

cent of units and 33.7 per cent of personnel were engaged exclusively or mainly in fundamental research, compared with 62.1 per cent and 54.1 per cent, respectively, for applied research.

Nearly 10 per cent of the scientific units employed no persons with university qualifications and nearly 90 per cent of the units employed not more than 10, while about a quarter had no technicians or trained auxiliaries. Some 60 per cent employed no one with technical diplomas and nearly half the remainder employed only one such person. In the educational sector, 24 units employed some 15 per cent of the university graduates, mainly in the

faculties of science and medicine, while in the public sector 13 per cent were employed in 3 per cent of the units in this sector, especially at the Centre for the Study of Nuclear Energy. Excluding the educational sector in the exact sciences, about half the units spent less than 1 million francs on research in 1961, and half these not more than 700,000 francs. In the public sector, including research associations, half the units spent not more than 3 to 4 million francs, while ten private enterprises, responsible for 60 per cent of the expenditure on such activities by private enterprise, spent more than 50 million francs and 5 of those 100 million francs.

REGIONAL ADMINISTRATION IN FRANCE

A PAMPHLET, *The French Administrative Reform*, issued by the Press and Information Service of the French Embassy, describes the structures of the Departments, of the Paris region, and of the other Regions as modernized by the decrees of March 14, 1964 (Pp. 30. London: Ambassade de France, Service de Presse et d'Information, 1964). The reforms, which will be implemented over a period extending to at least 1965, are based on the results of experiments conducted during two years in five test departments and in the pilot regions of Upper Normandy and Burgundy. The basic principle consists in making the Prefect once more solely responsible for the State service; the sole representative of the Government in the Department, he is the sole co-ordinator of public activities, with the exception of the military services, judicial services, assessment and collection of taxes, payment of public expenses, valuation of national property, factory inspection and supervision of the application of the social loans in agriculture. To ensure that the Prefect is fully informed of all important aspects of life in his Department, a central correspondence service will provide photographic copies of incoming letters, while copies of outgoing letters will also be submitted. Delegation of power is provided for certain highly technical services but delegation of signature allows more freedom and flexibility to heads of services.

A similar principle has been applied to the regions but only to external services concerned with economic matters, public investment and equipment, those which manage Government stocks or participate in programmes

involving national public funds. Such State services in the regions will be placed directly under the Prefect of the Region and cease to be directly under the Paris ministries. The Prefect will accordingly now have a role of initiation and decision in the economic field and a simple function of co-ordination in the administrative field. He will be assisted by an enlarged inter-departmental administrative conference and by a new commission on regional economic development. The new commission will be consulted when the Government prepares future development plans, after the draft has been submitted to Parliament and again after the final planning project has been discussed by Parliament and the operative sections relating to each region have been defined.

This regional reform does not apply to the Paris region, the administrative districts of which are being subdivided to give smaller units while a single assembly will replace the General Council and the Municipal Council, retaining on the whole the powers of the present Municipal Council and assuming those possessed by the General Council of the Seine. The suburbs are to be divided into Departments of normal status, while the pilot prefectures will permit construction of national administrative cities in each chief town. Provision is also made for a system of administrative and economic co-ordination, including a regional assembly or council, the composition of which is not yet fixed. Additional financial resources will be provided and it is anticipated that the new organization should be functioning smoothly by 1968.

THE BUILDING RESEARCH STATION

AT its headquarters in Bucknalls Lane, Garston, Watford, Herts., the Building Research Station (Department of Scientific and Industrial Research) had its 'Open Days, 1964' during September 22-25, when members of the public, including Press representatives, were accorded an unrivalled opportunity of seeing something of the inside workings of this long-established and important organization. Displays and hourly full-scale demonstrations illustrating some of the more important activities of the Station and many items of present-day research were made available to the visitors. In the department concerned with building operations and economics, the theme is research into the efficiency and economy of building operations, development of new techniques, examination of methods of management and organization, and factors influencing costs. Mechanical engineering deals with research applied to production and handling of building components on site and in the factory, and investigations in the engineering services requisite to completed buildings. Environmental physics is concerned both

with factors controlling conditions in buildings and with the subjective reactions of the occupants to these conditions. The section devoted to user requirements and design deals with building design and occupants' requirements in relation to housing and to some special building types. Research in the materials department ranges from the constitution and properties of building materials to investigation of their behaviour in use, including laboratory-scale tests to pilot plant trials. Structural engineering is concerned fundamentally with loadings, with the behaviour both of components and of full-scale and model structures, and with the engineering properties of building materials.

The soil mechanics department was the first to be set up in Britain. It has done pioneer work on the engineering properties of soils and their relationship to the structural behaviour of foundations, tunnels, retaining walls and earth dams. A section devoted to mathematics provides a service for the rest of the Station, and present-day work, reflecting projects in three other departments, includes the

theoretical basis for modular design, the theory of microwave techniques for moisture measurement, and the theory of sound transmission through lightweight partitions. Building practice is concerned with external contracts, technical enquiries, co-ordination of work on British Standards and Codes of Practice, building legislation, etc. The tropical building section is concerned with special problems of housing, building and planning in tropical and subtropical countries. Apart from these instructive demonstrations, facilities were available for providing technical information, in the form of leaflets giving background information and details of the researches involved in many of the exhibits; the technical enquiry service was in operation, dealing with questions

on the technical aspects of building construction; the Station library was open to visitors and various official publications of the Station were displayed. In this latter connexion an important publication has since appeared entitled *Developments in Roofing* (Building Research Station Digest 51 (Second Series), October 1964; pp. 6, 4d.). This Digest discusses the properties, construction and laying of roof decks and the weatherproof coverings applied to obtain satisfactory performance. It also deals briefly with the properties of some new roofing materials. This is an excellent and up-to-date summary of both conventional and unconventional roofing practices (excluding tiling) and a copy should be available to architects and all others concerned with modern building construction.

STRUCTURE AND INTEGRATIVE FUNCTIONS OF NERVOUS SYSTEMS

DURING the Southampton meeting of the British Association, Section D (Zoology) discussed some recent progress in our knowledge of nervous systems, particularly the relationship between structure and function. The first two speakers were concerned with invertebrate animals, many of which continue to provide preparations and information which is of value in furthering our understanding of basic nervous mechanisms. The second two speakers presented data from two fields of study which have greatly advanced our knowledge of the mammalian brain during recent years.

Dr. E. A. Robson (Department of Zoology, Cambridge) began appropriately with a quotation from Sherrington's classic *The Integrative Action of the Nervous System*, in which he said "in the multicellular animal . . . it is nervous action which *par excellence* integrates it, welds it together from its components, and constitutes it from a mere collection of organs an animal individual. This integrative action in virtue of which the nervous system unifies from separate organs an animal possessing solidity, an individual, is the problem before us . . .". In discussing coelenterate nerve-nets, Dr. Robson pointed out that these animals are without a central nervous system and yet show a remarkable degree of integration in their behaviour. Histological studies of the nervous systems of jelly fish and sea anemones by Schäfer and the Hertwigs in 1878 had shown the existence of neurones as separate units. Their work, in fact, provided early support for the neurone theory, which was only established later from data on the vertebrate nervous system. Dr. Robson went on to review the classical work of Pantin and his co-workers which, by means of electrical stimulation and mechanical recording techniques, had made it possible to interpret the behaviour of coelenterates in terms of the properties of neuromuscular and interneuronal facilitation. Thus it had provided valuable physiological support for the view that the nerve net is synaptic. The distinction was made between through-conducting systems responsible for the protective response of a sea anemone and the swimming beat of a medusa, and the more localized responses which are coordinated by a net in which the number of synapses to be crossed appears to be greater.

In addition to those reflex responses, coelenterate behaviour is also characterized by inherent activity, first studied in detail by Batham and Pantin using the sea anemone *Metridium*. This animal shows rhythmic expansion and shortening which are usually synchronized with dawn and dusk, but may persist in total darkness for at least three weeks. The interaction of this and other autonomous phases of activity with responses to environmental stimuli can produce impressive sequences of behaviour—well illustrated by the observations of Ross on the transference of *Calliactis* from one whelk shell to another.

More recent advances in our knowledge of the coelenterate nervous system have resulted from the application of electrical recording methods to these animals. This was first achieved by Horridge, who recorded a nerve impulse in the through-conducting system of the jellyfish, *Aurelia*. More recent work has shown that a variety of electrical phenomena can be recorded using micro-electrode techniques. With electrodes in the foot of *Hydra*, Passano and McCullough recorded a constant background of potentials which arose from this region. They could be excited by light and were possibly endogenous to the endodermal nerve net. They also observed bursts of impulses which were associated with spontaneous longitudinal contractions. These arose from the hypostome and were initially inhibited by light and possibly occur in the endodermal nerve net. Other potentials were associated with attachment of the tentacles during locomotion and other tentacular movements. Clearly there is considerable electrical activity in the nervous system of *Hydra* and exactly what mechanisms are involved is only now being investigated. It suggests that the behaviour of *Hydra* is controlled by a hierarchy of pacemakers which are in turn influenced by sensory stimuli. Josephson has found a similar picture in the marine hydroid *Tubularia*, where rhythmical potentials often not directly related to visible behaviour are also observed. The application of these methods has revealed new physiological problems, since, for example, it appears that there are sometimes more than two separate conducting systems, although only two separate nerve nets, ectodermal and endodermal, have been recognized structurally. Dr. Robson suggested that other structures such as muscle fields may have a role as conducting systems.

It seems probable that, as with other invertebrates, the ability to 'tune in' to the nervous activity will give us far more detailed information about the integrative mechanisms where previously our information was based largely on the overt behaviour and responses of the animal. The application of similar techniques has very recently led to the recording of the electrical signs of nervous action in the remaining major group of animals in which it had not been achieved—the Echinoderms, which also rely a great deal upon a nerve net.

Dr. G. M. Hughes (Department of Zoology, Cambridge) explained that the title of his talk, "Electrophysiological Anatomy of Invertebrate Nervous Systems", had been chosen to emphasize the way electrophysiological techniques developed, for the investigation of detailed mechanisms of nervous function is of value in establishing both gross and micro-anatomical features of nervous organization. Thus, in the crayfish they have shown that the areas innervated by a given segmental nerve are not confined to a single segment. Furthermore, the segmental pattern of the sensory innervation of the abdomen is out of phase with the segmentation of the ganglia supplied by the