bines, and operates in the frequency range 19–21,000 cycles. The weight and size of the equipment have been minimized by the use of resistance-capacitance circuits in place of the usual inductance-capacitance type which, at these frequencies, would require very large iron-cored chokes. The analyser has two selective amplifiers in series which may be exactly in tune, 3 per cent apart or 10 per cent apart, to provide three different band-widths.

A number of new valves which, hitherto, have not been manufactured in Great Britain were displayed by Mullard Electronic Products, Ltd. Of special interest were a 3-cm. band reflex klystron with an output of 25 mW., and two new thyatron, one containing xenon and the other hydrogen. These should prove useful to workers who have been relying on supplies of American surplus equipment.

F. C. Robinson and Partners, Ltd., demonstrated the 'beta' thickness gauge made by the Baldwin Instrument Co., Ltd. A radioactive isotope emits β -rays which fall on an ionization chamber. Any material placed between the two will absorb part of the radiation, and the change in ionization can be related to the thickness of the sheet. The instrument is normally calibrated to read mass per unit area; but if a material of constant density is used it can be made to read thickness directly. Also on view at this stand was the Scophony-Baird home tape recorder, which gives remarkably high-quality recordings lasting half an hour on a 1,200-ft. reel of plastic tape impregnated with iron dust.

In conclusion, perhaps a word of congratulation to the exhibitors in general might be allowed on the extremely attractive, though modest, appearance of all the displays.

C. A. TAYLOR

BRITISH ELECTRICAL AND ALLIED INDUSTRIES RESEARCH ASSOCIATION

ANNUAL REPORT FOR 1948–49

THE work of the British Electrical and Allied Industries Research Association for the year ended September 30, 1949, is reviewed in the twenty-ninth annual report, issued recently*.

The Association has long played a part in the scientific and technical development of the electricity supply industry, and this has been recognized by the British Electricity Authority by the adherence as ordinary members of the Association of the Central Authority and of the Area Boards. In reviewing the general structure of the Association, which is based on twenty-three sectional committees, stress is laid on the useful scientific liaison which the Association effects. These committees, which have a primary responsibility for advising on research policy in their respective fields, form a meeting ground for research workers from industry, government establishments and from the universities, and their influence is, in consequence, a good deal wider than might be inferred from their immediate responsibilities to the Association. It is pointed out that, as the Association serves an industry which has within the organisations

of its members very great technical resources, it is natural that the Association itself should tend to pursue "longer term, more fundamental and background research".

The subject of electrical engineering materials stands very high in the list of the Association's activities. Important fundamental work on dielectrics has been carried on both in the Association's laboratories and on an 'extra-mural' basis in several university departments and at the National Physical Laboratory. Research on magnetic materials, directed towards the improvement of the quality of electrical sheet-steels and to the production of improved permanent-magnet materials, has, for the most part, been supported in university laboratories. Electrical discharge phenomena have been the subject of extensive research both in relation to problems of direct practical interest in connexion with circuit-breaking and also in the fundamental field. The application of the theory of the electrical discharge, which was developed by Mr. C. E. R. Bruce to certain astrophysical problems, has been further extended by him.

Among the numerous researches on very varied topics listed in the report may be mentioned: the use of wind-power for generation, further work on communication interference and radio interference, short-circuit stresses in transformers and parasitic forces in integrating electricity meters. A total of ninety reports was issued during the year. In a paragraph dealing with organisation and staff, an interesting comment is made on the incidental function which the Association performs in training young scientific staff for the electrical industry.

UNIVERSITIES AND MANAGEMENT

IN the concluding address to the British Institute of Management conference at Harrogate in November 1949, Lord Lindsay stated that we are living in an age of technological revolution and that the productivity of a modern nation depends upon science and perhaps even more so is connected with a spirit of scientific research. By scientific research is meant not just what is taught and produced in the natural science faculties but that taught and produced in any proper university environment. It is a restless inquiring spirit, and the economic success of a modern industrial nation depends upon how far that spirit is pushed right down through the whole of society. To achieve the things Great Britain requires will depend upon two factors, the first being the extent to which this spirit of scientific research goes; it should not be confined to people in the universities but sent right down to the men at the bench. The second is how far each individual has public concern, that is, concern with how the country is run, understanding of the common man and those items needed in the structure of society.

The responsibility of the university in relation to the job would therefore seem to be to produce the science and skill necessary for our modern economic situation—more especially to introduce the scientific spirit, thought and outlook—and to give everybody a sense of citizenship. This means that university training must not be purely specialized although it must have a specialist or technical side. "An arts degree tends to produce an awful lot of uplift and makes people somewhat impractical and out of touch

* British Electrical and Allied Industries Research Association. Twenty-ninth Annual Report, October 1, 1948, to September 30, 1949. Pp. 188. (Leatherhead: British Electrical and Allied Industries Research Association, 1950.)

with ordinary life." What is really required is specialization and general education. At the new university in North Staffordshire (Stoke) it is proposed to start a general course for students who will not know whether they are science or arts students in the first year. They will follow one course and thereby all have a common background of understanding. Since one of the regrettable academic trends in recent years has been the excessive departmentalization in technology and science it is hoped to form a community with a common aim and thought in North Staffordshire in which the professors will form an essential part.

Lord Lindsay then raised the question of what part the universities can play in education for management. He suggested that management needs certain technical information which can be learned in technical colleges, but that the university should only be concerned with providing future managers with a critical faculty and showing them the relevance of their subject studies to matters which are not specialized. The universities should not provide a special course in management and there should not be people in universities studying for a "B. Man" degree living together as potential managers. A student at the university who hopes to go into business management should study something that has a strong sociological side, like Oxford Modern Greats. At the university they should also be given a sociological bent of mind, the ability to see the importance of structure in organisation and groups.

T. H. HAWKINS

CONSTITUTION OF MARS

A PAPER by K. E. Bullen, "On the Constitution of Mars", suggests that the earth and Mars are of the same primitive composition. On the basis of an earth model—referred to in the paper as model *A*—which was advocated by Bullen in "An Introduction to the Theory of Seismology" (1947), W. H. Ramsey assumed that the density variation in the earth's deep interior is essentially determined by pressure rather than by changes in the materials present, and found a discrepancy in fitting the planet Mars to the hypothesis that the terrestrial planets are of the same primitive composition. The discrepancy is considerably less than that found by H. Jeffreys on the hypothesis that the large change in density across the boundary of the earth's central core is due to a change of material rather than to pressure. Ramsey showed that the discrepancy could be removed if model *A* were modified to include an allowance for the gravitation of the heavier elements towards the centre of the earth.

In the present paper, Bullen shows that the discrepancy is fully removed by an earth model *B* instead of *A*, model *B* being constructed on the basis of a compressibility-pressure hypothesis. In this model there is a sharp density increase from 3.36 to 3.37 gm./c.c. at a depth of 80 km., followed by a fairly steady density gradient down to a depth of 2,700 km. After this the gradient increases sharply for the next 200 km., the density being 5.57 gm./c.c. at the base of the mantle. Inside the central core the density ranges from 9.74 to 12 gm./c.c. at a depth of 4,980 km., and then rises sharply, reaching a value of 17–18 gm./c.c. at the centre. This model is independent of the observations of the radius and mass of Mars

and Venus, so that no *ad hoc* adjustments are involved in fitting it to the planets. In fitting Mars to the hypothesis of the same primitive composition for the terrestrial planets, the most satisfactory agreement is obtained on the assumption that Mars has an inner core in the same proportion by mass as the earth.

The calculations show that the results are consistent with a large proportion of nickel-iron in the inner cores of the planets, and some higher-density additional material. The subject is also discussed by Bullen and Ramsey².

¹ Bullen, K. E., *Mon. Not. Roy. Astro. Soc.*, **109**, 6 (1949).

² Bullen, K. E., and Ramsey, W. H., *Mon. Not. Roy. Astro. Soc. Geophys. Supp.*, **6**, 1 (1950).

AIR HYGIENE AND AIRBORNE INFECTION

A SPECIAL report of the Medical Research Council, entitled "Studies in Air Hygiene"*, is a symposium written chiefly by a group of workers led by Dr. R. B. Bourdillon, who continued the work on problems of airborne infection and air disinfection begun under the direction of the late Sir Patrick Laidlaw and continued under Dr. C. H. Andrewes. It states in the preface that this publication must be accepted as a landmark in the study of air hygiene. Not only have various practical methods of air disinfection been discussed and compared, but also a reliable and easy technique for the quantitative estimation of bacterial contamination of the air has been found.

The work described in the report falls into four sections: first, there are detailed accounts of instruments developed for sampling air and experimental and theoretical examinations of factors which influence the efficiency of these instruments; second, the report discusses practical methods of air-disinfection, special attention being directed to the value of the aliphatic alpha-hydroxy-carboxylic acids; third, field studies of the levels of bacterial contamination of the air in theatres, homes, factories, etc., are described; and fourth, the report discusses a few animal experiments on the transmission of airborne infections. A critical evaluation of the different methods of air disinfection ends the report, of which the appendixes and five pages of references to the literature enhance its value.

Field trials now in progress will help to decide whether improved air hygiene will result in improved health. At present, the preface to the report warns us, we must not assume that unselective reduction of the number of bacteria in the air of buildings will necessarily reduce the number of overt infections of people living in them. On the other hand, Dr. L. Colebrook and his colleagues at the Birmingham Accident Hospital have shown that secondary infection of burns can be largely eliminated by strict aseptic technique carried out in a room ventilated by an abundant stream of filtered air; effective methods of laying blanket-dust have reduced cross-infection in fever and surgical wards; and appropriate methods of air hygiene have protected industrial workers from dangerous bacteria.

* Medical Research Council. Special Report Series No. 262: Studies in Air Hygiene. By R. B. Bourdillon, O. M. Lidwell and J. E. Lovelock; with W. C. Cawston, L. Colebrook, F. P. Ellis, M. van den Ende, R. E. Glover, A. M. Macfarlan, A. A. Miles, W. F. Raymond, E. Schuster and J. C. Thomas. Pp. iv+356+33 plates. (London: H.M. Stationery Office, 1948.) 7s. 6d. net.