

THE GRADUATE SCHOOL IN MATHEMATICAL PHYSICS AT BIRMINGHAM

IN 1956, a Graduate School in Mathematical Physics, leading to a diploma, was instituted in the Department of Mathematical Physics of the University of Birmingham. It had been noticed that students who graduated in the honours school of mathematical physics in the Department seemed well equipped, and considerably in demand, for work involving the applications of mathematics to physical problems in industry, government laboratories, etc., because of the training they received in the principles of physics, and particularly in the techniques of translating physical problems into mathematical terms, and of interpreting the solutions from a physical point of view.

Entry to the honours course at Birmingham is restricted to students of high ability, who must have the appropriate background in their school training, since the three-year course makes fairly heavy demands on the students. It seemed likely therefore that a one-year postgraduate course would be of advantage to students who had taken a degree in mathematics, because they could not—or did not choose to—enter the mathematical physics course, or who graduated from universities at which such a course was not available.

The three years of operation of the Graduate School have provided sufficient experience to judge that it can serve the purpose for which it was intended, and that it imparts to the students knowledge and experience which serves them well in their later work. The course extends over one academic year (October to July) and is normally intended for honours graduates in mathematics with subsidiary physics. In some cases it proved possible to fit in students with somewhat different qualifications. Lecture courses attended by the students include a course in methods of mathematical physics (given so far by Dr. J. G. Valatin, who is in general charge of the Graduate School), which forms the central theme of

their introduction to the outlook of a mathematical physicist. In addition, students normally take selected parts of the lecture courses for honours physicists, and those parts of the final-year course for mathematical physicists (electromagnetic theory, hydrodynamics, quantum mechanics) which they have not previously covered, and which suit their particular needs. Other options include mathematical statistics, numerical methods, elasticity theory, statistical mechanics, and usually at least one course in one of the applied science departments. All students attend a weekly seminar arranged specially for the Graduate School in which they contribute themselves, and otherwise hear talks by members of the research group in mathematical physics and others. It has proved possible to arrange for each individual student a combination of courses which suits his particular interests and knowledge.

Although many of these courses are given for other purposes, students find it easy to synthesize their work and to build them into a common foundation of understanding.

The number of students in the course has remained small in the first three years, and is likely to continue small until the existence and purpose of the course become more widely known. It is therefore premature to give any statistics of the subsequent occupations of students who have obtained the diploma. These included work in industry and government laboratories as well as academic research. (One student took up postgraduate work in the Mathematical Physics Department at Birmingham, and two joined an applied science department in the University.)

The development of the Graduate School was greatly aided by the award of advanced course studentships of the Department of Scientific and Industrial Research, and in some cases by grants from the University of Birmingham.

R. E. PETERLS

WATER-RESOURCES AND WATER-USE SURVEY

THE study of the use and conservation of water resources is a relatively new geophysical science and one that impinges closely on other sciences such as meteorology and climatology, geology and geomorphology, agriculture, economic geography, demography, etc. The importance in the modern world of economic and land-use planning, particularly with reference to so precious a raw material as water, involves the collection of a vast and varied amount of data and information relevant to the assessment of water resources, on not only a national but also an international basis. Two papers*,

* World Meteorological Organization. Technical Note No. 25: Design of Hydrological Networks. Prepared by Max A. Kohler. Technical Note No. 26: Techniques for Surveying Surface-Water Resources. Prepared by Prof. Ray K. Linsley. Pp. v+16+x1+41. (WHI-No. 82.TP.32.) (Geneva: Secretariat of the World Health Organization, 1958.) 4 Swiss francs.

published by the World Meteorological Organization, are useful statements in this important field, particularly in view of the varying scientific standards of recording and observation that are available and possible in different world regions.

M. A. Kohler summarizes briefly the types of hydrological data, the network density of observations required, and network planning, and the techniques for estimating hydrological data that can be used. Attention is directed to the impracticability of devising a universally standardized procedure and a scheme is put forward for the creation of a minimum cover of permanent full, partial, and temporary observational stations.

The second, longer, technical paper is more closely concerned with techniques for the surveying of surface

water resources in a region, and providing estimates of usable water supply. Attention is given to methods which are adapted for use in the absence of adequate hydrological data and to simple techniques of observing hydrological phenomena which may provide useful data with least cost in time and money. Despite the importance of ground-water circulation in all regions—and especially in arid regions—the survey is limited to the discussion of techniques with regard to surface resources. These are a guide to the estimation of requisite rates of replenishment of ground water that are necessary for the effective use of the latter over a period of time. The main topics discussed are the hydrological balance, precipitation, evapotranspiration and its measurement, stream-flow, sediment transport and water supply, and a summary direction for procedure in the matter of water-resource surveys.

The special problems and peculiar needs of a densely populated and highly industrialized country such as Great Britain are summarized in an interesting discussion on a water-use survey opened by Prof. W. G. V. Balchin (under the chairmanship of Prof. Dudley

Stamp), with contributions from experts representing a very wide range of technical interests in this important field (*Geog. J.*, 124, 476; 1958). Prof. Balchin directs attention to the dramatic increases in water consumption in Britain during the past century, culminating in an increase of 50 per cent in England and Wales and 41 per cent in Scotland during the short period 1938–56. The water storage capacity in the same time has increased by only 46 per cent and 31 per cent, respectively. The area where the consumption is greatest is the area where population is densest and the rainfall least, and where the local resources are already fully employed—that is, in lowland Britain and particularly in the great urban and industrial complexes.

These papers are a salutary reminder, through the many facets to the problem of water conservation that they reveal, of our ultimate dependence on water resources and our need to avoid over-exploitation of a raw material that, in Great Britain at least, people assume all too readily is in abundant supply, and for which in many others the supply is already precarious.

ALICE GARNETT

CARNEGIE TRUST FOR THE UNIVERSITIES OF SCOTLAND

THE fifty-seventh annual report of the Executive Committee of the Carnegie Trust for the Universities of Scotland covers the year 1957–58 (pp. iv + 74. Edinburgh: Carnegie Trust for the Universities of Scotland, 1959) and includes the financial accounts for the year ended September 30, 1958. A major preoccupation of the Executive Committee during the year was the formulation of a policy to implement its new powers of investment. During the year there were on the books five senior research scholars, thirty-six research scholars in their second or third year, and twenty-five in their first year. For 1958–59 the value of the senior scholarship has been increased to £500 (with an additional £100 for expenses), while scholars at Oxford, Cambridge and London will receive £450; scholars living away from home, attending a Scottish or an English provincial university, £400; and scholars living at home and attending a Scottish university, £350. A grant of £4,000 a year for five years from the end of 1958 was made to the Scottish Dictionaries Joint Council, subject to some conditions with regard to progress. Ten of the research grants awarded during the year were for expenses involved in illustrating the published results of research and five grants were made to authors as a subvention towards the cost of publishing their books.

Four grants are particularly mentioned. The Trust has provided a special heavy-duty vehicle and a 'Folboat' with outboard motor and a grant for running expenses to assist Prof. J. H. Burnett and Dr. D. H. N. Spence, of the University of St. Andrews, in preparing a comprehensive account of the aquatic vegetation of Scotland, a research which involves crossing many moorland roads to examine distant mountain lochs. A grant of £2,500 was made to Prof. R. H. Matthew, of the University of Edinburgh, for a study by a research team correlating the problems of the design of basic dwelling units, lay-out, siting and services

with social requirements, with specific reference to contrasting types of social grouping and including a cost study. Another grant was to the University of Glasgow North Rona Expedition, which spent about a month on North Rona and Sula Sgeir, paying particular attention to marine biology. Some very rare species of algae were found and a special census was made of Leech's petrel. A second successful expedition, assisted by a grant from the Trust, was one from the University of Aberdeen, led by Prof. A. C. O'Dell, to St. Ninian's Isle, Shetland, in June–July 1958, in which a most important collection of silver ornaments was uncovered.

Of the ten grants for travel and maintenance made to members of university staffs engaged in research, three were to members of a faculty of medicine, four in science and three in arts. Among these may be mentioned those to Dr. W. I. Card to enable him to visit centres in the United States and Canada, where work of interest and importance in gastroenterology is proceeding; to Mr. Alastair Fraser, to work in Copenhagen in the laboratories of Prof. M. Thomsen and Dr. E. Thomsen, leading authorities on insect endocrinology, and later in Liège, Brussels and Paris; to Dr. C. H. Gimingham to enable him to follow up in Scandinavia his investigations in Scottish heaths, aimed at gaining a comprehensive picture of the ecology of heather, including its reactions to grazing and burning and influences of soil climate and at utilizing this information in an investigation of the ways in which heath lands have originated and are maintained; to Dr. Elizabeth D. Fraser, to enable her to test in America some of her hypotheses regarding perceptual constancy as a function of personality and learning and the effect of metabolic disturbance; and to Dr. P. H. Tuft, to discuss his experimental techniques in embryology in the United States.