

gravity meter, enclosed in a bathysphere weighing about half a ton, is lowered to the sea-bed, its position being fixed by radar intersection from fixed reflectors on land and at sea. The accuracy of measurement is estimated to be ± 0.05 mgal. The technique is, of course, several years old, but an important refinement in the new equipment is the inclusion of a compensator for microseisms, or seabed movements of relatively long period.

The meeting devoted some little time to the important subject of terrestrial tidal variation of gravity in precision studies, and, as the past president of the Association, A. van Weelden, had played a big part in initiating world-wide experiments to improve our knowledge in this respect, he was invited to take the chair for this section of the meeting. C. Morelli (Italy) reported on an extension of his diurnal investigations discussed at the Paris meeting and showed that curves calculated for northern Italy, lat. 45° N., long. 12° E., are applicable for all longitudes if times are suitably corrected. The curves yield an accuracy of 0.01 mgal. within 2 deg. of latitude. Extension to 13 deg. beyond this range also gives the same accuracy on multiplying the amplitudes by a suitable factor. M. Cunietti and G. Inghilleri (Italy) provided a general analysis of the accuracy of the curves for any one station and proposed that the terrestrial tide be derived from an expression of the form:

$$\Delta g = F_1 \sin^2 \varphi + F_2 \sin 2\varphi + F_3,$$

where the constants, which are functions of the local hour angle and declination of the moon and sun, would be periodically determined and published. R. Tomaschek (Great Britain) discussed solutions which, by needing only little computing work by a survey party in the field, would avoid the necessity of making periodical calculations in a central institute. He advocated the use of permanent curves for the sun and the moon and a simplified current noon ephemeris of the moon.

J. Goguel (France) then reported the conclusions of the Tidal Committee, consisting of himself, C. Morelli and R. Tomaschek. They recommended publication in *Geophysical Prospecting*, the journal of the Association, of two kinds of tidal corrections for 1954, which should be tested by field parties as to their simplicity. The first kind consists of curves showing the continuous variation of the tidal forces for several selected latitudes, and the second consists of tables. Each is expressed by:

$$\Delta g = -A + N(\cos \varphi + \sin \varphi) \cos \varphi + S(\cos \varphi - \sin \varphi) \cos \varphi,$$

where φ is the latitude and N and S time functions of the moon and sun together. The tables are obtained by means of a tide predictor. By using a simple nomogram the tidal correction may be determined by means of N and S for any latitude.

C. Morelli and L. Sogaro (Italy) described the results of a magnetic survey designed to investigate the trend of the volcanic outcrops in the Lessini, Berici and Euganei uplands as they disappear beneath the Venetian plain towards the Adriatic Sea. Two branches are apparent, one towards Venice and the other towards Chioggia.

In the electrical section J. J. Breusse and G. Huot (France) illustrated how, in the course of exploring for water, four hundred depth measurements mapped the top of a clay formation underlying the alluvium of the Catania plain (Sicily). The map showed the presence of an old river valley system which was

believed to be filled with permeable alluvium; five wells drilled over these channels were productive. The problem of electrical sounding in the case of dipping plane interfaces is usually approached through an approximate application of the electrical image method for horizontal interfaces. A few years ago, however, an exact but laborious solution of the general problem was formulated. This has recently been improved on by J. Chastenot de Gery and G. Kunetz (France), who illustrated their analysis with interpretation charts. A most informative paper was that given by J. L. Mathieu (France), who described the 'laterolog', a method for better recording of formation resistivity in boreholes. Here, a current of constant intensity is forced into the formation perpendicular to the wall of the hole as a sheet of predetermined thickness by means of a special electrode arrangement, the control system being automatic. The many advantages of the 'laterolog' over ordinary resistivity logs were explained and illustrated by numerous examples.

The one general paper, by O. Vecchia (Italy), discussed the application of electrical and seismic refraction measurements in the problem of building a subsidiary dam on the Lake of Molveno, near Venice. The depth to bedrock was given by refraction, while the permeable nature of the overlying detrital matter was determined by electrical measurements at a number of water-levels. The results showed that subterranean losses disappeared when the level of the lake was 160 ft. lower than normal.

The technical proceedings closed with three films: "Schlumberger Surveys", presented by courtesy of the Société de Prospection Électrique, Paris; and "Recording the Safe Way" and "Drilling the Safe Way", both by courtesy of the Society of Exploration Geophysicists, United States. A short report of the Committee on Safety, given by A. van Weelden, made it very clear that lively action has been and will be taken on this important facet of applied geophysics.

All the arrangements for the meeting were efficiently and generously made by A.G.I.P. Mineraria, which also organized a visit to their geological and geochemical laboratories and to a seismic party; here, a comparative demonstration of rotary and percussion drilling by winch and diesel hammer was most impressive. On the lighter side, sight-seeing tours were arranged by A.G.I.P. for members' wives and for members themselves when their otherwise arduous duties were over, and the Fondazione Ing. Lericci gave a cocktail party. The next meeting of the Association will be in Copenhagen in the late spring of this year.

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¹ *Nature*, **167**, 723 (1951), and **170**, 1010 (1952); *Petroleum Times*, **57**, No. 1470 (1953).

MATHEMATICAL ASSOCIATION

ANNUAL MEETING

THE annual meeting of the Mathematical Association was held at King's College, London, during January 4-5, with the president, Prof. T. A. A. Broadbent (Royal Naval College, Greenwich), in the chair. In his presidential address, "Printer's Ink and the Teacher", Prof. Broadbent, who has edited the *Mathematical Gazette* since 1930, drew on this experience to offer two main suggestions to the teacher of mathematics. First, mathematics is a language, the

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 "Examinio-Deuteronomy", "Examinio-Genesis" and "Examinio-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