

from the beginning of 1950 has transferred to the British Council the formal responsibility for the welfare of all Colonial students in Great Britain. The Council will now be responsible for housing two hundred such students in new London hostels as well as for the Colonial Office hostels in the provinces, and for this it will be provided with an additional £515,000 from the Foreign Office, Colonial Office and Commonwealth Relations Office, of which £425,000 will come from the Colonial Development and Welfare Fund, and which will be managed by the Council as a separate account.

To other activities of the British Council the general cut of ten per cent imposed on all Government expenditure will in future apply, and the accounts of the work given in the latest report will be read with that limitation in mind. Glancing first at the work under the Science Advisory Committee, of which Sir Henry Dale has resigned the chairmanship after serving since 1942, the Engineering Panel of Advisers has been replaced by the secretaries of the Institutions of Civil, Mechanical and Electrical Engineers, and their presidents serve on the Science Advisory Committee. A Combined Sciences Department has taken over the responsibility of work for all sciences other than agriculture and medicine. Lecture tours overseas were undertaken by twenty-one eminent British men of science, and a conspectus of current scientific research in British universities and university colleges was prepared under the title "Scientific Research in Britain". A survey was made of financial facilities available in the United Kingdom to enable British scientific workers to study overseas and vice versa. In the Science Library 134 bibliographies were compiled in response to requests, and these are distributed to all Council libraries overseas.

The library of the Medical Department dealt with more than 140 requests for bibliographies and information, and more than fifty scholarships were awarded to medical postgraduates and places found for them in universities and hospitals. At the request of the Ministry of Health, programmes were arranged for World Health Organisation fellows studying in Great Britain. The showing of some films on anaesthesia to Italian medical men led to the dispatch of Mr. Geoffrey Organe, of the Westminster Hospital, to Italy and to the establishment there of three schools of anaesthesia; it is somewhat surprising that such results and the close relation between the medical profession in the two countries should have been left to the initiative of the British Council. A similar remark, apart from the question of travel funds, might well be made of the initiation of interchange of lecturers between British and foreign universities. It seems highly desirable that universities and professional institutions should scrutinize carefully this latest report of the British Council and decide what activities there may be which it would be more fitting with professional esteem for them to pursue on their own initiative, and what it is more appropriate to leave to the British Council because of the greater experience which, as in student welfare, the latter is able to bring to bear.

This may well be true of some publishing activities. To *British Science News* (ceased publication, 1950) and the *British Medical Bulletin*, the new quarterly *British Agricultural Bulletin* was added in 1948; but there are other publishing activities, such as *Britain To-day*, which might be improved with closer scrutiny, and the book trade should now be able to manage its own exhibitions of books overseas and export trade without

specific assistance from the Council. The library policy of the Council has already changed, and responsibility for the establishment or maintenance of general public libraries is being transferred to the Colonies themselves. The report points out that the main impact of the work overseas is upon specialists, students and others who are unable to visit Britain, and that about half the Council's headquarters staff is engaged in providing the necessary services and supplies of cultural material for the overseas staff.

EARTHQUAKES DURING OCTOBER-DECEMBER 1949

DURING the last three months of 1949 there were thirty-one strong earthquakes and at least 116 minor ones. October opened with a shock having an epicentre to the west of Lake Tanganyika. On October 4 there was a shock of magnitude $6\frac{1}{2}$, from latitude 1° S., longitude 21° W., in mid-Atlantic; but probably the greatest earthquakes of the month were on October 19, 20 and 21 in the Solomon Islands region. The epicentre of these shocks was near lat. $5\frac{1}{2}^{\circ}$ S., long. 154° E., and the magnitude of the greatest $7\frac{1}{2}$. As far away from the epicentre as Rabaul (New Britain), damage was done to some houses which were thrown off their foundations, while in other houses crockery and glassware were damaged by being thrown from tables and shelves. Several water tanks were thrown from their stands. On October 31 a shock of magnitude $6\frac{3}{4}$ occurred some seventy miles south of Sitka (Alaska), and this was felt in Sitka. Probably the earthquake of deepest focus during the three months, however, happened on October 28 in the region of the Fiji Islands, the depth being about 450 km.

On November 22, in the region of the Kermadec Islands, the greatest earthquake of that month occurred, and the next greatest, on November 27, was in the region of the Tonga Islands; the former had instrumental magnitude $7\frac{1}{2}$ and the latter $7\frac{1}{4}$. It is possible that a slight earth tremor occurred on November 16 in the Potteries district in England. Windows rattled and beds moved, but no damage has been reported.

December 17 and 19 marked the principal earthquakes of that month. On December 17 there were many shocks having the same epicentre (lat. 54° S., long. 71° W.), the greatest being at 15h. 07m. 53s. G.M.T., this having instrumental magnitude $7\frac{1}{2}$. The region affected was in the far south of the Argentine and Chile, and the movement was particularly severe in Tierra del Fuego. Property damage was done at Punta Arenas (Chile), the most southerly town in the world, where several buildings, including a school, collapsed. At the small Argentinian seaport of Ushuaia, the pier broke in two and several buildings were damaged. The total casualties appear to have been one policeman killed and another injured when a house collapsed. On December 29 an earthquake with instrumental magnitude 7.4 shook Luzon, the chief island of the Philippines. Near Ilog, the capital of Isabella Province, on the east coast fissures spouted water and roads were blocked by landslides. At Naguilian, near by, a 'jeep' is said to have disappeared into a fissure. Along the coast, there were landslides and the sea ran over low-lying country, drowning one woman. In Manila and other places damage was done to buildings, and in Cabantuan

several women and children were injured in a panic rush from a cinema. Records have been received from the central stations at Strasbourg and of the United States Coast and Geodetic Survey, and from individual stations at Cleveland (Ohio), De Bilt (Netherlands), Durham, Kew, Pasadena, Stuttgart, Toledo, Zurich and the Swiss observatories.

DEVIATION OF RADIO WAVES AT THE IONOSPHERE

INVESTIGATIONS in radio direction-finding have been conducted in Great Britain under the auspices of the Department of Scientific and Industrial Research since the formation of the Radio Research Board in 1920. This work has had a two-fold objective: first, to ascertain the possibilities of direction-finding at various frequencies for practical application to such purposes as station identification, navigation and meteorology; and secondly, to explore the phenomena involved in the propagation of radio waves over the surface of the earth and through the upper and lower atmosphere. The research towards these objectives has entailed a continuous improvement in instrumental technique, the results of which have had a far-reaching influence on the development and use of radio direction-finding equipment all over the world. In the high-frequency range of about 3–30 Mc./s., radio waves are transmitted mainly as a result of one or more reflexions from the ionosphere; and unless precautions are taken to avoid them, errors in the indication of the direction-finders result from the reception of waves coming down from the ionosphere under certain conditions of polarization.

Such instrumental errors are, however, reduced to a negligible magnitude in the spaced-loop type of direction-finder, which was developed as a practical tool in Great Britain more than ten years ago. With suitable equipment of the spaced-loop type the actual azimuth of arrival of radio waves can be determined to within a fraction of a degree. But this may not be the correct bearing of the sending station unless the propagation of the waves has been confined to the great-circle plane containing both sending and receiving stations. The results of experimental investigations on this problem carried out during 1938–47 are described in a recent report* from the Department of Scientific and Industrial Research, entitled "Lateral Deviation of Radio Waves Reflected at the Ionosphere", by W. Ross.

The investigations included large numbers of observations of the direction of arrival of waves from various transmitting stations at distances ranging from 90 to 8,500 km. The deviations from the great-circle path were found to be of a random and variable nature; at distances less than about 300 km., the rapid moment-to-moment fluctuations were superimposed upon slowly varying deviations with quasi-periods of 10–30 min. The standard deviations of the observed departures from the true bearing of the sending station ranged from about 8° for a distance of 90 km. to 3° for a distance of transmission of 260 km. These figures are mutually consistent, and suggest that the cause lies in a random tilting of the F₂ layer of the ionosphere, the standard deviation of the tilt being about 1–1.5°. For ranges

* Department of Scientific and Industrial Research: Radio Research. Special Report No. 19: Lateral Deviation of Radio Waves Reflected at the Ionosphere. By W. Ross. Pp. iv+32. (London: H. M. Stationery Office, 1949.) 9d. net.

of transmission beyond 500 km. the fluctuations, although still very marked, decrease in magnitude. Typical values for the standard deviation of the fluctuations ranged from 0.9° to 1.3° for distances of 500–5,000 km.

At the close of the Second World War an opportunity arose of comparing the bearing deviations obtained in the above manner with a spaced-loop direction-finder of small aerial spacing (a tenth of a wave-length) with observations taken on a different system, which had been developed by the Germans, and using an aerial spacing of about two wave-lengths. For comparable conditions the close agreement in the results obtained supports the conclusion that the fluctuations in observed bearings are due to a tilting or corrugation of the ionosphere at the point where the waves are reflected from it. The extent of these tilts is not known; but the experiments suggest that they may be measured in tens of kilometres. The study of the lateral deviation of radio waves propagated by way of the ionosphere has been greatly extended in the present programme of work at the Radio Research Station, Slough, as a result of these investigations.

DAYTIME METEOR STREAMS OF 1948

TWO papers, under the title "The Daytime Meteor Streams of 1948", the first by A. Aspinall, J. A. Clegg and A. C. B. Lovell, and the second by C. D. Ellyett, have recently been published (*Mon. Not. Roy. Astro. Soc.*, 109, 3; 1949). The first paper deals with the measurement of the activity and radiant positions of the daylight meteor streams between May and August, 1948, which were first studied by the radio-echo method in 1947. The results of the 1948 work confirm those of the previous year and also provide some additional information, in particular on four other major showers in July and early August. The radiants of these were at $\alpha = 85^\circ$, $\delta = +11^\circ$, $\alpha = 96^\circ$, $\delta = +21^\circ$, $\alpha = 108^\circ$, $\delta = +13^\circ$, each of which gave echo-rates of 20–35 per hour, and remained active between July 12 and 17, after which their activity remained at a low level. The other shower became active on July 23 and reached its peak two days later, when its hourly rate rose to 30 per hour. The radiant was rather diffuse, in Auriga, varying from $80^\circ + 39^\circ$ on July 23 to $91^\circ + 38^\circ$ on August 4, after which it disappeared. Numerous tables, charts and details on individual showers are given in the paper, which should be carefully studied by everyone interested in meteor work.

The second paper is concerned with the measurements of velocities of meteors associated with the showers described in the previous paper. The automatic recorder gives a photographic record of the range and individual amplitudes of the first sixty pulses reflected from the meteor trail¹. The mean velocity for ten Geminid meteors was found to be 34.4 ± 1.45 km./sec., which is in good agreement with Whipple's photographic results². From the geocentric velocities thus determined, it is possible to deduce approximate results for the heliocentric velocities, and up to the present these confirm elliptic orbits—a view which is now practically accepted for most, if not all, meteor streams.

¹ For reference to the apparatus, see *Nature*, 161, 596 (1948).

² *Proc. Amer. Phil. Soc.*, 79, 499 (1938).