LIVERPOOL.—The title of emeritus professor of engineering has been conferred upon Prof. H. S. Hele-Shaw.

MR. R. S. GLENNIE, of the Battersea Polytechnic, has been appointed chief lecturer in pharmaceuticals at the Royal Technical College, Glasgow.

THE Treasury has made to the University College at Swansea a grant of 5000*l.* in a lump sum towards expenses, and also an annual grant of another 5000*l.*

REFERENCE has already been made in these columns to the establishment of a new Department of Aeronautics at the Imperial College at South Kensington. This addition to the work of the college was initiated by the generous action of Sir Basil Zaharoff, who endowed the University of London chair of aviation known as the Zaharoff chair, tenable at the college, to which Sir Richard Glazebrook was appointed with the duty of directing the new department. A comprehensive scheme of instruction and training, mainly post-graduate in character, has been arranged for next session, beginning in October, including special sections in aeronautical engineering, meteorology, and navigation, and with the valuable co-operation of the Air Ministry the services of a distinguished staff of experts have been engaged. Apart from the director with his great experience of this work at the National Physical Laboratory, Sir Napier Shaw will be professor of meteorology and Mr. Leonard Baird professor of aerodynamics; Mr. A. J. Sutton Pippard will deal with the structure and strength of aircraft, and Mr. A. T. Evans with aircraft engines. Courses of lectures will also be given dealing respectively with airships and with navigation, while arrangements are in hand for special instruction in air-cooled engines, high-compression engines, dopes, instruments, wireless telegraphy, and similar subjects. Subject to certain necessary restrictions, it has also been arranged that students of the department will carry out part of their practical training in one or other of the Government establishments concerned with aeronautics.

THE Bureau of Education at Washington has just issued a Bulletin (No. 11) giving statistics relating to school systems in the United States for the year 1917-18. The bulletin is concerned with elementary and secondary education only, and is an elaborate document covering 153 pages octavo, accompanied by 62 tables of statistics and by 49 maps and diagrams illustrative of the various aspects and conditions of primary and higher education, other than university and professional, in the several States. From the figures set forth it would appear that the total population of the States has increased from 38.2 millions in 1870 to 105.4 millions in 1918, and that the children of school age between five and eighteen have increased from 12 to 27.2 millions, and the school enrolment from nearly 7 to nearly 21 millions; whilst the pupils in the high schools, who numbered 80,000 in 1871, were about 1,700,000 in 1918. The number of teachers employed was 650,709, being 105,194 men and 545,515 women, whose average salary in 1918 was 635 dollars, as compared with 189 dollars in 1870. The percentage of scholars enrolled of school age between five and eighteen was 75 in 1918 and 57 in 1870, largely due to better teaching and supervision, a more suitable course of study, transportation of pupils, and improved economic and general condi-