1880's may not occur at any time. The need for further climatological research assumes greater urgency in view of our precarious fuel position.

Mr. M. Parry, of the University of Reading, followed with an appropriate reminder of the factors governing heat losses from a house. His remarks were based on studies made by the Building Research Station. Using the standard technique of degree-days, he then presented useful data from Reading, Bath and Nottingham to show the differences in fuel requirement likely to arise between houses of similar type, within and without the built-up area. Making further allowances for the wind factor, local variations of the order of 25–30 per cent in the annual fuel bill can be expected. Urban studies were rewarding.

Dr. Alice Garnett directed the attention of the audience to a variety of published studies in regard to atmospheric pollution, and went on to demonstrate the unpleasant—indeed disturbing and potentially lethal—accumulations which might be set up in certain parts of the Sheffield area, where a number of gauges have been established. Here she made effective use of maps indicating the association with local relief. She drew emphatic conclusions regarding the need for very close study of the problems which might arise from the siting of new 'industrial zones' in an area with such well-marked relief and a day-and-night outpouring of smoke.

Miss E. M. Frisby, who is working with a well-known commercial advisory and consultant organization in the United States, summarized the way in which climatological information can be presented for the use of various clients engaged, for example, in building construction in remote country, or in the processing of food crops. The comment was made that in Britain such provision of information is a public service.

The afternoon papers were primarily concerned with evaporation. Mr. G. Melvin Howe (Aberystwyth) demonstrated maps of seasonal water surplus and deficit, based on the Thornthwaite formulae, for England and Wales. Clarity in cartographical representation is a valuable service which the geographer can and does render; a comment, however, might be that the representative character of the fundamental statistics used might be questioned in view of the local characteristics of stations to which Mr. Parry had earlier directed attention. Mr. S. Gregory (Liverpool) re-emphasized the need for water storage and conservation. In reminding the audience that since H. R. Mill geographers had taken little interest in rainfall, he summarized the type of work already done and stressed the need for further cartographical studies, especially in the north of England, where industrial demand for water is rising much more rapidly than was forecast.

Prof. B. J. Garnier, of Ibadan, brought in a welcome contribution from overseas. Irregular incidence of the short bursts of intense rainfall in Nigeria, coupled with very high evaporation, seldom much less than 4 mm. daily, explain why a slight deficiency is quickly felt. He showed how in relatively well-watered country irrigation may nevertheless be very valuable, especially as the increase in the population will soon necessitate more intensive production of food.

Mr. J. L. N. Sibbons (Sheffield), at the end of the session, taxed the non-mathematical part of the audience; he gave a carefully reasoned demonstration of the difficulty of determining the potential loss of moisture under specified climatic conditions.

He showed that the assessment of evaporation-losses by the Thornthwaite method breaks down in certain unusual climates. From another point of view he showed that Penman's approach is also open to some criticism; and, taking account of Sir Graham Sutton's work, he proposed equations which would give better estimates. This was a bold and well-reasoned paper in an exacting field, and it is to be hoped that Mr. Sibbons's ideas will find outlet in print; at least one expert from the Meteorological Office was observed to be engaged in animated comment on the equations on the board.

The papers were varied, and served at least one useful purpose, in that they showed the value, as a shorthand summary of results and as a stimulus to discussion, of well-drawn maps and diagrams, although at times the observational basis may be open to question. Many in the audience were perforce little acquainted with the numerous specialized studies now forthcoming from various sources and research groups. The critically minded geographer can render a useful service in assembling and filtering such material. The geographical approach, moreover, can be illuminating, in that the results of scientific investigations can be related to a particular area and tested by the members of the audience against their own direct field-experience and observation elsewhere.

INTERNATIONAL UNION OF FOREST RESEARCH ORGANIZATIONS CONGRESS IN OXFORD

THE Twelfth Congress of the International Union of Forest Research Organizations was held in Oxford during July 7–14 under the presidency of Prof. Aldo Pavari, of Florence. At this, the first occasion on which the Union had held a Congress in Britain, about 250 delegates attended, from forty-two different countries. The Union, which was founded in 1890, is an association of forest research institutes, including universities, industrial research stations and State institutes, and its main purpose is to advance research into forestry problems. Originally a Union of Central European stations, it has steadily expanded until it now has members in all parts of the world; it is still attracting new recruits, and among recent accessions are the Academy of Sciences of the U.S.S.R. and the research stations of the Forest Service of the United States.

Most of the meetings of the Congress were held in the Imperial Forestry Institute; but the opening and closing ceremonies took place in Regent's Park College, Oxford. The Congress was formally opened by the Minister of Agriculture, Fisheries and Food, Mr. D. Heathcoat Amory, who spoke about forest policy in Great Britain and the place which research has taken in recent developments. He mentioned that much of the earlier effort was devoted to establishing crops of trees on land which had carried no tree growth for centuries; after about thirty years of effort, many of the problems of establishment have been solved, and British research workers are now turning their attention to the problems of managing forests. Work study and mechanization are being dealt with, and much interest is being taken in the effect of trees on the soil. Mr. Amory

also referred to research into the qualities and properties of timber, a subject most essential to foresters, who must never lose sight of market requirements.

The work of the Congress was carried out in Sections, of which there are nine, each dealing with a different subject, and discussions continued during the week, except for a break on July 12 when delegates visited Rothamsted Experimental Station, the Forest Products Research Laboratory at Princes Risborough and the Forestry Commission's Research Station at Alice Holt, near Farnham.

The section leaders, who continue in office between Congresses, are responsible for keeping in touch with all the research workers in their respective fields of action, for circulating information of interest to members of their Section and for initiating action when this is necessary. The Section on Forest Influences, under Sir Harry Champion, of Oxford, dealt with two main subjects: the effects of shelter belts on agricultural and horticultural crops and on livestock; and the effect of forest growth on water supplies. On shelter, it was recommended that there should be an expansion of research into the influence of different types of shelter-belt on crop yields, using modern statistical methods wherever possible; in this work, closer contact with those engaged in plant and animal husbandry is of great importance. More information is needed on the effect of tree roots on agricultural crops under various conditions, on the shelter effect of scattered trees and groups of trees on pasturage and on the influence of systems of shelter belts on regional climates. The effect of forest cover on water supply is a difficult subject to treat experimentally, and the Section recommended the setting-up of a working party to study research methods and procedures. Attention was directed to the lack of comparative watershed data from the more tropical dry or seasonally dry regions, and the need was stressed for a study of the theoretical foundations and the practical application of the concept of evapo-transpiration. The Section also asked member institutes to pay more attention to research on forest influences in the humid tropics.

Under Prof. A. de Philippis, of Florence, the Section on Site Factors dealt with plant communities and their importance to practical forestry. With the help of phytosociological methods, there are many problems which can be solved quickly as, for example, the improvement of indigenous stands, the acceleration of forest successions, the conversion of forests to more favourable silvicultural types, and the choice of species for forest plantations. The Section recommended that rules of international application should be drawn up for uniform methods of forest mapping and for uniform procedure in classifying and naming forest communities.

Dr. C. Syrach Larsen, of Denmark, and the Section on Forest Plants, spent some time in a discussion on teak, as a result of which further work on the flowering of this tree was called for as well as provenance trials. There was some discussion on the selection of stands and single trees for seed production and tree breeding, subjects in which there is at present a wide interest. Some countries, among them Great Britain, have started to compile registers of individual trees and of crops of trees which are suitable sources of seed, and the Section recommended that countries which had not started on this work should begin forthwith. Subjects to which special attention should be paid before the next Congress are methods for the mass

production of seed, the place of the Mexican pines in silviculture and provenance types of Douglas fir.

The Section on Silviculture, under Prof. H. Leibundgut, of Zurich, dealt with methods of classifying trees and spent some time in discussing how to assess the effect of various methods of tending forest crops on growth and quality. The wide field of practical silviculture was also dealt with.

Dr. H. van Vloten, of Wageningen, leader of the Section on Forest Protection, dealt with research into population dynamics and discussed virus diseases of insects of importance in forestry. The possibility was also examined of securing international co-operation in making trial plantations of important tree species in several continents in order to study resistance to diseases and pests.

The Section on the Study of Growth, under Prof. Y. Ilvessalo, of Helsinki, considered the methods of studying yield and growth in forest crops, the variations in yield arising from climatic factors and the determination of the amount of timber which may be cut. It was agreed to form a working-group to examine the possibility of standardizing methods of measurement and to consider how best to circulate information on instruments used in forest mensuration.

Prof. J. Speer, of Munich, presided over the Section on Forest Economics, which dealt mainly with costs in forest operations. In this field, terminology is of importance if the performance in one country is to be compared with that in another, and the Section decided to study this subject with the view of clearing up the obscurities which exist at present. It was also agreed to promote further studies on interest, which plays an important part in the long-term calculations common in forestry, and on the productivity of forest labour. This last item touches closely on the work of the Section on Operational Efficiency, which met under its leader, Prof. U. Sundberg, of Stockholm. In this Section, the two principal subjects which were discussed were medical and physiological problems in forest work, on which much research has recently been done in Sweden, and transport in the forest in relation to the efficiency of operations.

The Section, under J. Campredon, of Paris, which is concerned with the properties and uses of timber discussed the influence of site and of provenance on the quality of the timber, and recommended further research in this field in conjunction with ecologists, geneticists and physiologists. It was also decided that fresh studies should be made of methods of sampling for the qualitative study of timber.

Immediately before the Congress, the Committee on Bibliography, a body in which the Union and the United Nations Food and Agriculture Organization are jointly concerned, met under the chairmanship of Prof. E. Saari, of Helsinki. This Committee has encouraged the use of the Oxford Decimal System of Classification for Forestry and is arranging for its translation into various languages. It is also participating in the preparation of a multilingual forest terminology, and is promoting co-operation between a large number of national and regional centres of forest bibliography; the three international centres are in Oxford, Reinbek and Washington, D.C.

Towards the end of the Congress, the senior delegate from Poland, Prof. M. Kreutzinger, of Warsaw, announced that the Polish Government had decided to offer Great Britain a breeding pair of

European bison for scientific study. The bison in Poland suffered much during the two World Wars, and it is reassuring to learn that stocks of this fine forest animal are slowly building up again. Prof. Kreutzinger stated that at present there are eighty-four bison in Poland reasonably represented by sex and by age and that the annual crop of calves is now about fourteen.

The Union elected Mr. James Macdonald, director of research and education of the Forestry Commission, Great Britain, to be president in succession to Prof. Pavari, whose term of office expires at the end of this year. Dr. van Vloten was elected vice-president. The Permanent Committee of the Union was enlarged, and now consists of the following members: Dean C. F. Korstian (Duke University, North Carolina); A. Oudin (Nancy); Prof. M. Kreutzinger (Warsaw); Dr. K. L. Aggarwal (Dehra Dun); Dr. V. L. Harper (Washington, D.C.); Prof. M. Näslund (Stockholm); Prof. A. Uzcategui (Venezuela); Prof. M. Ohmura (Tokyo); Prof. A. Horky (Vienna); Prof. T. Bunusevac (Belgrade); and a representative, yet to be appointed, of the Institut National pour l'Étude Agronomique du Congo Belge. The Union accepted an invitation from the Government of Austria to hold its next Congress in Vienna.

After the Congress at Oxford, about a hundred and forty of the delegates took part in study tours, which lasted for a week and of which seven were conducted in different parts of Great Britain. During these tours an attempt was made to show the visitors as much as possible of the research in forestry and closely allied subjects which is proceeding at the present time in Great Britain, to inform them of the major problems still awaiting solution and to give them an impression of the variety of conditions in the woodlands and forests in the country.

J. MACDONALD

SELECTION OF MANAGERS

AT the annual general meeting of Unilever, Ltd., the whole of Lord Heyworth's speech was devoted to the way this organization is managed. The Unilever organization is an Anglo-Dutch partnership operating several hundred companies in more than forty different countries; a manager is one to whom is entrusted, at whatever level, the supervision or direction of others. There are altogether some 22,600 managers in Unilever, out of a total labour force of about 270,000; managers form 8 per cent of the total. Inside the general pattern the proportion of managers to the whole varies from one part of the business to another, and from one country to another.

At one end of the scale are the plantations in Nigeria and the Cameroons, where both the country and the operations are still comparatively simple. Here the managers form only about 3 per cent of the whole. In Indonesia, on the other hand, where there is a business producing both detergents and edible fats, the proportion of managers has risen to 6 per cent. In the United Kingdom, with operations in detergents, edible fats and other foods, oil-milling and toilet preparations, the proportion of managers to the total labour force reaches 11 per cent; in Holland with the same range of operations, it is about the same. In the highly sophisticated conditions of the United States, where Unilever interests embrace detergents, toilet preparations, foods and oils and

fats, the managers form 15 per cent of the total of the employees. The pattern that emerges is that the higher the degree of mechanization and the more sophisticated the environment, the higher will be the ratio of managers required.

The managers fall into three main categories. At the base of the pyramid there are the junior managers, numbering about 16,400. Of these there are some 5,000 in Great Britain and 800 in Holland. This category includes the foremen and supervisors. Next comes the large class of middle and senior managers, totalling about 6,000. At the apex is the top management, the two or three hundred people who take on themselves the decisions which make or mar the success of the business as a whole. The only test applied to determine a man's suitability to enter the managerial ranks is that of merit. No particular social or educational background is demanded. An increasing proportion of prospective managers have had a university education; but Lord Heyworth forecasts that in future, as to-day, many Unilever managers will be men who came in at one of the lowest levels, who "came up the hard way" and whose qualities of leadership were developed after they had joined the business.

Selection is a matter in which decentralization is essential. In general, it is left to the individual companies and local managements throughout the world to do their own selection, whether from within their existing ranks or by recruitment from outside. They can, and do, draw upon the common fund of knowledge and experience which has been accumulated by the personnel divisions at the Company's headquarters; as a result, the technique of selection everywhere conforms more or less to a common pattern.

One basic principle is that the qualities of the potential recruit are assessed not merely by individual interview but also by seeing him perform as one of a group; he can show whether he possesses such obviously desirable qualities as intelligence, common sense, organizing ability, and the ability to get on with others. Some men are picked primarily for their specialist knowledge, and special attention is paid to developing their general management ability in the business. The man must have the germ of leadership within him, however; it seems to be more difficult at the stage of initial selection to detect this germ in the technical man than in the non-scientist. For the man reading science at the university to-day the curriculum is so specialized, and so much time has to be spent in the laboratory and lecture room that special attention may have to be paid to help him to broaden his outlook. From Unilever experience it is known that technological skill and management ability are far from incompatible.

The most important training is that which is done individually and on the job, and this must be flexible and selective. There is no general scheme of training into which everyone will fit. Training should be tailored to measure and not ready-made. Immediately, or after a short settling-in period, a man is given a job, and in that job he starts to learn the art of being a manager. This training of the men under them is a vital part of the work of all managers, and the man who neglects it or regards it as a waste of time is unlikely himself to reach the heights.

To this basic training on the job, courses provide a most valuable reinforcement, and in these post-war years this form of training has been greatly extended. Unilever courses are of two main kinds.