ferrous to ferric chamosite, there occurs a partial dehydration which can be related to the lattice positions of the hydroxyl groups. The retention of water and structural order to high temperatures during the dehydration of nacrite[1] was also demonstrated. These results were considered in relation to oxidation–dehydration processes in other minerals, and, as an example, it was shown that chemical analyses for decomposition products of biotite[7] can only give reasonable structural formulæ using assumptions derived from the above experiments. The derivation of good structural formulæ was commented upon by Dr. MacEwan, Dr. Nagelschmidt and Dr. Mackenzie, while Dr. S. J. Gregg (University College, Exeter) compared the retention of water by silicates to a high temperature with the retention of water and carbon dioxide by other compounds. Dr. H. P. Rooksby (General Electric Co., Wembley) referred to the retention of water by γ-Al_2O_3, and, in reply to his questions on the structural dehydration data, Dr. Brindley stressed the slowness of heating and the reproducibility of results even with broken crystals. The mechanism of the dehydration of kaolinite, with special reference to the work of White *et al.*[8], was also discussed by Dr. Nagelschmidt, Dr. Grimshaw, Dr. Howard, Mr. Youell and Dr. Brindley.

The final paper was not upon the subject for discussion although it had an indirect connexion. In order to determine the effect of grinding on kaolinite, Dr. S. J. Gregg, T. W. Parker (English Clays, St. Austell) and Mrs. M. J. Stevens (University College, Exeter) ball-milled a sample for a thousand hours, withdrawing aliquots at intervals for various physical and chemical tests—for example, X-ray examination, air sedimentation, loss on ignition, etc. Up to six hundred hours, the primary particles were decomposed chemically as well as broken physically, and the products formed an amorphous layer on the somewhat disorganized, undecomposed particles. The resultant particles, which possess an internal area, resisted complete dispersion and, after six hundred hours, the proportion of stable aggregates increased. During discussion, questions were asked by Mr. Greene-Kelly, Mr. Henderson, Mr. Jones, Dr. Neumann, Dr. MacEwan, I. L. Freeman (London Brick Co., Stewartby) and Dr. Mackenzie upon the method of sampling, the wear on the ball-mill, the uniformity of particle size, density measurements and the stability of aggregates. The possibility of interference of electrostatic charges with air-sedimentation tests was suggested by Dr. P. L. Plesch (University College, Stoke-on-Trent), and, in reply to a question by Mr. R. Johnson (British Ceramic Research Association), Dr. Gregg pointed out the significance of the inter-relationship of measurements of bulk density, sedimentation and surface area. The X-ray results were discussed by Dr. Brindley and E. K. Cundy (English Clays) and the amorphous coating, or 'Beilby layer', by Mr. Robertson.

Before the end of the meeting, two brief reports—one on the conference on clays and clay technology, held at the University of California during July 21–52, 1952, and one on the meetings of the Comité International pour l'Étude des Argiles, held in conjunction with the Nineteenth International Geological Congress, Algiers, during September 8–15, 1952—were presented by Dr. MacEwan and Dr. Mackenzie, respectively.

This meeting, as a whole, proved most valuable, giving ample proof of the significance of clay – water relationships in all aspects of clay studies, both pure and applied. Its value was enhanced by the concentration on problems which our present knowledge is insufficient to solve, but which might well form the subject of future research.

ROBERT C. MACKENZIE

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RADIO RESEARCH IN THE BRITISH COMMONWEALTH

AT the meeting of the British Commonwealth Scientific Official Conference in 1946, a Specialist Conference on Radio Research was convened and was held in London during August 1948 under the chairmanship of Dr. R. L. Smith-Rose. The proceedings of this Conference, which were published (S.O. Code No. 47–148–1949; London: H.M.S.O.; 4*d*. net), included a number of recommendations designed to encourage the Commonwealth countries to participate more actively in a comprehensive programme of fundamental radio research. This programme included such items as proposals for the location of ionospheric recorder equipment for determining the characteristics of the ionosphere at vertical incidence, the study of the propagation of radio waves at oblique incidence and the comparison of radio transmission forecasts with the results of the practical operation of radio circuits. Other matters were concerned with radio noise of both terrestrial and extra-terrestrial origin, the investigation of meteors by radio methods, and with a study of the effect of meteorological conditions on the propagation of very short radio waves. Suggestions were also made for extending the limited services of standard frequency transmission, and for collecting information to increase our knowledge of the electrical constants of the ground in all parts of the Commonwealth.

The progress made towards the implementation of these recommendations has been reviewed on two occasions by correspondence through the British Commonwealth Scientific Liaison Offices in London; and last August in Sydney, Dr. Smith-Rose held another meeting of the Specialist Conference, taking advantage of the presence there of a number of radio scientists attending the General Assembly of the International Scientific Radio Union. It was noted that considerable progress has been made in extending the network of ionospheric recording stations throughout the Commonwealth. In addition to the stations in Great Britain at Slough and Inverness, the United Kingdom has maintained similar stations at Singapore and in the Falkland Islands; and more recently an experimental equipment has also been in operation at Port Lockroy in Antarctica. Furthermore, similar recorder equipment has been installed by the United Kingdom Department of Scientific and Industrial Research at Ibadan, Nigeria, and at Khartoum, where it is now being operated by the University

College authorities at those places. The Canadian authorities have installed new stations at Fort Chimo, Resolute Bay and Baker Lake; and South Africa has assisted the Belgian Congo authorities to build a station at Leopoldville. The Australian Radio Research Board responded very actively to the recommendation that a chain of ionospheric observatories should be operated in the vicinity of longitude 150° E. by setting up recorders at Hobart, Canberra, Brisbane and Townsville. Furthermore, a station has been set up at Macquarie Island which should be of great assistance in the study of ionospheric conditions in antarctic regions. In India, ionospheric recorders of various types have been installed at Delhi, Calcutta, Ahmadabad and Kodaikanal.

Research on the absorption of radio waves travelling through the ionosphere is being actively pursued in the United Kingdom and in Australia, Canada and India; and the results are used, with other ionospheric information, in a comparison of radio transmission forecasts with practical results. Investigations are also in progress in most Commonwealth countries with the view of improving the forecasting of ionospheric storms, which on occasions cause serious interruption of practical radio services, including communication and broadcasting.

For several years past, measurements of the atmospheric radio noise-level prevailing at frequencies of 2–20 Mc./s. have been made by a subjective method at some twelve stations in various countries; and development work is in hand to extend this investigation to frequencies of 15–500 kc./s. in order to provide more direct information on the performance of low-frequency radio aids to navigation. Fundamental investigations on atmospheric disturbances, including in some cases a detailed study of waveforms, are in progress in the United Kingdom, India and South Africa. A recommendation was made at the Sydney meeting that the high-frequency noise-measuring equipments in Australia and New Zealand should be put into operation again as soon as possible, since continuity of the study of atmospheric noise for several years all over the world is essential for the ultimate improvement of the efficiency of operation of all radio services.

Following a recommendation made at the London meeting in 1948, the New Zealand authorities have been able to initiate in the southern hemisphere the study of meteors by radio methods, as a field of research complementary to that pursued in the United Kingdom. The collaboration between the two countries has been very effective, and it is now recommended that the work in New Zealand should be continued and extended so far as practicable.

The extremely short-wave portion of the radio spectrum is likely to be of very great importance to the future of radio services of all types. With this in mind, a strong recommendation was made at the Sydney meeting that research on tropospheric wave propagation should be vigorously pursued in all countries in order to improve our knowledge of the influence of different climatic conditions on the possible correlation between radio propagation and meteorological conditions. A considerable amount of investigation work in this field has been conducted during recent years in New Zealand, and in the United Kingdom; but there is a need for a continued study of the effects experienced under different conditions and at various frequencies in order to assist those responsible for planning future radio systems and services.

The extensive research work on solar and cosmic noise, which is now embraced under the general title of 'radio astronomy' and which has been pursued in several countries, notably in Australia and the United Kingdom, is too well known to need any detailed reference here. It may be remarked, however, that the meeting in Australia of the International Scientific Radio Union provided an excellent opportunity for some of the workers in this field to meet and discuss matters of mutual interest, and particularly to compare the results of experience in the northern and southern hemispheres.

In February 1950 the United Kingdom established a limited regular service of standard-frequency transmissions from the Rugby radio station of the General Post Office, using the call-sign *MSF*. The service provides transmissions for short periods daily on frequencies of 60 kc./s. and on 5 and 10 Mc./s. These transmitted frequencies are monitored by the National Physical Laboratory, and the latter's observations show that over a period of a day the frequency remains constant to about 1 part in 10^9, a slow drift of frequency over longer periods being corrected whenever the deviation from the nominal value approaches 2 parts in 10^8. Apart from this service, the Union Observatory in South Africa radiates time signals, and a standard frequency transmission is made on low power from Johannesburg. The Australian authorities are also exploring the possibilities of establishing a standard-frequency service to meet local requirements in that continent.

With regard to the measurement of the electrical characteristics of the ground at radio frequencies, in Canada, South Africa and South-West Africa, surveys of conductivity by radio methods have been in progress for some years; and the All-India Radio organization is starting systematic measurements of the electrical properties of the ground throughout India. It is realized that this type of investigation should be pursued in close association with a study of the effects of the contours of the terrain on ground-wave propagation at various frequencies. It is considered, however, that the original recommendation should be retained with the view of encouraging Commonwealth radio organizations to collect all appropriate information on measurements made in their own countries, to facilitate the preparation by the United Kingdom of a survey of existing knowledge of the electrical constants of the ground at radio frequencies.

HUMAN FACTORS IN INDUSTRY

TWO committees to work on human problems in industry have been set up jointly by the Department of Scientific and Industrial Research and the Medical Research Council, one being concerned with human factors in individual efficiency, and the other with human relations. The division of interest between the committees is broadly that the first will study the individual worker and his job, and the second such things as the relation between the manager and the worker, between the worker and his mates and between the foreman and the technical specialist.

The subjects to be considered can be listed under four headings, the first three of which are, in general, the responsibility of the committee on industrial efficiency, and the fourth is that of the committee on