great importance of the minerals derived from the soil in the interchanges and inter-relations between soil, plant and animal. It also raises the interesting possibility that high rainfall in the west of Britain may have an ameliorative effect as well as that to be expected from soil leaching.

In order to study these complex relations, it has been necessary also to envisage technical advances in the development of statistical methods for the analysis of the vegetation mosaics and their correlation with the complex soil characters, and the diversity of rainfall.

No part of Great Britain has, however, remained unaffected by the impoverishment of flora, fauna and soil induced by human activities in the past. Changes in land-use, even, for example, in the time of mowing a meadow, may have profound effects on the flora and invertebrate fauna. Thus, the increasing historical and archæological evidence accumulating in North Wales about early human settlement also offers considerable scope for developing knowledge of the influence of former land-use on existing vegetation and wild-life. This is a field of research which is scarcely possible elsewhere in highland Britain because of the scarcity of information about the past.

The basic researches which are thus developing owe much to the pioneer work on soils of the late Prof. G. W. Robinson, as well as to the more recent inspiration of Prof. Alun Roberts. They have also profited much from the existence in the University College of North Wales of strong Departments of Agriculture, Botany, Forestry and Zoology, the continued co-operation of which augurs well for the future.

While, in the present stage of investigation, much of the work centres around the general problems of upland and moorland vegetation and soils, there are other centres of developing research in the nature reserves, notably the special mountain floras and faunas, the dune vegetation and invertebrates at Newborough, and the problems presented by the woodland reserves now becoming available. These are likely to offer much scope for development into other fields of investigation as the primary researches mature.

THE DAVID NORTH PLANT RESEARCH CENTRE

THE Colonial Sugar Refining Co. is to build a plant research centre in Brisbane to conduct basic research on the sugar cane plant. The laboratory, costing £300,000, is to be completed by June 1961.

The Company has been well aware that, over the past twenty years, there has been a very considerable increase (more than 50 per cent) in the yield of agricultural productivity per acre. For example, in the United States, that of corn has risen about 80 per cent, milk by 40 per cent and beet sugar by 50 per cent. In contrast to this, the increase in yield per acre of cane sugar in Australia, and probably elsewhere, has risen only by 25 per cent. This suggests ample room for improving the yields of sugar. However, the scope for increasing the yields of sugar by conventional methods may be somewhat restricted as many of the clones which make up the present-day breeding material are the result of perhaps thousands of years of selection for sweetness and low fibre during cultivation by primitive communities and, secondly, the more obvious improvements, mainly associated with disease resistance, have been effected. Future important advances are only likely to be achieved through a background of thorough understanding of sugar cane physiology and genetics.

The laboratory will be known as the "David North Plant Research Centre", after Mr. David Shepherd North, who, as early as 1904, was investigating plant diseases in sugar cane. Later, he became interested in seed germination and breeding of cane. His pioneering work on both diseases and breeding in Australia did much to ensure the success and the stability of the industry.

In 1958, plans for the new laboratory were initiated in collaboration with Dr. H. R. Highkin, Dr. D. Koller and Mr. P. Keyes, of the Earhart Plant Research Laboratories at the California Institute of Technology. The basic plan of the new laboratory is very similar to that of the Earhart Laboratory, which was constructed in 1947–48, under the direction of Prof. F. W. Went. Five air-conditioned greenhouses, each of 240 sq. ft., are to be held at temperatures of the range 10–40° C. These are connected by an atrium to a group of eight constant-temperature rooms occupying 1,500 sq. ft. The rooms encompass a range of temperatures from 40° C. to frost conditions at −10° C.

The constant-temperature rooms are each subdivided into four compartments which are artificially illuminated and provide opportunity to study the interaction of temperature, light intensity and light quality in growth and flowering. Means will also be available to control root temperatures independently of other environmental conditions. Because cane plants grow to considerable height, 20-ft. head-room has been allowed in all of the growing areas.

The remainder of the building is broken into two sections. The entrance to the whole structure is secured through air locks ; change rooms are provided, and visitors and staff alike are required to wear sterile clothing. The main laboratory area, 1,800 sq. ft., provides facilities for biochemical investigations with particular emphasis on tracer techniques.

Studies on the physiology and biochemistry of sugar cane were commenced in 1955 as a joint venture between the Botany Department of the University of Sydney, the Plant Physiology Unit, Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization and the Colonial Sugar Refining Co. The initial work covered studies on the respiration of sugar cane stalks and the germination of sugar cane sets. At the same time, basic studies were undertaken on the mechanism of auxin action in plants. This work showed that the adsorption of pectin methylesterase to the tissues of cell walls could be altered by the addition of auxin and synthetic auxins. Experiments with tissue slices demonstrated that pectin methylesterase could be extracted with dilute salt solutions and that the enzyme was

partitioned between the tissue and the extracting solution. The equilibrium concentration of pectin methylesterase in solution was altered by the addition of auxin. Presumably the growth of the plant requires that pectin methylesterase be attached to the wall tissue, and the major action of the auxin is that it should be able to reach the appropriate tissue and cause adsorption of pectin methylesterase and perhaps other enzymes.

The group also investigated the movement of sugars into the storage tissues of cane. The uptake was shown to consist of two processes. The first process was that of diffusion into the outer space of the tissue volume, and was governed by the concentration gradient, equilibrium being attained in about half an hour. The second process continued at a constant rate for about 60 hr. and sugar moved against a considerable concentration gradient. The movement was prevented by anaerobic conditions and a number of metabolic inhibitors. This active uptake of sugar into the inner space is analogous to the accumulation of salts by other plant tissues. It was shown that only sucrose—and not reducing sugars—could be taken into the inner space, but that loss from this space was mainly glucose or fructose formed by hydrolysis, particularly in immature tissue. The turnover time for the sucrose pool for young tissue was about 9 hr.

To make use of these observations and other fundamental data, detailed studies are required of the effects of the environment on growth and the translocation and accumulation of sugars. Comparative studies will be made on different species and varieties within species of the genus *Saccharum*. The central interest will be the ability to store carbohydrate as sucrose.

The genetic make-up of commercial varieties of sugar cane is derived from *S. officinarum*, but virtually all varieties now cultivated carry genes from other species, usually with very low sugar content. Hybridization was carried out to increase vigour, resistance to disease, and to widen the range of climatic conditions in which cane can be cultivated successfully. It is anticipated that the comparative studies on sugar accumulation will provide knowledge of the mechanisms by which canes do or do not store sucrose, and this information can be used as a basis for studies on the physiological and biochemical genetics of sugar production.

The work at the David North Plant Research Centre will also include a comprehensive investigation on flowering in the genus *Saccharum* and several related genera and on problems associated with sterility and with the germination of its seeds. Complementing this programme, more general studies will be undertaken in the field of phytohormonal and chemical control of plant growth.

The research staff will consist of five graduates and assistants. Space will be made available for two or three guest research workers from other institutions to work with the Colonial Sugar Refining Co.'s group.

Other laboratories situated in Brisbane which carry out research on plants are located in several departments of the University of Queensland, at the Cunningham Laboratory of the Commonwealth Scientific and Industrial Research Organization and the laboratories of the Queensland Sugar Bureau. This concentration of research groups should establish Brisbane as a leading centre for research on tropical plants in the southern hemisphere.

K. T. GLASZIOU

SOME ASPECTS OF AUTOXIDATION

AN informal symposium on the "Physico-chemical, Biological and Applied Aspects of Autoxidation" was held during April 4–5 in the Department of Inorganic and Physical Chemistry of the University of Liverpool. The meeting was organized by Dr. N. Uri (Ministry of Agriculture, Fisheries and Food Research Establishment, Aberdeen) on behalf of the Colloid and Biophysics Committee of the Faraday Society, and its host, Prof. C. E. H. Bawn, was its chairman.

On the afternoon of the first day four papers, dealing mainly with physico-chemical aspects, were presented to the meeting. Prof. J. C. Robb (University of Birmingham) spoke about a new method in work on autoxidation of hydrocarbons in the liquid phase. He explained the considerable experimental difficulties that are encountered when the rates of diffusion of oxygen from the gaseous into the liquid phase must be taken into account. A method has been developed in which the oxygen already dissolved is used up during kinetic measurements without the necessity for replenishment. The rate of reaction is followed by the measurement of rise in temperature by means of a thermocouple and a sensitive amplifier. A rise of 10^{-3} deg. C./sec. can be determined with a time response of about 10^{-2} sec. The sensitivity of the method enables one to study non-stationary build-up of radical concentration and to obtain quantitative information on rate constants of propagation and termination as well as reactivity of free radicals towards retarders. Autoxidation of *cyclo*hexene and methyl *cyclo*hexene have been studied at temperatures of 40–80° C.

The second paper, which dealt with the initiation phase in the aerobic oxidation of linoleic acid and its esters, was presented by Dr. N. Uri. Evidence was presented suggesting that metal catalysts are important even in the apparently uncatalysed autoxidation. A survey of the effects of heavy-metal stearates and porphyrins indicated that there must be a complex system of initiation involving oxygen–metal complex formation and subsequent formation of free radicals. A reaction scheme was proposed which involved reactions of the metal compound with oxygen, hydroperoxide and substrate and included an inhibitory reaction between metal and free radicals; the latter feature explained an anomalous curve obtained when the rate of reaction was plotted against metal catalyst concentration. Some experiments relating to the effects of environment and chelating on the catalytic activity of the initiaton were described. A brief survey of the effects or various novel free radical acceptors and their theoretical interpretation concluded the paper. If