ground are still considered to be the most reliable means of recording the state and behaviour of glaciers. Recently, however, aerial photography, with its advantage of the avoidance of 'dead areas' due to obstacles, has been applied to the study of glacier dynamics. Unfortunately, the paper gave no information on the experimental equipment, either aerial cameras or the new Soviet stereograph "SD-1", which was claimed to be notable for its precision, having a relative mean-square error of vertical control in the neighbourhood of 1/3,000. It was a

conclusion of the paper that aerial photography could greatly speed up a survey, especially with the use of helicopters, but that no single method in phototopography is appropriate in every situation.

The meeting ended with projection of the Russian research film, "North Pole", showing Soviet scientific research in the Arctic and describing the results of oceanographic and meteorological work. Of special interest were sequences showing the circulatory movements of water and ice-flows about the Pole.

R. L. F. BOYD

GLASSHOUSE CROPS RESEARCH INSTITUTE

OPEN DAY

THE Glasshouse Crops Research Institute, Littlehampton, Sussex, held its annual open day on June 10 when nearly two hundred visitors attended. The laboratories were open for inspection during the morning, and after lunch, at which the director, Mr. F. W. Toovey, reported on the Institute's progress during the past year, a series of demonstrations were arranged in the experimental glasshouses and mushroom sheds.

In tomato variety trials by the Plant Breeding Section (Mr. L. A. Darby) special interest was shown in hybrids with the 'Baby Lea' variety, some of which are in the F_2 generation and beginning to breed reasonably true. This variety has a compact habit of growth (short internodes), and an attempt is being made to incorporate this habit into known good combining varieties with the aim of producing an F_1 hybrid of good early and total yield, bearing high-quality fruit, and which will not suffer from the excessive vigour of hybrids at present grown commercially. A cucumber-breeding trial, which was also demonstrated, tests the value of F_1 hybrids for commercial use with special reference to early and total yields, and to fruit quality.

The Plant Physiology Department (Dr. E. R. Leonard) showed the concluding stages of a time-of-planting experiment carried out as part of its growth analysis studies on the tomato. Previous work has suggested the influence of day-length on the growth of all the major organs of the plant, including the roots, and in order to investigate this more fully sowings at one of the dates included in the main time-of-planting experiment have also been carried out at three other centres in the British Isles, ranging from Guernsey in the Channel Islands to Auchincruive in Scotland, and in Malta and Finland. A prototype temperature-controlled glass cabinet, erected in a glasshouse, for studying the growth of tomato plants under controlled day-length throughout a cropping season was also on display. Another exhibit was equipment for the production of artificial temperature gradients across a tomato fruit in connexion with the Department's investigation of fruit ripening disorders, including those loosely referred to as 'blotchy ripening'.

The Chemistry Department's programme, under Dr. G. W. Winsor, includes a comprehensive study of the nutrition of the tomato, and a wide range of glasshouse experiments was on view. These comprise a basic factorial trial, testing nitrogen, phosphorus, potassium, calcium and magnesium, two experiments

on liquid feeding, and an investigation of the effect of magnesium deficiency on yield and its control by applying magnesium sulphate to the soil or to the foliage. Determinations of nutrient uptake are a special feature of these experiments. Laboratory studies of tomato fruit composition were also demonstrated; these have particular reference to fruit-ripening disorders and may shed light on factors determining flavour. Changes in the enzyme activity associated with ripening are also being investigated. The Department also works on other glasshouse crops, and of topical interest were the studies being made of the effects of manganese toxicity on tomatoes, lettuce and carnations. A factorial nutritional trial on carnations, testing three levels of nitrogen and potassium in the presence or absence of added phosphorus, magnesium or calcium, was also on view. With the cultivated mushroom certain cultural problems are studied, particular attention being paid to various factors of the casing layer in relation to fruiting; evidence has accumulated that total moisture stress has an important influence on fruiting. An investigation of the effect of factors of the atmospheric environment on mushroom growth is also about to be taken up, and a prototype controlled-environment chamber for this was on view.

The Plant Pathology Division (under Dr. L. Broadbent) demonstrated the work of its three Departments, Entomology (Dr. N. W. Hussey), Mycology (Mr. P. H. Williams) and Virology (Mr. M. Hollings). At present the Entomology Department is devoting a great deal of attention to cecids affecting the cultivated mushroom; observations on their life-history were illustrated, and results were presented on the very rapid rate of increase of the larvae in compost. The results of experiments on the control of cecids by the application of γ -BHC to compost or casing were also displayed. The Mycology Department showed aspects of its work on the *Didymella* stem rot of the tomato, on cucumber mildew, on carnation wilts and on mushroom fruiting disorders. In connexion with the investigation of carnation wilt diseases, a glasshouse experiment on the survival of the pathogens in soil and plant roots was in progress; this involves the growing of carnations, chrysanthemums and tomatoes in rotation in concrete-lined beds to see whether the wilt organisms can be carried over on hosts other than the carnation, even though producing no visible symptoms on those hosts. Mushroom fruiting disorders, associated with greatly reduced cropping, have caused much concern to the

industry during the past few years, but their investigation has proved very perplexing because of the variety of symptoms produced. At the Institute the possible transmissibility of the disorders has been particularly studied, and in recent experiments, which were demonstrated, evidence of artificial transmission and natural spread following the inoculation of beds has been obtained. Of special interest in the Virology Department's programme, which is about to be greatly expanded, was the success achieved in rooting meristem cultures of carnations and transferring them to conventional growing media; this work has been undertaken as a prelude to the investigation of heat therapy for carnation virus diseases.

The Crop Protection Department (Mr. W. H. Read) had a striking demonstration of the effect of captan in protecting tomato plants from *Didymella* stem rot. A glasshouse trial showing the value of the chemical soil sterilizing agents, metham and chloropicrin, in comparison with steaming, was also on view.

Among the current activities of the Statistics Section (Mr. D. Cooke) attention was directed to a survey that is to be carried out, in collaboration with Rothamsted Experimental Station and the Ministry of Agriculture, on the tomato varieties in commercial cultivation in relation to earliness and district. This should provide information of particular interest in connexion with the breeding programme and experimental work generally.

F. W. TOOVEY

STUDIES IN RECREATION

UNDER the title "After Work: Leisure and Learning in Two Towns", the National Institute of Adult Education has published, for the Manchester and District Advisory Council for Further Education, studies in Bolton and Rochdale by Mr. R. Ruddock and Dr. A. Wilson (pp. 63. London: National Institute of Adult Education, 1959. 3s. 6d.). Prof. R. D. Waller contributes an introduction explaining the purpose and basis of the two surveys, which give special attention to the twenty to thirty age group, and suggesting a few generalizations. Dr. Wilson's survey of Rochdale started a few months later than Mr. Ruddock's survey of Bolton, and he stresses the quality and quantity of educational and cultural activity in this town of some 86,770 inhabitants. While this is probably not less than that of any other industrial town of comparable size in Great Britain probably as many as 40 per cent of young adults have no connexion with any organization outside their job and home. The Rochdale Literary and Scientific Society, founded in 1878, has always had the backing of influential scientists, doctors, teachers and others and often exercised considerable influence in educational and cultural matters; its membership has fluctuated between 233 and 350 during the first half of this century, but has since reached 650. Nevertheless, apart from societies promoting religious, musical, dramatic or highly specialized leisure pursuits, the voluntary societies have little success in attracting people in the 18-35 age group, and during the past five years the membership of voluntary societies has fallen by 12-13 per cent.

The survey suggests that some of the young adults would welcome the opportunity to live a fuller social life and that others might adopt a similar attitude if parents, school-teachers and employers broadened their horizons and developed their latent interests in society and the problems which face its responsible citizens. Dr. Wilson suggests that the links between technical students and liberal or non-vocational studies could be developed, for example, by residential courses organized by the Extra-Mural Department of the University of Manchester. Nor is full use yet made of the facilities for further education under the part-time day release scheme: with a school population of 12,287 in sixty schools, day release from 2,289 technical college students is only 943, 76 from 243 School of Art students, and 19 from 1,883 Further Education Centre students.

For Bolton, with approximately double the population (163,800), the statistical picture is similar. The population per acre, rates per head and birth-rate are very similar: there are 25,374 students in 102 schools and the total expenditure on education is roughly double (£2,278,812 compared with £1,115,567). Of the 6,700 technical college students, 2,800 are day release, but there is no day release among 748 School of Art students and 2,700 Further Education Centre students. Like Rochdale, Bolton is becoming less dependent on the textile industry, and employment in the textile industries has dropped to less than 25 per cent of the working population, compared with 47 per cent in Rochdale. Mr. Ruddock estimates that the voluntary societies contribute only perhaps one-twentieth to the cultural activity of Bolton and that the whole cultural life of Bolton is sustained by some 6,000 of its citizens. Among the suggestions he makes, all concerned with the upper 30 per cent of the population, in the educational sense, is extended publicity to ensure that more young adults know of the Workers' Educational Association and other serious organizations in the cultural field. Many premises require improving and equipment. The Central Library is admirably situated for sponsoring experimental provision, and although there is much good teaching of the plastic arts in Bolton, local amateurs could benefit by experience of a more exciting and vital practice which might be offered from outside. Besides the provision of special courses for those conducting classes and meetings, Mr. Ruddock suggests that the many graduate teachers, lawyers, doctors, ministers, scientists and administrators in Bolton might be encouraged to associate more freely and that executive members of local businesses would gain much from organized group contacts with specialists in science, administration, education and social science, many of whom could be reached through the University Extra-Mural Department or Bolton Technical College.

Prof. Waller points out that neither survey says much about the large undifferentiated mass—what its members' spare-time activities are, what could be done to interest them and involve them in socially healthy and worth-while pursuits. Both surveys support explicitly and implicitly Dr. I. Trenaman's conclusion, that all cultural and educational activities touch only about half of the population, and that