

design teams in different establishments. The possibilities of such duplication were evidenced by the numbers of separate companies designing and manufacturing particular lines of electrical equipment. The point was illustrated by data from the return of trade associations for 1959. In that year in Great Britain the numbers of separate companies engaged in certain classes of electrical and allied manufactures were as follows:

Power transformers	19
Steam turbines	11
Domestic appliances	67
Switchgear	50
Control gear	34
Small switch and fuse gear	32
Domestic radio and television sets	60
Semi-conductor devices	26

Fortunately there had been in recent years a trend towards the creation of larger industrial units and this was a trend which must be encouraged if we were to use our technical man-power efficiently.

Turning from the human to the technological side of electrical engineering, Mr. Lucas directed attention to the fact that a major division had developed forming two branches known, respectively, as those of 'electronics' and 'power'.

Starting with the Fleming diode of 1904, the electronics industry now comprised radio and television and radar, electronic automatic control, computing and electronic switching. Side by side in the power field there had been developments, not perhaps so spectacular, but none the less, very great. Substantial advances had resulted from improvements in materials. In power generation, steam turbine generating unit ratings had increased five hundred fold from the early years of the century. At that time a unit rated at 1 megavolt-ampere (MVA) would have a steam temperature of 580° F. at a pressure of 200 lb./sq. in. To-day units of 550 MVA rating were being designed and built to utilize steam at 1,050° F. and a pressure of 2,350 lb./sq. in. Power transformers had increased from 15 MVA at 33 kV. to 570 MVA at 400 kV., the upper limit of size now being determined by transport limitations. Rectification from alternating to direct current for such purposes as industrial electrolysis, electric traction or for heavy industrial drives had been developed, utilizing mercury arc rectifiers or semi-conductor rectifiers. It was, however, probable that the development of the controlled semi-conductor rectifier might lead to the elimination of the mercury arc rectifier. In the specialized field of electric power supply for

aircraft, generating equipment for a modern airliner represented a capacity of 300 kVA. Nuclear power stations were in operation, designs well established, and the output ratings of successive stations increasing in steady progression. There were, however, under consideration the possibilities of electricity generation by direct methods of energy conversion by fuel cells, thermoelectric devices, magneto-hydrodynamics or from nuclear fusion.

Although it had been argued that these two branches of the electrical industry were separate and distinct with little in common, it was becoming daily more clear that not only did their interests largely overlap but they were becoming interdependent in a very marked degree. Electronic devices for sensing, measuring and controlling, often in association with elaborate computing equipment, had become essential elements in the applications of electric power. These assemblies of electronic circuits and the power units which they controlled had, in fact, become the 'building bricks' of industrial development.

These considerations brought into sharp relief the characteristics of a type of engineer whose activities, although not unfamiliar to the industry in the past, were taking on a greatly increased significance. This was the application engineer. Such an engineer would require to have a knowledge of the new developments both in power and electronics, a full understanding of the principles of automatic control, and facility in the use of the tools of his trade, the digital and analogue computers by means of which his stability equations would be solved. The application engineer would not, of course, have the detailed knowledge of machines or electronic devices required by the designer but rather a good broad working knowledge. He must, in addition, have specialist knowledge of some branch of the particular industry which he serves, as, for example, the steel industry, mining, chemical and oil, paper and printing, aircraft and marine.

The increasing interrelation of the two main branches of the industry was associated with and indeed in large measure originated from modern developments in nuclear and in solid-state physics. There were in these facts important implications relating to the education and training of electrical engineers. They appeared to call for common basic curricula in our colleges and universities for 'power' and 'electronics' engineers. In addition, schemes of practical training in industry should be subject to re-examination.

J. GREIG

## THE NATURE CONSERVANCY

THE report of the Nature Conservancy for the year ended September 30, 1961, is commendable both for the speed with which it has been produced and for the encouraging progress it records\*.

During the year there has been significant progress towards making conservation effective as a balanced and co-ordinated whole; there has also been an increasing sum of research results and a growing impact of research on management and land use.

Scientific management of the Island of Rhum, for example, is now yielding a substantial amount of meat (in the form of venison) for human consumption.

\* Report of the Nature Conservancy for the year ended 30th September, 1961. Pp. vii + 114 + 14 plates. (London: H.M.S.O., 1961.) 8s. 6d. net.

At the same time, the vegetation of the Island which was previously deteriorating rapidly is now recovering and improving in composition; a considerable acreage has been released for afforestation, and a successful research programme on deer population has been reconciled with precise control of numbers. The Conservancy has been able to contribute scientific information about red deer (*Cervus elaphus*) to assist the Red Deer Commission in starting successful dealings with the Highland deer problem as a whole. A scientific basis has also been found for a new approach to the management of grouse moors.

Encouraging progress has been made with the working out of methods of managing water catch-

ments. The Conservancy has extensive responsibilities extending over many thousands of acres of headwaters of rivers and streams (including those of the Tees, the Aberdeenshire Dee and the Tay), and is the only scientific organization combining experience both of watershed management and of experimental studies of the problems involved in the conservation of water in the more remote gathering grounds. The Conservancy also has considerable material on climatology (including the only available series of evapo-transpiration studies in different regions), on experimental modifications of drainage and burning patterns, and experiments in the establishment of protection forests. They have, therefore, a substantial contribution to make towards a solution of the national problems of water conservation that now have to be faced.

Despite the imposition of a serious cut in their estimates, which necessitated considerable reduction in planned activity, the Conservancy has been successful in acquiring the necessary land and is beginning construction of a new experimental station at Monks' Wood, Huntingdonshire. This station will greatly increase the Conservancy's effective contribution in applied ecology, particularly with regard to the management of natural and semi-natural woodlands, the scientific implications of the use of toxic chemicals on the land, and the development of techniques for control of vegetation, animal populations, water-levels and other factors involved in practical conservation. Monks' Wood will also be the centre of the Conservancy's growing educational effort, particularly with the training of post-graduate students and others who have completed their formal education.

During the year there has been a notable increase from approximately 139,000 acres to approximately 179,000 acres in the total area included within the National Nature Reserves. By far the greater part of this increase was in Scotland. Progress in completing present negotiations in England and Wales was somewhat disappointing, but several other important reserves will shortly be ready for declaration. Significant progress was also made in the development of forest nature reserves and in the planning of a national network of wildfowl refuges, in agreement

with the Wildfowlers' Association of Great Britain and Ireland.

Although such advances have undoubtedly strengthened the development of policies on national conservation, they do not directly contribute towards the great tasks of education and information, which have to be tackled on a much wider front. Here, again, there is a record of encouraging progress. There has been a spectacular growth in the numbers and influence of the Naturalists' Trusts which, with the sustained support and encouragement of the Conservancy, the Council for Nature and the Society for the Promotion of Nature Reserves, cover most of England and South Wales. In consequence, the Conservancy's regional officers now have the keen interest, active support and in some cases informed criticism of local naturalists and others interested in the countryside, working as a team.

In the long term, the quality of education in the life and earth sciences is decisive for the future of conservation. Here an encouraging start has been made in bringing together interested parties through a Study Group on Education and Field Biology, in assessing available experience, detecting gaps in research, information and practical provision, and preparing to secure for biology and the earth sciences adequate treatment in the coming transformation of the educational system. The successful start of the diploma course in conservation at University College, London, is likely to be followed by similar conservation courses in various parts of the Commonwealth. This will help alleviate the shortage of trained men and women not only for conservation duties but also for teaching at various levels.

Internationally, the year has seen encouraging advances. After thorough preparation, the Arusha Conference on the Conservation of Nature and Natural Resources in Modern African States met with signal success in September 1961. It was followed by the launching of the World Wild-life Fund. Two of the welcome features of this activity have been the conspicuous rise in the status of conservation, for example, among the United Nations Special Agencies, and the enhancement in the prestige and effectiveness of the International Union for Conservation of Nature and Natural Resources.

## EMPLOYMENT OF MARRIED WOMEN IN BRITAIN

**I**N a recent survey the Institute of Personnel Management reveals some important facts as to why more and more women go out to work, the difference employment has made to their lives, and their husbands' reactions to their jobs and their absence from home.

With the increasing marriage-rate and the lowering of the average age of marriage, in addition to full employment, it is likely that this tendency towards greater employment of married women will continue. The Institute therefore decided to look at the question of 'working wives' from the employers' point of view, and, in a further survey by Dr. Viola Klein, an analysis has been made of the attitudes of some employers to this section of their labour force\*.

The investigation is particularly concerned with how satisfactory firms believe married women to be from the point of view of labour turnover and absenteeism. It seeks also to discover to what extent managements will provide these women with skilled work and opportunities for promotion, and what special provisions they are willing to make to cater for the particular needs of married women.

Although considerable numbers of married women, with and without young children, are at present employed by industry in Britain either on a full- or part-time basis, within the next twelve years there will be a widespread shortage of women workers. Whether this gap can be filled by recruiting more married women will only partly depend on the attitude of employers. Much will depend on the readiness of married women to come forward in sufficiently large numbers. This, in turn, will be influenced by the

\* Institute of Personnel Management. Occasional Papers, No. 17: *Employing Married Women*, Pp. 51. (London: Institute of Personnel Management, 1961.) 7s. 6d.