

process, and that when slip occurs there is a momentary jump in temperature. Blok works out the temperature rise for sliding contacts for a number of ideal cases. Neely describes simultaneous friction and wear measurements and shows that the wear-reducing value of addition agents may be quite different in degree and sometimes in direction from the friction-reducing value. Brownsdon, Southcombe, Wells and Waters, Clayton and van der Minne report breakdown loads and wear under relatively severe conditions, and provide a fund of information relating to 'oiliness' and extreme pressure effects which can only be partially co-ordinated; it appears that the good qualities of extreme pressure oils can only be brought out at high pressure and speed, leading to high temperature.

In the papers dealing with viscosity, that by Groff explains the use of a chart for the graphical solution of a number of viscosity-temperature problems. Geniesse describes the kinematic viscosity measuring equipment which has been adopted by the American Society for Testing Materials, and the new viscosity-temperature chart. Barr describes viscometer bath arrangements for high temperatures, and suggests a new empirical formula for expressing viscosity-temperature relationship. Suge gives an account of his methods and results of measurement of viscosity up to high temperature and pressure; he finds that the product of surface tension and coefficient of compressibility is a constant, and measures the thermal conductivity of oils. Bradford and Vandegrift quote Dow's results on the effect of pressure on the viscosity of mineral oils.

Coming now to papers dealing with oxidation tests of oils, Andrews finds that the rate of separation of water-in-oil emulsion is a good guide to the condition of a turbine oil in service. Moerbeek is critical of the

many oxidation tests for internal combustion engine oils on account of the disagreement between their results and the lack of correlation with engine behaviour; he is pessimistic as to their ultimate capability of predicting the behaviour of oils in engines. Mardles and Ramsbottom provide extensive results on the oxidation of oils with varying temperatures, time and method of oxidation. Hanson and Egerton, finding that gumming increases when engine knocking occurs and that nitrogen oxides are formed particularly under these conditions, have investigated the connexion between the two; they find that nitrogen oxides, even in small proportion, have a marked catalytic effect on oxidation, and suggest that this may be one of the factors leading to lack of correlation between laboratory and engine tests. Moutte, Dixmier and Lion find that they get improved correlation by first oxidizing the oil at low temperature and then subjecting it to high temperature. Evans and Kelman have found that soaps such as tin oleate can inhibit the catalytic effect of iron on oxidation, and by engine tests have chosen optimum proportions of tin and chromium oleates for an engine oil.

The time has certainly not yet arrived when the principles of lubrication can be said to be satisfactorily established on a scientific basis: clearly, much additional and carefully co-ordinated research of a really critical nature must be carried out. Nevertheless, progress has been made and certain underlying physico-chemical concepts are emerging. The papers contributed to this general discussion form an admirable review of the present position, and their detailed study is recommended to all interested in the theory and practice of lubrication and lubricants.

H. J. G.

## Recent Advances in Horticulture

MANY useful reviews are contained within the pages of vol. 5 of the Horticultural Education Association's yearbook for 1937 "Scientific Horticulture" (Pp. 196+xxxii, 3s. 6d. net, from the Hon. Editor, S. E. Agric. Coll., Wye, Kent), which constitute a welcome channel for the distribution of knowledge from the research worker to the teacher of horticulture. "Some Recent American Work on the Copper Fungicides" is described by Mr. R. W. Marsh; Prof. Stoughton contributes "A Review of the Problem of Bud Dormancy". Dr. O. N. Purvis discusses recent Dutch research on the temperature requirements of hyacinths, and Dr. Meirion Thomas has a paper on "Plant Hormones and Their Possible Importance in Horticulture". Dr. F. Kidd and Dr. G. West show that apples destined for long-period gas storage should be picked within a fortnight of the 'climacteric phase'. This is the time when growth in size of the apple ceases in autumn, and is indicated in practice when the fruit can just be detached by gently twisting it on its stalk. The late Dr. W. Maldwyn Davies describes the results of his experiments on factors which affect the distribution of virus-transmitting aphids, particularly *Myzus persicae*. Winged individuals of this species fly readily when the temperature reaches 65° F. Increasing humidity deters the movement of winged aphids, and flight ceases

completely when the wind velocity rises above four miles per hour. Dr. T. Whitehead has correlated this knowledge with a survey of districts in North Wales which are suitable for the growth of virus-free seed potatoes.

Messrs. B. S. Furneaux and W. G. Kent have investigated a malady of fruit trees known as the 'death'. This is due to the suffocation of roots by rise of the water-table after planting in a dry period, whilst wind-rocking of newly planted trees is often a contributory cause. Research work in progress at the John Innes Horticultural Institution is reviewed by Mr. W. J. C. Lawrence, and at the St. Ives Research Station by Mr. R. B. Dawson, who also contributes a paper on the routine management of lawns. Dr. W. G. Ogg discusses the reclamation of peat land and the utilization of peat as a mulch, as a potting medium, and as a source of organic matter for garden soils. Prof. G. W. Robinson discusses more general problems of horticultural soils.

Papers dealing with practical topics also appear in the volume.

### CHESHUNT RESEARCH STATION

The twenty-second annual report, for 1936, of the Experimental and Research Station sponsored by the Nursery and Market Garden Industries' Development

Society, Limited, at Turner's Hill, Cheshunt, Herts, shows that much work is being directed towards the improvement in quality of tomatoes. The director, Dr. W. F. Bewley, and Mr. J. Harnett, have investigated the condition of tomatoes upon arrival at the wholesale markets in many parts of England, and much information has been made available for growers. Manurial and crop-management trials have been continued, and a method for restricting the root systems of tomato plants within clay pots gives earlier ripening and enhanced quality. Soil heating, applied after the two bottom trusses have set, gives a greater yield than the use of continuous ground warmth from planting time.

The Station now possesses a mushroom house, where an attempt is being made to understand the cultural requirements of this plant, and where the incidence of pests, and the appearance of undesired fungi, can be studied and controlled. A truffle fungus, *Pseudobalsamia microspora*, has been described as a new invader of mushroom beds. Several new fungal diseases of flowering plants have been described.

An interesting method of testing for the presence of spotted wilt virus in chrysanthemum plants has been evolved. This virus is scarcely tolerant of oxidation, and it is difficult to inoculate such hosts as tobacco or tomato with it. A dilute solution of sodium sulphite, acting as a reducing agent, allows such inoculations to be performed with ease. The occurrence of the eelworm *Anquillulina dipsaci* upon the tomato has been recorded, and the marking of tomato fruits with circular rings is shown to be the result of drops of water containing *Botrytis* spores.

#### LONG ASHTON RESEARCH STATION

The annual report of the Agricultural and Horticultural Research Station at Long Ashton, Bristol, for 1936, sets forth the results of a number of investigations which are especially practical in their outlook. A new section deals with soil surveys; Dr. T. Wallace has described the soils in the Vale of Evesham, in their relation to fruit and vegetable crops, and Dr. D. A. Osmond has studied the more intensive problem of the Station's pedology. Mr. G. T. Spinks reports work in progress on apple breeding, and variability of apple trees on seedling and on clone rootstocks.

Drs. T. Swarbrick and W. E. Berry have carried out yield trials with various black currant varieties in relation to the system of pruning adopted. They give the interesting result that hard pruning reduces the crop significantly in every case. The same two workers have also inquired into the incidence and spread of the virus disease of black currants known as 'reversion'. They indicate a correlation between the appearance of big bud, caused by a gall mite, and the virus, though big buds have never been observed before the symptoms of reversion, on the same bush. This raises the possibility that the gall mites may be present upon a bush for some time, in numbers sufficient to transmit reversion, but insufficient to produce a gall.

Dr. H. G. H. Kearns, Mr. R. W. Marsh, Dr. H. Martin, and Mr. E. Umpleby have a number of papers upon the control of pests and diseases by spraying. A third progress report on the use of combined washes is given, and sulphite lye has been used as an emulsifier. Dr. C. L. Walton shows that a type of parsnip canker is caused by the eelworm *Anquillulina dipsaci*, which can also induce similar

symptoms on onions, and in collaboration with Messrs. L. Ogilvie and C. J. Hickman, a study of the effect of nitrogenous fertilizers on potato 'sickness' has been made. The eelworm, *Heterodera Schachtii*, which causes the trouble, evidently interferes with the nitrogenous metabolism of the potato, and the yield of tubers on 'sick' land can be increased by the application of nitrogenous manures.

Mr. P. T. H. Pickford reviews the cider-making trials during the year, and Mr. Vernon L. S. Charley contributes two papers upon principles involved in the manufacture of fruit juice syrups. This work is of importance in providing a new and steady market for various fruits, and should help materially in the economic management of the extremely variable yield of home-produced fruit. A study of the dormant buds of the cricket-bat willow, as they affect the wood, has been made by Mr. H. P. Hutchinson, who also inquires into the effect of lateral branches upon the production of sets in this species of willow.

#### CULTURE OF AMARYLLIDS

The American Amaryllis Society has decided upon the title *Herbertia* for its third, and all subsequent year-books. This is to honour the pioneer work of William Herbert, whose published work on the Amaryllidaceæ appeared in 1837. Vol. 3 (Pp. 151, from the editor, Dr. Hamilton P. Traub, Mira Flores, Orlando, Florida, U.S.A., 1936) is dedicated to Arthurgton Worsley, whose contributions to the culture of amaryllids are acknowledged in a short appreciation by Lord Aberconway, president of the Royal Horticultural Society of England. The botanist will find much of interest in the volume, particularly in the sections dealing with the physiology of reproduction and with genetics and breeding. Little is yet known about causes which influence the balance between flowering and vegetative propagation in bulbs. A paper on "The Propagation of *Zephyranthes rosea* by Under- and Over-Feeding" by Dr. Hamilton P. Traub and A. E. Hughes, provides a welcome introduction to the effect of soil nutrients upon propagation by bulbils. I. W. Heaton describes the propagation of amaryllids by destruction of the terminal bud, and Wyndham Hayward gives a method for propagating *Lycoris* by basal incisions. Dr. Traub has a further paper on "Growth Responses Following Stem Cutdown of Amaryllids".

The most widely interesting contributions in the section on genetics and breeding are, perhaps, those which relate to the storage of pollen. It has only been possible in the past to cross-pollinate such varieties as overlapped each other in their times of flowering. It is now possible to store pollen of many species for a considerable time. Miss Norma E. Pfeiffer has shown that the best conditions for storage are provided by a temperature of 10° C. with a relative humidity of 35-50 per cent. Dr. Traub shows how such a humidity can be preserved in an enclosed space by means of saturated solutions of various salts. Dr. A. B. Stout has an article on the evaluation of horticultural clones of day lilies, and there are also papers upon specific genetic problems relating to the Amaryllidaceæ by S. P. Lancaster, G. W. Gibson, R. T. van Tress, and Wyndham Hayward.

The section on colour description includes three papers on colour photography, and the colour charts of Fischer and the Royal Horticultural Society are discussed.