

Leicester in spending the most. The average is about 7.2 per cent—a not manifestly exorbitant proportion. Expenditure between universities is not an easy comparison to make, for much depends upon the detailed layout of the estimates. Nevertheless, the universities which spend more than 10 per cent might learn something from those which spend only 5 per cent. What these figures do not reveal is the extent to which academic time and effort are diverted to administration on a part-time basis. This is a field in which statistical comparison is more difficult. All that is gathered is a vague impression of middle-aged scholars bewailing the administrative work thrust upon them; a complaint sometimes intended to excuse their lack of literary or scientific output. Eagerness for office is due to several causes, among which the most important is the least noticed. Presiding over a committee or dictating a routine correspondence is far easier than doing a good piece of research. It may often be better paid and frequently leads to the higher offices and honours, so that the scholar is offered every inducement to desert the library and take to the filing cabinets. Part of the trouble with British university administration centres on this inducement. For those most easily tempted along the easier path are not necessarily the most competent, though many of them prove to be so. In some instances, the burdens of which they complain have become burdensome as a direct result of their own inefficiency.

Those who admire the system of some larger American universities would wish to give more extensive powers to the executive head. There is no assurance, however, that this would be either an improvement or an economy. What is needed is an equivalent of the army 'p.s.c.', a higher qualification to be obtained by a short course and accompanied

by an impartial and secret assessment. "Could not some university organize a staff course in higher administration, to be supervised by retired vice-chancellors and held at some centre for research which could be furnished with all the information available about all the universities of the world?" The course would be held in the vacation and designed for those who had been in charge of departments and for whom higher responsibilities might be predicted. After some experience of the course, universities might limit their higher offices to those who had gained this qualification.

For a scheme of this sort one strong argument from army experience is worth noting. Such faults as were apparent in the British generals of the Second World War were seldom or never attributed to lack of brains. There were failures in leadership; but the staff college system prevented any repetition of Balaclava. The same cannot be said of the university world. Such a staff college would provide a ready-made group of advisers to which a university might turn for guidance.

There are some arguments on the other side. Some of these will derive from that strange reluctance which academic persons reveal when invited to apply scientific method to university affairs. There is no insoluble problem in academic administration so long as the university is kept down to a reasonable size. But there are problems which remain unsolved merely because those immediately concerned lack the ability to find a solution and because they fail to apply the sort of method which they would apply without hesitation to matters more obviously scientific. In this matter of using a methodical approach to a political problem, the universities have not only a duty to themselves but also a further duty, by way of example, to the world.

THE NUFFIELD FOUNDATION

THE fourteenth annual report of the Nuffield Foundation (pp. xii+201. London: The Nuffield Foundation, 1959), covering the year ended March 31, 1959, records for the first time expenditure on grants exceeding £1 million, and of this £1,137,900, roughly a quarter was spent in the Commonwealth, mostly in Africa, and the rest at home on scientific, medical and social projects and on fellowships. With regard to the last it may be noted that since 1946, 357 travelling fellowships have been awarded, and from the beginning the Foundation has made a special point of enabling the married overseas fellow to be accompanied by his wife and for its married Fellows has provided a small colony of furnished flats in Prince Albert Road, London. Travel grants during the year have covered the visit to England of Mr. R. C. Robinson, a neurosurgeon from the University of Otago Medical School; a visit to Dr. D. G. Abraham, Ibadan, by Dr. Wallace Brigden to study a puzzling heart condition; a lecture tour in Canada by Sir Christopher Ingold, arranged by the Chemical Institute of Canada; and a study visit on Commonwealth constitutional law by Prof. C. H. Alexandrowicz, of the University of Madras. Three medical fellowships, three fellowships and four scholarships in dentistry were awarded during the year, but the scheme for sociological scholarships and bursaries was discontinued and a new scheme of senior sociological

scholarships initiated experimentally for three years. Only one travelling fellowship for Home Civil servants was awarded, but eight travelling fellowships were awarded in medicine, twelve in natural science, and nine in humanities and social science, while twenty-three awards were made under the Royal Society-Nuffield Foundation Commonwealth bursaries scheme.

In this report the Foundation, welcoming the new emphasis placed by the Government on the teaching of technology, records that, after considering how best it could help without trespassing on public responsibilities, the Foundation has decided that its chief interest should be in the technological colleges providing advanced courses. These colleges have a different purpose from the technological departments of universities, deriving from the belief that some students mature better if their theoretical training is more closely interwoven with industrial practice than is usual or desirable for university students. It considers that all such colleges need to establish a fruitful partnership with the industries with which they are most intimately associated, and while refraining from adopting a detailed programme of schemes for sandwich courses, for example, for which it would be willing to provide grant-aid, has indicated its interest in experimental schemes designed to achieve closer unity between the colleges and industry and in schemes which would benefit technological industry

generally. As regards support for research at Commonwealth universities and institutions of like standing, the emphasis during the year has been on Africa.

In science, three grants of £50,000 were made during the year: one to the University of Edinburgh for fundamental research under Profs. M. Swann and C. H. Waddington on fibroblasts which may throw some light on the causes of rheumatism; another to the British Museum (Natural History) for the purchase of about half the collection of meteorites formed by Mr. H. H. Niniger, of Arizona; and the third, over five years, to the University of Cambridge for the development by Dr. M. V. Wilkes, of the Mathematical Laboratory, of a much faster digital computer, *Edsac 3*, capable of solving partial differential equations. Among other grants may be noted a further £9,000 over three years in support of the study of protein metabolism and particularly connective tissue under Prof. A. Neuberger at St. Mary's Hospital Medical School; £4,350 over three years for an investigation by Dr. I. Rorison, of the University of Nottingham School of Agriculture, of the effects of aluminium on plant growth; £11,000 over three years for the biochemical and physiological investigation of cell division and expansion in the meristems of the shoot and root at the University of Edinburgh; and a further £5,250 over three years to enable Dr. A. G. M. Weddell to continue his studies at the University of Oxford on the mechanisms of common sensation; and £1,690 a year for three years to King's College, London, for an investigation of the cell cortex and cell movement under Prof. J. F. Danielli.

In technology a research unit for psychological and social research on problems of technical education and human factors in industry has been established at Brunel College of Technology, Acton, with the help of a Foundation grant of £15,000, and £12,000 over five years was also offered to the University of Birmingham to establish a research unit in the Institute of Education under Prof. E. A. Peel to study and advise on the placing, counselling and teaching of part-time technical college students.

Apart from the grants to the University of Edinburgh for work on fibroblasts and the nature of the enzyme systems involved, all other new grants for research in rheumatism have been made to departments or projects already supported by the Foundation. These included £3,000 over three years for an electron microscope study at the Rheumatism Research Centre, University of Manchester, of the fine structure of the fibroblast in different phases of its metabolic activity, and £4,100 to the University of Sheffield for work under Dr. H. F. West in the Sheffield Centre for the Investigation and Treatment of Rheumatic Diseases. Other grants for medical research have included £25,000 over five years for a metabolic research unit at the Institute of Urology, University of London, and £20,000 towards the capital expenditure at Banstead Place and Dorincourt of two units for the rehabilitation of young chronic sick, chiefly for building and equipping a physiotherapy unit at Banstead Place.

Grants in the United Kingdom for social research and experiment in education include one of £7,500 over three years to the School of Architecture, University of Cambridge, for studies of urban reconstruction, particularly of urban housing in relation to daylight, sunlight and open space, including the provision of special apparatus, such as an artificial

sky and the necessary measuring instruments for the study of day-lighting. A grant of £4,000 for two years was made to the Christian Frontier Council in aid of a study of the notion of equality in modern society with special reference to its implications for politics, industry and education, and for the pursuit of the ideals of excellence; one of £2,200 to the University College of North Staffordshire to enable a study of Parliament on the lines of a pilot study completed for 1955-58 to be made for the period 1945-55; a grant of £1,250 to the Institute of Race Relations, London, for a study of the integration of alien or minority groups of workers (chiefly West Indians and Poles) in an industrial situation in the London area; one of £3,700 to the School of Social Studies, University of Sheffield, for an inquiry by Mr. E. R. Kelsall into wastage, after training, among women teachers in England and Wales. A grant of £2,000 was made to the University of Manchester to enable Prof. S. Devons to try out his scheme of using honours graduates in physics part-time on research at a university and part-time on school teaching to relieve the shortage of first-class teachers of science in grammar schools, and £8,500 was offered to the Scottish Council for Research in Education to permit a follow-up survey between eleven and eighteen of the mental survey of the whole eleven-year age-group of more than 70,000 children in Scotland made in 1947, while up to £3,500 was offered to initiate "Youth Ventures", a non-profit making company intended to provide an unconventional youth service to fill in the gaps until the 'new towns' are more fully developed commercially.

In the field of research in ageing and care of old people, £6,000 was provided to the University of Cambridge for further studies of the economic position, and a grant of £3,700 to the University of Bristol for studies of the employment of older workers was renewed for a sixth and final year. The University of Birmingham received another £6,500 for Prof. P. L. Krohn's unit studying the ageing ovary, and the University of Leeds £6,000 for a further year's study by Dr. D. A. Hall's team of the changes taking place in connective tissue and the processes concerned in the degradation of such tissue during ageing, while £4,500 over the next three years was provided for work on physiological and pathological changes in the aged under Dr. E. Woodford-Williams at the Sunderland General Hospital.

Among grants for the Commonwealth Overseas during the year are £3,000 over two years for a study of the normal lymphatic system in typical primates, and £3,320 over two years for studies on the helminthic fauna of freshwater fish in Central Africa at the University College of Rhodesia and Nyasaland; up to £50,000 including a capital grant up to £30,000 over five years for an experiment in rural education by the Ministry of Health, Kenya; £5,000 to University College, Ibadan, in support of epidemiological field work in Nigeria; £3,000 as an emergency measure to extend the life of the Medical Research Unit, University of Natal; £20,000 over two years to the East African Agriculture and Forestry Research Organization for grassland reclamation in the Ngorongoro Crater highlands; a further £5,000 to the Gayaza Girls' High School for its study of farming and a balanced diet; a further £5,750 to the University College of East Africa for its swamp research; £13,850 for the study of urbanization in the Sierra Leone Protectorate being undertaken by the University of Edinburgh under Dr. K. L. Little; £12,000

for five years to the radio education unit of the University College of the West Indies; £20,000 over three years on a tapering basis to the Government Central Pedagogical Institute, Allahabad, for teaching English; up to £4,000 to the University of Hong

Kong to enable Prof. J. E. Driver to purchase equipment for his Department of Chemistry, and £3,600 over three years to the Institute of Child Health, Calcutta, for studies of the pattern of disease in a sample group of children.

PROGRESS IN FOOD INVESTIGATION

FOR many years the annual report published by the Department of Scientific and Industrial Research under the title "Food Investigation" has reviewed the work of the Food Investigation Board and of three research institutes, namely, the Low Temperature Research Station at Cambridge, the Ditton Laboratory, Maidstone (with its associated unit at Covent Garden), and the Torry Research Station, Aberdeen.

In 1958 the Council of the Department of Scientific and Industrial Research decided on a series of administrative changes: (1) to disband the Food Investigation Board; (2) to retain the Torry Station as an independent establishment of the Department; (3) to transfer the other two institutes to the Agricultural Research Council. This latter change was brought about "because the two Councils believe that it is in the national interest to bring all Government research on food, other than fish, under one organization, the aim being to make the research more effective". From now onwards a report on the Torry Research Station will be published annually by the Department of Scientific and Industrial Research; the report, "Food Investigation 1958"*, is limited to the Cambridge and Ditton Laboratories and will be the last to appear under the auspices of the Department.

The Cambridge and Ditton Laboratories are complementary to one another: at Ditton the emphasis is on problems associated with fruits and vegetables; at Cambridge, although important work is being carried out on plant tissues and products, the major stress has been on animal products—meat (including bacon and poultry), eggs and animal fats. At both centres there have been fundamental investigations in biochemistry, biophysics and microbiology, and the report illustrates how difficult it is (in any event in the field of food technology) to draw a distinction between pure and applied research; the examination of the factors governing the quality of meat, eggs or

fruit has stimulated basic work on the chemical composition of these materials and on the nature of the enzymes present; in turn, the newer information obtained has helped in the solution of practical problems of food storage and preservation.

The Cambridge section of the report includes summaries of investigations on three recent developments in food technology, namely, the administration of oestrogenic hormones to young animals (to increase the rate of gain of weight and the efficiency of food conversion), the use of antibiotics in poultry storage and of radiations in meat preservation. Details are given also of recent research on the phenolic constituents of plants; these compounds—ranging from relatively simple molecules to complex polymers—are now known to play a significant part in the control of colour, flavour and texture in a wide variety of foods.

The Ditton Laboratory records the increased commercial use of the hydrocooling process for vegetables such as watercress and lettuce; controlled experiments have shown that vegetables subjected to this process should arrive fresher on the market and retain their quality for a longer period. Another important line of research is concerned with the storage of potatoes in bulk using a new method of suppressing sprout growth—the introduction of nonyl alcohol vapour into the ventilation system of the store. An account is given also of various lines of research in plant physiology and biochemistry, and in refrigeration and other aspects of 'biological engineering'.

The food industries in the United Kingdom owe a debt of gratitude to the Department of Scientific and Industrial Research for sponsorship of research over some decades; the annual reports of the Food Investigation Board and other publications from the individual laboratories have played an indispensable part both in stimulating industrial research and in placing food storage and processing in the United Kingdom on sound scientific foundations.

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* "Food Investigation 1958." Pp. vi+32. (London: H.M. Stationery Office, 1959.) 3s.

THE HOVERCRAFT

A DEVICE for forcing out compressed air between a ship's surface and the water was patented in 1883. It did not work. Many similar fruitless attempts were made in the next sixty years until, in 1953, Mr. C. S. Cockerell began experimenting with air lubrication. His success is now universally recognized and the first hovercraft has begun the hard task of practical development, foreshadowing a new contender in the field of maritime transport.

Cockerell began as had De Laval, by attempting to contain a sheet of air between the surface of a vessel, in this case a planing craft, and the sea. He found that the reduction in drag was offset by the

hull modifications needed to supply the air. He then attempted to contain the air lubricating sheet between vertical plates but these plates increased the skin friction drag. The answer was to replace the solid containing plates by curtains of air and so the hovercraft was evolved.

The experimental version now flying, the 'SR-NI', is an oval dish on top of which are mounted the propulsion and control systems, and the air compressor. The compressor is a 7-ft. diameter ducted fan powered by a 435-h.p. internal combustion aero engine. Two-thirds of the compressed air is fed to two concentric annular slots near the periphery of the