

language of abstract, rational thought, and the teacher who wishes to train his pupils in this language must first be master of his own mother-tongue; good mathematics and clear, simple English go together. Secondly, the teacher must use periodical literature in mathematics to keep in touch with some part, however small, of current research, so as to be able to present school mathematics to his pupils as an essential element of a living, growing organism.

In the afternoon of January 4 the meeting discussed the report of the Association on the teaching of sixth-form geometry. The report recommends a first course, including all that can be regarded as suitable for every pupil who takes mathematics as a main subject after he begins to specialize in mathematics, science or engineering, and a second course, suitable only for mathematical specialists, in which the beginnings of abstract projective geometry could be studied, thus rendering less abrupt the transition from school geometry to university geometry. The discussion was opened by Prof. E. H. Neville (University of Reading), the chairman of the committee which drew up the report, and by Mr. H. Miller (Watford Boys' Grammar School). In the open discussion members recognized the high importance of the report, but suggested that some years would have to elapse before its recommendations could be digested and applied. In the evening of the same day, the principal of King's College, Mr. P. S. Noble, spoke on "Euclid the Artist". Mr. Noble, as a distinguished classical scholar, sees Greek geometry as an integral part of Greek thought and art, and, after sketching its growth from Thales to Apollonius, he compared mathematics with other typical products of the Greek genius, in its essential simplicity, logic and beauty. As a particular instance, a detailed comparison with Greek forensic oratory was drawn.

The proceedings on January 5 opened with a discussion between Mr. J. Kershaw (College of Building, Liverpool) and Dr. C. W. Jones (University of Liverpool) on "Numerical Analysis". Mr. Kershaw outlined a course in numerical analysis for engineers, and Dr. Jones commented on the points raised, the general content of the syllabus and details of method. This interchange of ideas proved very instructive, and the Association hopes to stage a more elaborate version of such a debate at a later meeting. Mr. C. T. Daltry (Institute of Education, London) spoke next on "Teaching through the Flash of Insight". There is a logico-psychological conflict in the learning of mathematics, which may be resolved through teaching in accordance with Nunn's doctrine of the growth of mathematics from problem to process. 'Gestalt' psychology suggests that the problem must be seen as a whole, with a structure transcending the related parts; genuine learning ensues when this view of the problem leads to "the flash of insight". All teaching, said Mr. Daltry, must be directed to the encouragement of individual insight and personal creative activity.

A discussion on "Unified Mathematics as a Factor in Education" was opened in the afternoon of January 5 by Mr. K. R. Imeson (Sir Joseph Williamson's Mathematical School, Rochester), Miss W. A. Cooke (High School, Slough), Mr. K. B. Swaine (Yeovil School) and Miss K. M. Sowden (City of Bath Training College). 'Unified' mathematics may mean a combined course or a method of teaching. The speakers found the second aspect the more important, and suggested a number of topics which could be grouped around one fundamental mathematical

principle. Other matters of debate were the provision of combined or separate text-books, and the relevance of the method to pupils at different stages. In the open debate, details were criticized, but there seemed to be no definite verdict in favour of the 'unified' course.

The last paper was given by Dr. E. A. Maxwell (Queens' College, Cambridge), on "The World Around Us", in which, by a survey of the "General Knowledge" questions set by the scholarship groups of the University of Cambridge during the past fifty years, he depicted the examiner as historian, artist and sociologist. Delicate textual criticism enabled Dr. Maxwell to make substantial contributions to the study of "Examino-Deuteronomy", "Examino-Genesis" and "Examino-Revelations".

The president of the Association for 1954 is Prof. W. V. D. Hodge, Lowndean professor of geometry in the University of Cambridge.

BROADCASTING AND TELEVISION IN GREAT BRITAIN

AT the meeting of the Institution of Electrical Engineers on October 8, Mr. H. Bishop, director of technical services of the British Broadcasting Corporation, gave his inaugural address as president of the Institution for the current session. The major part of the address comprised a most useful and opportune review of the development of broadcasting and television with special reference to the services of the B.B.C., and to the need for international co-operation. While those engaged in most branches of engineering have much to gain by the exchange of information and experience with their contemporaries in other countries, the radio engineer has a special need for international agreement since radio wave propagation cannot be restricted to national boundaries.

In just over thirty years, broadcasting has been built up from nothing in all the important countries of the world; and several international organizations are now constantly concerned in seeking solutions to the problems which accompany the development and operation of home and overseas services. These problems include the allocation of frequencies in parts of the radio spectrum long since overcrowded, and the application of standardization to facilities for the exchange of programmes and the control of interference.

Some idea of the complexity of the problem of broadcasting on low and medium frequencies, on which most national home services at present depend, may be gathered from figures given by Mr. Bishop illustrating the growth of broadcasting in Europe. In 1929 there were two hundred stations in operation occupying a band-width of 1,014 kc./s.: as a result of a European Regional Conference at Copenhagen, a 'plan' came into operation in 1950 under which 243 stations were allocated frequencies which filled the total available band of 1,215 kc./s. Three years later, the number of stations in operation had increased by 50 per cent; and as a result, all stations, including those of the B.B.C. in Britain, are liable to suffer serious interference. An indication of the corresponding growth of world broadcasting is given by the fact that the total number of sound receivers in all countries rose from 29 million in 1929 to more

than 200 million in 1953; the latter figure corresponds to one receiver for every twelve persons in the world.

The dearth of frequencies and the continued increase in the number of stations present a serious problem in the maintenance of a home sound broadcasting service in the low- and medium-frequency bands; and there is little prospect of resolving this problem by an increase in power or improvement in aerial efficiency at transmitting stations. The high-frequency band (3-30 Mc./s.) is not suitable for local services, and now has its own very serious problems for external broadcasting to countries overseas. In pursuance of the present policy of the B.B.C. of providing for the national coverage of three sound programmes, it is therefore proposed to inaugurate home broadcasting services in the very-high-frequency band of 88-95 Mc./s. Considerable experience has been obtained by the B.B.C. in this band with an experimental station at Wrotham in Kent, erected in 1949; and it is now planned to build fifty-one stations at nineteen locations to provide for the Home, Light and Third Programme Services. The building of these new very-high-frequency stations will take several years, and additional transmitters may be added later to complete the national coverage.

With reference to television broadcasting, Mr. Bishop first reviewed the considerations that resulted in the decision to reopen, in June 1946, the London television station, which provided a regular public service from November 1936 until the outbreak of war in September 1939. This has resulted in the development of the television service in Britain on the basis of the pre-war transmission standards of 405 lines, with double interlaced scanning at a picture frequency of 25 per sec. In the light of developments since that time, there is no doubt that this was the right decision. The subsequent installation of additional high- and medium-power transmitters in the United Kingdom has been accompanied by technical developments which have enabled a steady and considerable improvement in picture quality to be obtained with the band-width limitations imposed generally by the radio and cable links between the television transmitters and the studio at which the programme originates. While the present plans of the B.B.C. are concerned with providing national coverage to the extent of 98 per cent of the population for a single programme, the Corporation has also under consideration the need for providing an alternative television programme on a nation-wide basis. Such alternative services, together with any competitive programme service the Government may decide to introduce, will have to be transmitted in various bands of frequencies between 174 and 960 Mc./s. A large amount of research on various aspects of the use of these frequencies is in progress in anticipation of such developments. It is in these bands, also, that any system of colour television will have to be accommodated. In this connexion, Mr. Bishop stressed the importance of ensuring that any colour system introduced must be compatible with the present black-and-white system. This means that the colour transmissions must be such that they provide for the reproduction of a black-and-white picture on the two and a half million receivers already in use in Britain, without any modification of the band-width or other features of these receivers. It may, of course, be necessary to add an adaptor to such receivers to enable them to be tuned to the transmissions in the higher-frequency bands; and

this and other matters are already receiving attention by those engaged in the radio receiver industry.

In the concluding portion of his address, Mr. Bishop referred to the fact that the rate of growth of membership of the Institution, which is about 38,000, appears to be decreasing. While this is not necessarily a bad thing, it might, he suggested, be associated with the problem of maintaining a sufficiency of recruits to the electrical engineering profession. He suggested that it is time to make a fresh assessment of the needs of the profession and the manner in which these could be met by stimulating the appropriate class of education in schools and universities.

NATIONAL RESEARCH DEVELOPMENT CORPORATION

ANNUAL REPORT FOR 1952-53

THE report and statement of accounts of the National Research Development Corporation, covering the year ended June 30, 1953*, is the last which will appear before the Corporation's borrowing powers expire at the end of next June. Although the Development of Inventions Act, 1948, which established the Corporation, empowered the Board of Trade, with the consent of the Treasury, to make advances of up to £5 millions for the capital expenditure of the Corporation in connexion with the development and exploitation of inventions, only 10 per cent of that amount has been used by the Corporation for the development of new inventions during its first four years. A statutory function of the Corporation is to secure, where the public interest requires, the development or exploitation of inventions resulting from public research, and of any other invention which it appears to the Corporation is not being, or is being insufficiently, developed or exploited. Of the fourteen development projects currently in hand, five are derived from private sources. The great majority of the public inventions either require no development or are of such a character that industry, when interested, is prepared to accept the risk of development.

The activities of the Corporation in connexion with requests for assistance for development during the past four years thus suggests that within its statutory responsibilities the need for assistance is much less than was anticipated when the Corporation was established. As a result of these four years of working the Corporation is now a party to more than two hundred and fifty licence agreements with industry in the United Kingdom or abroad, and to revenue-sharing agreements with universities, university research workers and industrial research associations. The administration of 2,224 patents and patent applications in the United Kingdom and overseas thereby involved is a continuing commitment for the Corporation in respect of wasting assets with a maximum life of about sixteen years. The Corporation is also required to seek to recover its expenditure by licensing firms engaged in the industry concerned so as to use the inventions which the Corporation administers. Revenue from recurrent royalties has steadily increased, that for 1953 being £21,204, whereas that from paid-up royalties

* National Research Corporation. Report and Statement of Accounts for the Year 1st July, 1952, to 30th June, 1953. Pp. ii+18. (London: H.M. Stationery Office, 1953.) 9d. net.