college or research institute should be able to ask the Unit for statistical advice and even for computational help where special circumstances justify this. Not least important is the possibility that, through the provision of a unified statistical analysis, the Unit can encourage co-ordination of research and of reporting on related topics studied at different centres. At the suggestion of the Scottish Agricultural Improvement Council, the Unit has recently played a leading part in initiating a Survey of Fertilizer Practice in Scotland; this Survey, performed in collaboration with the three Agricultural Colleges and following closely a pattern that has been used with success in England and Wales, for the first time gives objective information on the types, quantities and methods of fertilizer application now used by Scottish farmers.

There is no rigid distinction between the staffs of the Department and the Unit. Members of the Unit undertake some teaching and members of the University staff may help with agricultural problems; the Department gives assistance to the science departments of the University in much the same way as the Unit does to other institutes. Inevitably, there is an agricultural bias in the teaching, and, of eleven graduate students who have worked in the Department since 1954, six have been on leave from employment in agricultural research. Efforts are now being made to strengthen activities of the Department in other fields, notably in mathematical statistics and in applications to research in medicine and social science. The staff of the Department is young, and most of its members have still to make their marks in research. Nevertheless, a number of very diverse topics in pure and applied statistics are at present under investigation. Among these are problems of vital statistics and population age structure, genetic equilibrium, statistical selection, demand curves and budget analysis, queue theory, comparison and calibration of milk testing techniques, design and analysis of animal feeding trials, and special aspects of experimental planning.

BUILDING RESEARCH, 1956*

THIS publication comprises the reports for the year 1956 of the Building Research Board and the Director of Building Research, Department of Scientific and Industrial Research. In its report the Board directs attention to the very great effort devoted by the Building Research Station to securing the application of the results of research in the building industry, but comments that this work, valuable though it is, cannot be extended at the expense of the longer term and more basic investigations in the Station's programme. The Board also notes with regret the further postponement of the construction of a new materials laboratory, originally planned for completion in 1951. This delay is particularly unfortunate if, as might be expected, lack of suitable accommodation is a further factor hampering the development of the more fundamental scientific work of the Station.

The Director's report outlines the very extensive and varied programme of research work in progress during the year under review; the topics investigated range from the hydration of cement to the design of a spray tap for ablution in offices. Without losing sight of the value of those topics of more immediate practical import, a few points of particular scientific interest may be mentioned.

For the study of the constitution of the principal chemical compounds produced at high temperatures in the manufacture of cements a microscope has been developed which permits the direct examination of the material at temperatures up to about 2,000° C. The specimen is held under the microscope at the tip of a thermocouple which when heated electrically also serves to fuse the material. The different compounds present can be identified and their melting range determined by direct observation. The instrument developed at the Building Research Station represents an advance on earlier apparatus of this kind because the method of fusing the specimen and the simplicity of its construction afford a degree of flexibility and accuracy not previously attained. The instrument has also been used at temperatures above 2,000° C. for the study of the system $2\,CaO.SiO_2$–$3\,CaO.P_2O_5$, which is of interest because of the adverse effect of phosphorus pentoxide on cement quality. Other studies in the field of cement chemistry have been concerned with the lime–alumina–water system by X-ray analysis and with the deterioration of high alumina cement which has attained a high temperature during setting or which has been afterwards stored under warm, moist conditions. The deterioration has been ascribed to the conversion of hydrated mono- or di-calcium aluminates to the tri-calcium compound with release of hydrated alumina. A number of interesting photographs demonstrate the disintegration of mortar cubes, in which the conversion had taken place, when immersed for 14 days in a solution of magnesium sulphate; this resulted from the reaction of the compound $3CaO.Al_2O_3.6H_2O$, formed during the 'conversion', with the sulphate ions to produce ettringite, $3CaO.Al_2O_3.3CaSO_4.32H_2O$. Normal high-alumina cement was unaffected by magnesium sulphate solution after immersion for as long as eighteen months.

An elusive problem is the assessment of the liability of building stones to deterioration on exposure to atmospheric conditions, but some progress is reported as a result of a further study of the pore structure in which the 'suction' of the material is correlated with its percentage saturation. Curves obtained by plotting suction against moisture content are indicative of the pore structure and enable differences in structure, which may or may not be appreciable under the microscope, to be expressed in quantitative terms. It is hoped that this work will make it possible to relate the pore-size distribution to the weathering properties of bricks and stone.

Rheological studies at the Building Research Station have been concerned with lime pastes, and a viscometer of the Couette type has been employed in this work. The difficulty resulting from the thixotropic nature of the materials under test is referred to, but in spite of this, reasonably consistent results appear to have been obtained with this apparatus.

An interesting application of centimetric electromagnetic radiation is described. This is a method for the determination of the total water content between the two faces of a wall. A narrow beam of 10 cm. radiation is directed normally through the wall, and

* Department of Scientific and Industrial Research. Building Research 1956: The Report of the Building Research Board with the Report of the Director of Building Research. Pp. vi+72+19 plates. (London: H.M. Stationery Office, 1957.) 5*s.* 6*d.* net.

for a variety of materials an approximately linear relationship is found to exist between the moisture content and the attenuation of the beam.

The provision of concrete shields for nuclear reactors presents a new and complex problem in the field of materials and structures which is being studied by the Building Research Station in collaboration with the U.K. Atomic Energy Authority. Instruments are being installed in the shield of the fourth reactor now under construction at Calder Hall for the measurement of strain, temperature, joint displacement and moisture. It is expected that the observations obtained will provide valuable data for future designs.

In the field of lighting, fundamental work is in progress in collaboration with the Medical Research Council on the problems of visual fatigue, attention and adaptation.

DULWICH COLLEGE

EXTENSION TO THE LABORATORIES

By R. GROVES

Master of the College

THERE can be few people now who are not convinced that the British public schools are aware of the country's need of scientific man-power. Not only is the teaching of science in these schools thoroughly 'respectable' now, but also the numbers specializing in science in the sixth forms are often more than 50 per cent of the total numbers in those forms, which is a sign that these schools realize the part that they have to play in meeting the need for scientists. The task now is to give every boy his chance to train as a scientist if he wishes, and this is more onerous than it was, for it means providing not only courses for the pure scientists, but also for those who will become technologists. It must be realized, too, that for every pure scientist we need many technologists, and for every technologist we need an army of technicians: all these have to be trained. Moreover, the sixth forms contain the classics, modern linguists and historians who, though perhaps numerically less, are still happily very strong, and it is to be hoped that they will continue to be so. It is surely essential, however, that an arts boy going up to the university must have some basic grounding in science, for he is going out eventually into a scientific world. Rather than being satisfied with a vague superficial approach to the subject, we have decided that every arts boy at Dulwich College shall do at least one physical science subject at General Certificate of Education Ordinary Level before going on to specialize in his own subject, thus attempting to give both depth and some idea of scientific method. All these considerations have led us during the past two years to do some hard thinking about the pattern of our scientific teaching, and have inevitably demanded more laboratories.

Perhaps the problem is more acute at Dulwich College, London, in that it is one of the few independent public schools which of its own volition takes a large proportion of its entrants from local authority scholars. This highly competitive entry gives it not only a remarkable cross-section of the population but also some able, fast-moving 'streams' from which many boys will go on to a university to read science or to an advanced technological institution to study applied science of some kind.

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Fig. 1. The Dulwich College Science Block opened in 1952