

word to say for the methods adopted at Johns Hopkins University, under Prof. Frost. He admits that statistics is a "difficult and deadly subject for any one who is not blest with a gift for mathematics." Division 6, though placed last, is the largest and most important of all. Not less than thirteen special courses are grouped under the main heading. The subject is so wide and is developing so rapidly that Dr. Balfour's hint that "refresher" courses may be arranged for medical officers of health will not cause surprise.

It remains to add that the planning of the building corresponds to this comprehensive programme. Full details are given in the *British Medical Journal* (July 10, 1926). The lecture theatre (the flat roof of which will be laid out as a garden-court) and the museum

(occupying 15,000 feet of floor space) are important features of the building. The library, a large and imposing room 35 feet by 120 feet, occupies the place of honour in the front of the building. There is a "Publications Department," in which provision will be made for informative and propaganda work. The Chemical Division in the north-east corner of the building will accommodate 70 students and the biochemical and nutritional laboratory 35 students; and there is also a number of staff and research rooms and a class-room with 70 seats. The third floor is mainly occupied by medical biology, and will absorb the greater part of the work of the old London School of Tropical Medicine in Endsleigh Gardens. It is hoped that the building will be completed in two years. T. LL. H.

News and Views.

THE sixth annual report of the Forestry Commissioners (Sept. 30, 1925) is a document of considerable interest if only for the summary it contains of a forest policy recently enunciated by the Government. A century or two has elapsed since any Government in Great Britain can be said to have held definite ideas on the subject of what a forest policy for the country should aim at. The Government of the day has now publicly recognised that the development of such a policy is largely dependent upon State action continuously applied over a period of years, a point which has for long been beyond dispute in many European countries. It is further recognised that large areas of land in many parts of Great Britain are more suited to the production of timber than food, that private forestry should be encouraged by a system of grants, and that the systematic establishment of forest workers' holdings at the rate of 5 holdings per 1000 acres of afforestable land should be aimed at. It may be said at once that this definition of the Government's opinions and aims in this matter is admirable. If persevered in, the progress of forestry should be assured.

THE total area of land acquired by the Forestry Commissioners to Sept. 30, 1925, was 286,198 acres, of which 177,633 acres were classified at the time of acquisition as plantable. Of the plantable area 100,244 acres (56 per cent.) are in England and Wales and 77,409 acres in Scotland. The Crown Woods, e.g. Forest of Dean, New Forest, and so forth have now been placed under the Commissioners. When the Commission was appointed it was laid down that 150,000 acres should be afforested in the first ten years. In the Acland Report the rate of planting per year was prescribed; 50,000 acres to be planted by the sixth year. This acreage has been slightly exceeded. In some respects the laying down of rigid planting prescriptions by area is unfortunate, since the effort to maintain the planting figure may result in poor or bad work and takes no account of possible losses from drought and so forth, experiences well known to all foresters. It also results in waste. For example, in the table of cultural operations in the

1925 report, 22,615*l.* is shown as expended on planting and 9526*l.* on beating up, i.e. filling up plantations in which deaths have occurred. This represents nearly 40 per cent. of the planting expenditure. Forestry, like agriculture, has to face unfavourable climatic factors, but the excessive expenditure alluded to above appears difficult to justify.

THE debate, which is a usual feature of the *Forum*, in the issue for August deals with the question "Is Civilization Contagious?" and is opened by Prof. Elliot Smith with a statement of the case for 'diffusion.' The argument proceeds on the lines which he has already made familiar in putting the case for Egypt as the place of origin and centre of diffusion of culture. The reply is by Dr. B. Malinowski, who argues ingeniously that the opposition between 'diffusion' and 'independent invention' is misleading. He maintains that 'invention' is not a single event for which one single individual is responsible, but a process consisting of a series of infinitely small, infinitely many, steps for which many individuals are responsible. Every cultural achievement is due to a process of growth in which invention and diffusion have equal shares. The familiar example of the 'diffusion' of a match he regards as futile because the match does not become an element of the culture of the native, but is merely a mechanical importation. So far Dr. Malinowski's formal answer to the 'diffusionist'—in effect a compromise which would commend itself to the average anthropologist, if not to the out-and-out upholder of 'independent invention,' should there be any such, whom Prof. Elliot Smith holds up to scorn. But Dr. Malinowski's quarrel goes deeper, and it is this which constitutes the real value of his contribution to the discussion. Only in the field, he maintains, can the problem be solved as a live issue and by functional analysis. Then it appears that every aspect of culture corresponds to a specific need of human nature, to the local environment, and to the general character of given civilisation. The problem is resolved then by the writer's conclusion that diffusion never takes place; it is always a readaptation. Culture is neither

invented nor diffused, but is imposed by "the natural conditions which drive man upon the path of progress with inexorable determinism."

THE Rothamsted Experimental Station has renewed its offer to Chambers of Agriculture, the National Farmers' Union, Students' Societies and the like, to supply, during the coming winter, lectures on a variety of subjects. These lectures are offered by way of supplement to the provision already made by county education committees and agricultural colleges covering the general field of agricultural education. Coming, as they do, from workers engaged on agricultural research, the addresses should prove of extreme interest to their hearers. The agricultural sciences have now become so highly specialised, and the volume of research published daily is so great, that there is a great field of exposition open to those whose duty it is to keep in touch with new things in the branch of research with which they are specially concerned. On the other hand, the director of Rothamsted may be assumed to be fully aware of the value to the experts themselves of direct contact with the actual workers on the soil. While it is true that the pursuit of knowledge should be the sole object of the research worker, that pursuit is in danger of becoming too academic when confined to the laboratory alone. The list of subjects upon which lectures are offered is some indication of the scope of work with which the Rothamsted Station deals. Following the transference of the workers in phytopathology from Kew and Manchester, the station now deals with every aspect of plant life in health and disease, as it concerns the farmer. It may be added that a recent addition to the roll of lecturers is Mr. C. Heigham, whose thoughtful articles on the business aspects of farming were, until recently, a feature of the Saturday page in a London journal. The main headings of the syllabus which accompanies the Rothamsted circular are: soil micro-organisms; agricultural botany; agricultural chemistry; soil physics; insecticides and fungicides; entomology and mycology.

THE weather of August in the British Isles has just been dealt with by the Meteorological Office, in a tentative way, as a supplement to the *Daily Weather Report*, similar summaries being issued on the first day of each month. The promptness of the issue adds much to its value, dealing with facts while fresh to the memory. In many respects the weather of August this year is said to compare favourably with the average August weather. At Kew Observatory temperature and sunshine were both above the average, while rainfall was remarkably low—the lowest since 1899. During the last ten days of the month high barometric pressure spread over the southern districts, giving generally fine weather; at Kew there was no appreciable rain after August 21 until the early morning of September 1. About 12 hours' sunshine were enjoyed daily in south-east England on August 26-29, while day temperatures rose until August 30 when 83° and 84° were registered in London. Some abnormally high night temperatures were recorded during the latter part of the

month. On the night of August 24-25 the thermometer remained well above 60° F. in many places, and did not fall below 65° F. in several parts of London. The mean temperature for the month at Kew was 64°·1, which is 2°·5 above the normal; winds were chiefly westerly and the barometer was high. Thunder only occurred on two days in London. The duration of bright sunshine at Kew was 207 hours, which is 20 hours more than the normal.

THE present status of long-range weather forecasting is dealt with by Prof. R. De C. Ward, of Harvard University, in an article written for the American Philosophical Society. The subject is being very actively considered not only in America but also in many of the European weather offices. Prof. Ward's purpose is to take stock of the subject rather than to offer any contribution to the discussion. He mentions that man's natural craving for advance knowledge of coming weather extends thousands of years back of any attempt at scientific weather forecasting. Allusion is made to the group of animal weather proverbs which have come into existence. Prof. Ward asserts that animals have no foresight which people credit them with, but these are simply characteristics of food supply and other conditions. Some credit is given to the very general forecasts based on sequences in the character of the seasons, but it is pointed out that just when a definite sequence seems to have started the chain is somehow likely to break and the sequence ends. With further and closer study something more definite may develop along this line. Allusion is made to the weather fluctuations associated with sunspot cycles, and it is stated that the results of these studies have not come up to expectations. A longer period generally recognised as having been fairly established is known as the Brückner 35-year cycle, but this may vary between 20 and 50 years. At present, and until such periodicities or variations are more fully understood, long-range forecasts definite and trustworthy cannot be based upon them. Prof. Ward, with high authority behind him, sums up the subject with the statement that the results reached are not yet generally applicable to definite seasonal forecasts, but there is, however, promise for the future.

AMONG the news items published in the *Bulletin for International Relations* (July) are the announcements of the adoption of the metric system in Greece on March 1 last, and of a decree of the Soviet Government for its introduction into Russia on January 1, 1927. A list of international scientific meetings to be held in 1927, 1928, and 1929 is also included. In 1927 there will be a congress of the International Institute for Cold, at Rome; a general assembly of the International Institute for Anthropology; a general assembly of the International Commission for the Investigation of the Air, at Prague; the sixth international Congress of Medicine, at Leyden; the seventh international Congress of Statistics, at Cairo; the fifth international Congress on Seed-Testing, at Rome, in May; the fifth international Congress of the Science

of Heredity, in Berlin (the first international congress to be held there since the War); the second Australasian Medical Congress, in Dunedin (N.Z.), in February; and a congress of the International Association of Medicinal Hydrology, in Italy. In 1928 there will be held an international Congress of Mathematics (the first to be held since the Toronto meeting in 1924), and in 1929 the seventh American Scientific Congress, at San-José, Costa Rica. The bulletin concludes with the communication, already announced in our columns (July 3, p. 21) that the International Research Council has decided unanimously to modify its statutes in order to make possible the adhesion of all States, without distinction; and to invite Germany, Austria, Bulgaria, and Hungary to join the Council.

An important branch of engineering at the present time is the manufacture of water turbines and electric generators for operation in hydro-electric stations. In the July number of the *Journal of the English Electric Co.* an interesting account is given of a 25,000 horse-power water turbine which they have manufactured for the Sao Paulo Electric Co., Brazil, and which has now been running successfully for some considerable time in the Sorocaba Power Station. The station is on the river Sorocaba at a distance of sixty miles from Sao Paulo. The hydraulic power is converted by three 15,000 H.P. units, also made by the E. E. Co., and by this new turbine which acts in parallel with them. The new machine operates under a head of 670 feet of water and it has its rated output at 600 revolutions per minute. At full load the discharge of water is 400 cubic feet per second and the velocity of the water relatively to the vanes is 130 feet per second. As a very close speed regulation was desired the turbine guide vanes are closed in $1\frac{1}{2}$ seconds when the load varies from full load to zero. The casing has the form of a logarithmic spiral. This gives a perfect intake vortex ensuring that the water all round the guide apparatus has the same entrance velocity. The formation of disturbing eddies is therefore avoided. The efficiency is about 90 per cent.

OUTDOOR switchgear, although in fairly common use in America and on the Continent in connexion with electric power transmission, is still rarely used in this country. The account given therefore by the English Electric Co., in the July number of its journal, of the switchgear the Company has erected in the open air for connecting the electric supply systems of the Preston and Blackburn Corporations by means of high-tension transformers and a 33,000 volt cable, is of interest and value. The two necessary sub-stations are almost identical. The switchgear is carried on a light steel structure supported by a concrete plinth on which stand four 2900 kilovolt ampere transformers, the ratio of transformation being from 6600 to 33,000 volts. On the low-pressure side the circuit is broken under oil, but on the high-tension side air-break switches are employed and are mounted with 'arcing horns.' The scraping action of the type of contact employed ensures the pushing

away of any sleet or snow and thus renders the switches satisfactory for use under any weather conditions. The parts are so strong that the contacts can be separated even when they are frozen together. As this type of gear can be employed up to 110,000 volts, it is probable that it will soon become common.

THE National Research Council (U.S.A.) has published, in its reprint and circular series, an address on science and engineering by Prof. W. F. Durand, of Stanford University, California, in which the author deals in an interesting manner with a familiar theme—the nature and interdependence of fundamental and applied research. He points out that each element of material progress in civilisation is the final product of a vast number of interconnecting studies, all of which converge towards this product and have their source in fundamental facts or laws of Nature. He asserts that we can never get behind these basic facts, but he treads on somewhat debatable ground when he uses the term 'explanation' to connote description of phenomena in terms of basic concepts such as 'energy,' 'electrons,' and 'quanta.' As a good professor of engineering he believes that the results of fundamental research, and, indeed, that all knowledge, find their highest expression in terms of service to humanity; and he shows how certain types of industrial research are really fundamental, although all forms of research have their place as essential elements of progress. Engineering affords some excellent illustrations of the interdependence of academic and strictly utilitarian research, and the example of aeronautics, with its dependence on mathematics, physics, mechanics, thermodynamics, and chemistry, is a particularly happy one. In conclusion, Prof. Durand pleads eloquently for more intensive fundamental research in the United States, which he believes has been relatively neglected there.

MOST of the islands in the Azores are subject to earthquakes that occasionally attain destructive violence. One of the well-known centres, though not the most active, lies in the Horta district at the eastern end of the island of Fayal. In this zone a strong earthquake occurred on August 31. In Horta, hundreds of houses were completely ruined and there were few that remained undamaged. Heavy safes were thrown out of alcoves, steam boilers were displaced, and large fissures crossed the streets. Though the earthquake was felt in the neighbouring island of Pico and even at Ponta Delgada in the island of St. Michael, the disturbed area, as in most volcanic regions, seems to have been small, considering the strength of the shock at the epicentre.

THE following awards for the year 1926–27 have been made by the Salters' Institute of Industrial Chemistry and approved by the Court of the Company: Fellowships have been renewed to—Mr. H. S. Pink, University College, Nottingham, and University of Oxford (fellow, 1924–25, 1925–26), at the Massachusetts Institute of Technology; Mr. V. E. Yarsley, University of Birmingham (fellow, 1924–25, 1925–26), at the Polytechnic, Zürich; Dr. R. Campbell, Arm-

strong College, Newcastle-upon-Tyne, and University of Oxford (fellow, 1925-26), at the Department of Chemical Engineering, University College, London. Fellowships have also been awarded to—Mr. E. A. Bevan, East London College, University of London; Mr. R. M. Deanesly, University of Oxford; Mr. R. Edgeworth-Johnstone, College of Technology, University of Manchester; Mr. H. B. Spalding, University of Oxford. The Salters' Institute has also awarded fifty-one grants-in-aid to young men employed in chemical works to facilitate their further studies.

AN interesting addition has just been made to the exhibits in the electrical communication section of the Science Museum, South Kensington, by Messrs. Television, Ltd., who have lent to the Museum the transmitting portion of the original apparatus used by Mr. J. L. Baird in experiments which led him from the wireless transmission of outlines in 1925 to the achievement of true television nine months later, when, on January 27, 1926, the transmission of living human faces with light, shade, and detail was demonstrated before members of the Royal Institution. The subject of television was referred to in an article in our columns on July 3. The apparatus now placed on exhibition at South Kensington includes the original ventriloquist's head used in Mr. Baird's experiments, the revolving dial with lenses, the slotted disc which, revolving at high speed, interrupted the light reflected from the head, another revolving in-

terrupter and the cell container with the aperture through which the flashes of light reach the sensitive cell.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—An assistant fishery officer in the Fisheries Department of the Ministry of Agriculture and Fisheries—The Secretary of the Ministry, 10 Whitehall Place, S.W.1 (September 20). Inspectors under the Agricultural Wages (Regulation) Act, 1924—The Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, S.W.1 (September 24). A head of the Department of Commerce of the Witwatersrand Technical Institute—The Secretary, Office of the High Commissioner for the Union of South Africa, Trafalgar Square, W.C.2 (September 30). An assistant in the Essex Museum of Natural History, Romford Road, Stratford—The Principal, West Ham Municipal College, Romford Road, E.15 (September 30). An evening lecturer in botany at the West Ham Municipal College, Romford Road, E.15—The Principal (September 30). A pathologist to the Lancashire Asylums Board—The Clerk of the Lancashire Asylums Board, County Offices, Preston (October 1). Research chemists at the Chemical Research Laboratory, Teddington—The Secretary, Department of Scientific and Industrial Research, 16 Old Queen Street, Westminster, S.W.1 (October 7). An assistant master for engineering and workshop practice at the Kingston-upon-Thames Technical Institute—The Principal.

Our Astronomical Column.

SUSPECTED COMET.—Mr. Wilk, assistant at Cracow Observatory, who discovered a comet last year, has sent a telegram to the I.A.U. Bureau at Copenhagen announcing his detection of another cometary object of the sixth magnitude on September 1, 21^h 46^m.0 U.T., in R.A. 15^h 53^m 12^s; N. Decl. 3° 55' (position referred to equinox of 1855). The motion was stated to be direct (that is, in the direction of increasing R.A.), and according to the wording of the telegram it reached the extraordinary amount of one degree in four minutes, but it is doubtful whether this is the correct interpretation. If so, the comet was very near the earth, and no forecast of its position is possible until more data are to hand. The writer of this note swept for a few degrees round the given position on September 4 without detecting any bright comet.

FIREBALL ON AUGUST 13.—Mr. W. F. Denning writes: "A large fireball was seen from various parts of England on August 13 at 9^h 13^m P.M. Among other places it was observed from Alford, Linc., Palling, Norfolk, Keynsham, near Bristol, and Derby. The meteor gave the impression of a brilliant rocket; for it illuminated the landscape and sparks followed the head along its somewhat lengthy course. As viewed from Derby it was described as being of an incandescent blue colour with a tail of similar tint and golden sparks. Another person says it emitted an intense bluish-white hue like lightning and that it vividly illuminated the country. I have compared the data and find that the radiant point is indicated at 303° - 13° near α Capricorni, and that the meteor traversed a path of about 84 miles, falling from 62 to 33 miles in height—velocity about 25 miles per

second. The direction of flight was from south by east to north by west, and the meteor passed from over Huntingford to near Doncaster. The radiant point is a well-known one and has been often observed in July and August supplying slow and brilliant meteors."

THE PROBLEM OF 'ISLAND UNIVERSES.'—The true interpretation of spiral nebulae, either as comparatively small bodies occurring merely as outlying members of our Galaxy, or, on the other hand, as very remote systems comparable both in size and nature with the Galactic system itself, still remains a matter of controversy. An important contribution to the problem is made by Dr. Hubble in the *Astrophysical Journal*, vol. 63, p. 236, in which a critical and detailed analysis is given of the naked eye spiral Messier 33, based on photographs taken with the great 100-inch reflector. The high resolving power of this instrument shows no difference between the images of so-called condensations and those of ordinary stars of the same magnitude. Ritchey's description of these objects as "nebulous stars" appears therefore to be no longer tenable. Numerous nebulae, novae, and variable stars have been discovered by Dr. Hubble in Messier 33, including 35 Cepheids. The distance as derived from the period-luminosity relation among the latter is about 263,000 parsecs. That this distance is of the right order of magnitude is confirmed by evidence from the novae and from the luminosity function for the brighter stars. Dr. Hubble considers Messier 33 to be an isolated system of stars and nebulae, far beyond the limits of the Galaxy; but as being more comparable in size and luminosity with the Magellanic clouds than with our own system.