50 per cent of a population of cells is destroyed by a given concentration of a drug", to quote a few of the enthusiasts.

It is not the function of this survey to direct attention to misprints and the like ; but the statement on p. 1224 that DNA is the chief chemical component of enzymes seems remarkable.

This report can be thoroughly recommended to biologists and pharmacologists as providing stimulating reading : so much so that it ends with a poem expressing the excitement one may feel at beholding Pomerat's ciné films. R. J. GOLDACRE

EUROPEAN ASSOCIATION OF EXPLORATION GEOPHYSICISTS

MEETING AT THE HAGUE

THE seventh meeting of the European Association of Exploration Geophysicists was held at The Hague during December 8–10, 1954, this being the first occasion when an earlier venue had been revisited. In the three years since the inaugural meeting there, the membership has grown from its anticipated strergth of about one hundred and fifty to a present strength of more than eight hundred— an indication of the very active European interest in exploration geophysics. With the president, J. Goguel, in the chair, the proceedings began with a short business meeting and an opening address by Prof. Vening Meinesz. The technical meeting included the presentation of twenty-two papers, nine dealing with seismic, seven with gravity, three with electrical and three with magnetic methods. This distribution does not fully correspond with that of exploration effort between the various methods which, in terms of numbers of field parties, has been quoted recently by Germain-Jones[1] as seismic 50, gravity 18, electrical 24 and magnetic 8 per cent, out of a total of some two hundred and thirty parties based on Europe.

Four of the seismic papers described theoretical approaches to field problems, the first by Y. d'Erceville (France), dealing with the velocity of propagation of longitudinal waves in muds. The observed velocity in such materials is often lower than that of either the solid or liquid constituent, and using a simple mathematical model he showed that such a velocity might be expected. Unfortunately, the theory also predicts a velocity, intermediate between those of the constituents, which is not observed in practice, and there was some criticism of the completeness of the chosen model. A. Stein (Germany), in attempting to determine the applicability of the reflexion method to mining problems in Siegerland, had calculated the energies to be expected in longitudinal and transverse waves reflected from siderite veins of various thicknesses. In a more purely theoretical approach to a similar problem, J. Baumgarte, H. Menzel and O. Rosenbach (Germany) dealt with the reflexion of longitudinal waves at a thin layer lying between media of differing velocities. The frequency spectrum and the energy/time relationships were discussed both for sinusoidal plane waves and for an incident pulse of arbitrarily chosen form. Although necessarily somewhat limited by the initial assumptions, this was felt to be a very promising step in the investigation of changes of seismic pulse wave-forms. In a further paper on reflexion sur-

veying, W. Brauch (Germany) considered the travel-time curves with particular reference to the possibility of determining velocity distribution.

Three papers were concerned with the more practical aspects of seismic surveying. W. M. Jones and A. T. Dennison (Great Britain) described a portable geophone, designed for long-distance refraction surveys, which has a natural frequency of 2 c./s. ; while there is some doubt whether this low frequency is required, experimental evidence on the subject is indecisive. The discussion on a protractor, designed by J. Schoeffler and E. Diemer (Germany) to facilitate the computation of refraction results, showed that many computers devise such instruments for the solution of their most frequent problems ; apart from those described at the meeting, instruments of similar type though differing in detail have been described elsewhere[2]. For several years, multiple geophone groupings have been used in reflexion surveying to minimize the background noise due to the shot, and H. Richard and M. Rimbaut (France) gave the results of a quantitative field study of the improvement obtained with various linear arrays ; this was found to depend, approximately, on the square root of the number of geophones.

A. M. Selem (Italy) gave a comprehensive description of the instrumental and interpretative techniques required for a reflexion survey in a coastal region of Southern Abruzzi, an area characterized by a heavily eroded topography. The use of special vehicles and field techniques has enabled the survey to be mainly truck-borne in spite of the steep gradients encountered. Variations in the near-surface layers and the rapid changes of surface elevation required a detailed investigation of the requisite corrections ; although the results have not yet been checked by drilling, it is thought that the techniques applied have been very successful. At the present stage of geophysical prospecting, it is somewhat unusual to hear a new method proposed. In this case, M. Matschinski (France) suggested that measurements of the seismic ground unrest could yield information on the underlying geological structure. Assuming that the seismic background is random in nature, he has applied statistical methods to show that measurements of shear strain and of the particle velocity at the surface are related to the depth and character of the geological formations. While certain instrumental and field problems can be envisaged in the practical application of such a method, it remains an interesting suggestion for the practical use of what are otherwise, like telluric currents in electrical prospecting, merely unwanted background noise.

In the gravity section, three authors were concerned with improved techniques of interpretation. G. C. Colley (Great Britain) discussed the variations in elevation correction factor required to correct readings to the datum level, with special reference to its variation across geological boundaries and structures. Formulæ were given for the case of dipping beds together with a general discussion of the anomalous effects which may result over anticlines and near outcrops, although it was agreed that application of the results would require some prior knowledge of the general geological picture. F. Sumi (Yugoslavia) was concerned primarily with a rather different application, the determination of the depth of an ore-body when its shape may be assumed. K. Jung (Germany) has derived a formula, suitable for numerical computations, for the topographical correction of gravity measurements ; this is analogous

to the earlier formula, derived by Schwedyar, for the correction of torsion balance readings.

W. Domzalski (Great Britain) reported a series of gravity measurements made in underground workings, readings being obtained also at points on the surface vertically above those below ground-level. By averaging the rock density values measured in the laboratory, he has obtained good agreement with those calculated from the gravity measurements using the standard value for the mean earth density. A more academic note was struck by S. K. Runcorn (Great Britain), who discussed the recent investigations in Great Britain of the direction of magnetization of rocks, with special reference to sedimentary rocks. Their relevance to theories of continental movements was described, and he emphasized the importance of further measurements to give positive evidence on polar drift and on the relative movements of land masses.

The growing use of geophysical methods in mining operations was typified by a description of a gravity survey in east Carmarthenshire by J. T. Whetton, J. O. Myers and I. J. Watson (Great Britain). This detailed survey around a new colliery site, in an area of complex geological structure, has indicated the presence of various faults as well as anticlinal and synclinal structures. These results should help in the planning of the mine-workings, and it will be interesting to see how closely the present geophysical interpretation agrees with the true geological picture. In a second report on a survey in northern Italy, C. Monnet (Italy) dealt with the extended application of the vertical gravity–gradient method. This has been used with excellent results over the areas of interest, and its use as a quantitative interpretation tool in other similar areas was recommended.

An interesting example of international co-operation was afforded by maps, presented by J. W. de Bruyn (Holland), showing the Bouguer and isostatic isogals over most of Europe and North Africa. These maps are on a 1 : 5,000,000 scale with 5- and 25-milligal intervals, and the Bouguer map clearly illustrates the principle of isostasy. The isostatic isogals, based on the Airy–Heiskanen system, show predominantly positive anomalies, and the features of this map were discussed in some detail. A later edition of these maps will be prepared to include a considerable amount of data received recently, and any further information which may become available will be most welcome. H. Closs (Germany) has prepared, in a similar way, a map showing the magnetic Z-anomalies over Europe. He hoped to make further progress with this, although there were difficulties in combining the results of different field surveys owing to the lack of a common standard of measurement; in the discussion, some doubts were cast on the practical value of such a map. An analogous seismic-velocity map was suggested; but this would clearly require agreement on the aim of such a map and the choice of one of the various possible types of information to be shown.

A paper by V. Baranov (France) provided three charts to help in the interpretation of magnetic surveys. Plotting the observed results and visual fitting to the normalized values on the charts give a rapid interpretation of the observed anomaly. As an example of the use of the charts, he described a mining survey in the Pyrenees where one ore-body, and possibly a second, had been successfully located. The various geophysical well-logging techniques are in widespread use, and J. L. Mathieu and C. Rosoff

(France) gave a general account of the methods currently employed, though omitting the continuous velocity logger now available in America, but not as yet in Europe. They described how the original electrical methods, though successful in soft formations, had proved unsatisfactory in hard sandstones and limestones, and they showed how the methods developed since the Second World War had considerably improved the value of well logging in such hard formations. For surface electrical resistivity measurements, O. Koefoed (Holland) proposed a modified method of calculating standard interpretation curves and gave a set of such curves for a three-layer problem. He critically reviewed Hummel's method of interpretation and suggested an amendment to extend its useful range.

Finally, in a paper particularly appropriate to a meeting at The Hague, A. Volker and E. O. Houtsma (Holland) described resistivity measurements made in and near the Zuider Zee to determine the salinity of the subsoil. For the measurements in open water, a special cable had been used which provided nine different electrode combinations for each position on the sea-bed, with a consequent increase in the speed of working. The results are of importance both for agriculture and for the provision of water supplies, a further example of the widespread applications of geophysical surveys.   A. T. DENNISON

[1] Germain-Jones, D. T., *Geophys. Prospecting*, **2**, 177 (1954).
[2] Vajk, R., *Geophys.*, **19**, 237 (1954).

THEORY OF PLASTICITY

THE James Clayton Lecture for 1955 of the Institution of Mechanical Engineers was given by Dr. William Prager, who chose as his subject "The Theory of Plasticity: a Survey of Recent Achievements", and Dr. Prager gives an account, both authoritative and entertaining, of the present position of the plastic theory. After a brief historical review, he states carefully the reasons for adopting simplified mathematical models, and emphasizes that the solutions derived therefrom can only be approximations to the physical truth. He then illustrates the stress–strain relations corresponding to the various simplified theories by reference to the displacements of cleverly devised kinematic models. These models are certainly most helpful as means of conveying a clear conception of the discontinuous stress–strain relations characteristic of the plastic state. Dr. Prager uses them for showing the difference between stress–strain theories based on total and incremental strain, a discussion which reveals clearly the conceptual superiority of the incremental laws.

The application of general plastic theorems in the calculation of ultimate load-carrying capacities in the fields of structural and mechanical engineering is then discussed. Methods of obtaining lower and upper bounds on collapse loads are introduced by reference to a simple structural example, in which plasticity takes the form of deforming hinges in a member subjected to a transverse load. The extension of these methods to continuous bodies, with application to mechanical engineering problems, is then described, and a number of illustrations are given. It is found that, while it is comparatively easy to obtain upper bounds in plane and three-dimensional problems, lower bounds are much more difficult to