the basic fundamentals of an effective plant breeding programme conducted on a conventional basis." However, if the Conference held out no prospects of isotope procedures leading to immediate economic gain in the biological sphere comparable to that which may result from their application to the physical processes of industry, there was ample evidence that the eventual gain through research applied both to medical and agricultural questions may be at least as great.

This Conference may in some ways be regarded as the successor, though on a larger scale, to other isotope conferences, for example, those which the United Kingdom Atomic Energy Authority held at Oxford in 1951 and 1954. Apart from the lavish hospitality which the French Government and several embassies provided, the most striking aspect in which the Paris Conference differed from its predecessors was in a shift of emphasis from techniques to results. It is true that the sessions devoted to techniques were of considerable interest, particularly from the point of view of scintillation counting, very rapid sampling procedures in biological work, and autoradiograph procedures. Much information on these questions is, however, now readily available, and facilities for tracer work have become as much part of the normal equipment of many biological laboratories as the microscope. Past conferences on radioisotopes in research have greatly aided this development and the value of the Paris Conference is beyond doubt. However, it can legitimately be asked whether such gatherings have, by their success, made their continuation largely unnecessary for the experimental biologist. The majority of scientific conferences concerned with experimental biology to-day embrace some aspects of radioisotope research; in the future it will be increasingly so, and the successful use of tracer methods may in future be better stimulated by conferences convened to discuss more limited fields.

R. Scott Russell

STATISTICS IN THE UNIVERSITY OF ABERDEEN

THE University of Aberdeen was among the first of British universities to provide for the teaching of statistics: in 1906, the Senatus recommended "the institution of a short course of lectures in the University on Statistical Methods which, in the opinion of the Senatus, is required for the equipment of advanced students in various branches of Science". In consequence of this recommendation, Mr. W. R. Macdonnell was "asked to act as lecturer, as he has given much attention to the subject and is competent to impart instruction in it". Macdonnell, who had been closely associated with Prof. Karl Pearson of University College, London, laid a firm foundation on which his successor, Dr. J. F. Tocher, was able to build more ambitiously. Tocher was one of the pioneers in the teaching of statistical methods and in the practice of statistical science; a well-known Aberdeen personality, about whom anecdotes are still current, he was lecturer during 1910–39. The University Calendar for 1920 shows that, even at this early date, Tocher was providing, single-handed, a breadth of statistical instruction that would not shame any university to-day: his lectures ranged over biometry, anthropometry, medical and vital statistics, eugenics and economic statistics, with strong emphasis on computing and practical work.

In 1954, the appointment of Dr. D. J. Finney as reader in statistics and the simultaneous establishment, within the Department, of the Agricultural Research Council's Unit of Statistics began a new phase of development. The resultant rapid increase in staff caused a degree of overcrowding that seriously impeded work. This period of discomfort has now ended: on October 7 Lord Cameron, chairman of the Carnegie Trust, inaugurated the new building that the Department now occupies. The building is a four-floor extension to the Chemistry Building in Old Aberdeen, Messrs. Pite, Son and Fairweather being the architects for both. The total cost, £32,000, has been met by generous assistance from the Carnegie Trust and the University Grants Committee and a deeply appreciated gift of £10,000 from the Rockefeller Foundation.

At present, the Department of Statistics has two floors of this building, giving an area of nearly five thousand square feet. There are individual rooms for each member of the teaching and research staff, two large rooms for a team of ten or twelve computers, two rooms for graduate students, and a classroom that accommodates up to twenty-four for practical work or more for lectures. The Department does not yet possess any large-scale computing machinery, but a room has been set aside for the eventual acquisition of electronic equipment. The accommodation must compare very favourably with that of any other university department of statistics in Britain.

The Department now has four lecturers and assistants, and the Unit of Statistics a further five graduate statisticians. A broad programme of elementary lectures enables undergraduate students in many different fields to obtain some knowledge of statistical principles; a particular feature of Aberdeen practice is the inclusion of about twenty hours of instruction in statistical science for medical students. Students of mathematics or economics can take statistics as a special subject for final honours. Aberdeen has followed several other British universities in instituting a diploma in statistics, based on postgraduate instruction, as a measure to combat the acute shortage of trained statisticians that most countries have experienced since 1945; teaching of the first students, a group of three from as far apart as Pakistan, South Africa and Wales, has just begun. In addition, there are facilities for Ph.D. students and, of particular value for those from overseas, a few students can be taken who have no degree or diploma in view but who wish to attend lectures and to gain experience of special types of statistical work.

For many years, the connexion of the Department with agricultural research has been close. The statistical sections of the Rowett Research Institute and the Macaulay Institute for Soil Research began as offshoots from the University Department; the North of Scotland College of Agriculture, situated in Aberdeen and closely associated with the University Department of Agriculture, has frequently sought assistance in the planning of field experiments and in the analysis of results. The new Unit of Statistics is intended to make a similar service available to agricultural research throughout Scotland. The aim is that any member of the staff of an agricultural

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.