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*Edited under the authority of the Executive Council
of the Institute.*

EXAMINATIONS.

Examinations for the following are conducted by the Institute:—

1. Junior Certificate in Horticulture.
2. Intermediate Certificate in Horticulture.
3. Diploma in Horticulture.
4. Second-class Certificate in Fruit-culture.
5. National Certificate in Fruit-culture.

EXAMINATION PAPERS.

Sets of examination papers used at the last six examinations in horticulture are obtainable on application for sixpence per examination set.

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Journal of the New Zealand Institute of Horticulture

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No. 2

PLANT PROTECTION

By

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THE BANKS LECTURE FOR 1934.

At the time when Sir Joseph Banks visited New Zealand on board the "Endeavour" (1769), little was known of the causes of plant diseases, and still less of methods for their control. The recommended practice in England at that time was to apply, with a brush or watering can, decoctions made from plants possessing an aromatic or objectionable smell. Little progress was made until the eighties of last century, when the recognition of economic losses caused by diseases led to the organization of the first plant protection services. Since then progress has been so rapid that today the literature of the subject equals all other biological contributions. This rapid development has resulted through recognition of the economic role of plant diseases in Agriculture (using the term in its widest sense), for it is now generally recognized that they are the limiting factors in crop production. This is evidenced by the fact that no plant or plant product is free from fungus and insect attack.

Plants are attacked by many organisms, such as insects (and related animals), fungi, bacteria and viruses. It is necessary to study these and elaborate control measures in each country; for experience has shown that it is seldom possible to utilize directly in one region, protective measures evolved in another, owing to the differential influence of varying biological factors. It follows that those countries which have developed plant protection stations, properly staffed and equipped, are best fitted for maintenance of production, and competition on the agricultural markets of the world.

The subject of this lecture is perhaps best covered under six sections, as plant protection embraces too wide a field to permit of a general discussion. These sections are:—

- I. Employment of Therapeutants;
- II. Utilization of Disease-resistant Plants;
- III. Production of Disease-free Plants;
- IV. "Biological Control";
- V. Application of Hygiene; and
- VI. Protection by Legislation.

I. THERAPEUTANTS.

This term is used to cover sprays, dusts, steeps and fumigants. The employment of these affords the most certain form of plant protection; as when properly selected and applied, therapeutants give almost complete protection against most pests and diseases. Their utilization is limited by the problems of application. Thus they are applied regularly in the orchard, glasshouse, or garden; to a limited extent in the field for the protection of truck crops; but as yet cannot be economically applied to most field crops and to forest trees. Therapeutants are conveniently discussed under the following groups.

(A) SPRAYS. These are applied in liquid form, by means of a pressure pump, hand or power operated, to protect plants against parasitic attack. Success in their employment depends upon (1) the concentration of the materials employed, (2) the type of spray selected, (3) the times of application, and (4) safety to plant tissues.

During the past four years we have been working on the problem of improving the efficacy of the sprays used in the Dominion. This work has led to a revision of times of application, concentrations, and materials employed in commercial orchards. The most significant aspect of this work has been the introduction of units whereby the value of each spray may be measured by the user. The employment of these units has led to improved disease control, and reduction of spray costs by upwards of 50 per cent. Particulars of these investigations, and their economic application, are given in a series of papers published in the N.Z. Journal of Agriculture, during 1932-1934.

(B) DUSTS. In the United States and elsewhere dusts have been used as substitutes for sprays, especially in the orchard and garden. Our experience has shown that they are inferior to and more costly than sprays, and cannot therefore be recommended under New Zealand conditions. In the United States and Russia large-scale dusting by means of aeroplanes has been employed, apparently success-

fully, in protecting cotton, cereals, and even forest trees. The scattered nature and small extent of most of our farm crops preclude similar development of this aspect of protection.

In New Zealand, work with dusts has been limited to combating certain diseases carried with the seed. Copper carbonate and certain organic mercury dusts have been found to be efficient and superior substitutes for copper sulphate (used as a "pickle") in combating stinking-smut of wheat. These dusts function also as repellants, protecting treated grain from attacks, while in store, by mice and insects.

(C) STEEPS. The limited application of dusts, and the fact that they do not eliminate seed-borne diseases, render them inferior to the hot water steep. This treatment is unfortunately too difficult a process to be used by the farmer, as it appears that each organism, and variety of seed, has its particular temperature requirement. Some seeds require to be soaked in cold water before being treated (the process being termed a presoak), whereas with others no advantage is to be gained by this practice. The following examples illustrate the complexity of the problem:

Loose-smut of wheat requires a presoak of 6 hours and a steep of 10 minutes at 127°F.

Loose-smut of barley requires the same presoak and a steep of 5 minutes at 127°F.

Smuts of oats require no presoak and a steep of 10 minutes at 135°F.

Collar-rot of peas requires a presoak of 18 hours and a steep of 50 minutes at 118°F.

The hot water steep has been applied successfully in the elimination of many seed-borne organisms; several examples being discussed in the section on production of disease-free plants.

A steep which was originated at the Station to free potato tubers from the organisms causing corticium-disease and powdery-scab, is the acidulated mercuric chloride steep. Although this treatment effectually destroys these organisms, its application is scarcely justified on the score of cost, other than for the production of nucleus lines of disease-free mother seed, which must be grown subsequently in disease-free soil.

(D) SOIL STERILIZATION. Many plant diseases and insect pests carry over in the soil, from one season to the next, several being responsible in restricted areas for the condition of "plant sick" soil, formerly held to be due to soil exhaustion. Destruction of these organisms enables the same soil to be used repeatedly, which means considerable saving to nurserymen and others. Two methods are available, (1) chemical treatment, and (2) the use of steam.

Chemical treatments are useful for application in the field, or to soils in which plants are growing. Certain chemicals may also be employed for soil disinfection in the absence of a steam plant. Formalin is the most effective, giving almost as good results as steam, though considerably more costly. We have found it to be effective in combating fairy-rings in lawns. Damping-off may be prevented by the use of cheshunt compound, a mixture of copper sulphate and ammonium carbonate. Equally satisfactory results may be secured with weak solutions (0.5 %) of potassium permanganate. These may be applied with a watering can to combat damping-off and similar fungous diseases without injury to the plant. An effective method of protecting cabbages against club-root attack is to treat the soil prior to setting out plants, with a 0.2 per cent. solution of acidulated mercuric chloride.

Grass grub may be dealt with in lawns by injections of carbon disulphide. In the absence of an injector, this chemical may be applied with a watering can in the form of an emulsion. Dilutions of emulsified tar acids (procurable from gas works) are also effective when applied in a similar manner. Lawns being laid down may be protected from future attack by mixing lead arsenate with the top three inches of soil.

The most efficient soil sterilizing agent is steam. Treatment may be partial or complete, the former being employed for disinfecting soils required for glasshouses and seed beds or boxes, the latter when disease-free soils are required for research work. Several processes are available. A boiler of some type is necessary, which must be of fair capacity for the treatment of any quantity of soil. For treating small quantities (about half a yard) at a time, we have found bins made from square 400-gallon iron tanks to be satisfactory. Into the bottom of these, steam is led at 75 lb. pressure until the top layer of soil gives a thermometer reading of 98°C. In glasshouses, steam may be led through an underground pipe system, which is costly but effective, or forced from the surface through perforated grids, to a depth of from 9 to 12 inches. The latter is the process commonly employed in Nelson glasshouses. For complete sterilization it is necessary to hold the soil under steam pressure in a closed pressure chamber. We use for the purpose a retort in which a pressure of from 15 to 20 lb. is held for half an hour or more, the time and pressure depending on the volume of soil under treatment.

(E) FUMIGATION. In New Zealand this practice is limited to the destruction of insect pests in glasshouses and stored products. It is effective only against insect pests (and related animals), being practically useless against fungi and bacteria.

Hydrocyanic acid gas is the most efficient fumigant, but possesses the disadvantages of being dangerous to man, and liable to

injure plant tissues. To avoid or reduce injury, it is necessary to employ the exact dosages specified; to fumigate in the evening after sun-down; to keep both soil and plants dry for 24 hours prior to treatment; and to avoid fumigating plants which have been sprayed previously with copper sprays. Even when these precautions have been taken, certain plants—roses, chrysanthemums, sweet peas, and certain vegetables—are liable to suffer injury.

A preferable fumigant, which we use in glasshouses at the Station, is nicotine. This is volatilized by the aid of heat, and although somewhat costly, is convenient and safe to apply.

For disinfection of stored products—as wheat, flour or chaff—carbon disulphide is usually employed. This liquid produces a penetrating gas, which is considerably heavier than air. Treatment is easy to apply, as it is necessary merely to place a measured quantity of the liquid in an open vessel on top of the pile (of the product), and to allow it to evaporate. Its chief disadvantage is that the gas is highly inflammable.

II. UTILIZATION OF DISEASE-RESISTANT PLANTS.

This method of protection has been employed for upwards of 50 years and finds considerable support, owing to the belief that success eliminates the necessity for the employment of additional protective measures. Despite the very considerable amount of work undertaken, it must be admitted that there are few outstanding instances of the successful production of resistant plants. This is due to the complexity of factors involved, most of which were not recognized until recently.

Resistance in a plant is exhibited as a rule towards one specific pathogen, or an individual strain of that organism. This is well illustrated by reference to recent discoveries regarding black-rust of wheat. This organism is now known to consist of upwards of 100 strains (biotypes), each with its own definite and selective parasitism. New strains are still being isolated, and as several of these have been known to hybridize, the difficulty of breeding a rust resistant wheat may be realized. In fact the problem is so complex that at present I do not think it is possible to produce wheats resistant to all rust biotypes; so that this method of attack must of necessity be limited to countries, such as New Zealand, where these biotypes are few in number. Many other plant pathogens are composed of numerous strains, so that a detailed study of each organism becomes essential before resistant strains can be produced. This discovery probably explains why so many plants, which are resistant to a specific organism in one locality, have failed to remain resistant when removed to some other region.

Resistance is confined to the variety, or even to the individual plant. When the resistant plant is of good commercial quality, it

is possible sometimes to produce resistant strains by selection. We are using this method at the Station in work on club-root control; and have available small quantities of a resistant swede, yellow fleshed turnip, white fleshed turnip, and a rape. If the resistant plant is of an inferior type, a good quality resistant line may be secured by crossing inferior resistant and superior susceptible plants. Unfortunately so many factors are involved that as yet few successes have been secured in this manner.

III. PRODUCTION OF DISEASE-FREE PLANTS.

This offers a convenient line of attack against those diseases which are disseminated with or upon the seed, tubers, bulbs, or runners of plants.

With seed-borne diseases the procedure we have followed in their elimination, is to select seed from pedigree plants of the variety, free this from disease (usually by means of the hot water steep), sow the seed under controlled conditions, and finally to produce quantities sufficient for commercial distribution. Outstanding results in the field have been secured in the elimination of smuts and stripe (both fungous diseases) from the malting barley crops of Canterbury. The effects have been (1) to eliminate annual seed treatments, (2) to reduce seeding from 2-2½ bushels to 1 bushel per acre, and (3) to increase yields over 7000 acres by upwards of 20 %. Success has been due to the active collaboration of Mr. C. H. Hewlett, Managing Director of the Canterbury Seed Co. We are now applying the process to the elimination of quite a number of seed-borne diseases, among which may be mentioned bean-wilt, maize cob-rot, pea collar-rot, and swede dry-rot.

Several diseases are carried with the tubers of potatoes. I have already referred to the method evolved for combating those which are carried externally. The most serious diseases, carried within the tubers, are the virus diseases, of which there are at least six types present in New Zealand. These bring about progressive degeneration in the potato crop, and have reduced the Dominion average yield from 12-15 tons per acre, to 4 tons or less. The only known method of combating these is to produce potatoes which are free from these diseases. We have available small quantities of several commercial varieties of virus-free potatoes, and are now bulking these for commercial distribution. Clean plants become infected in the field by insects, such as aphides, which carry infection from diseased plants. Consequently, it is necessary to grow virus-free tubers in isolated areas, removed from any other potato crop, or from areas which have previously grown potatoes, owing to the danger of infection, (in the latter case), from volunteer plants.

Strawberry virus affords an illustration of a disease carried with the runners. This has proved a serious problem as, where formerly strawberries could be cropped for at least six consecutive

years, today it is necessary to replant every second season. As all commercial areas are infected, it has been necessary to produce virus-free plants from seed. Quantities of these have been raised, but it will be several years before plants are available in commercial quantities, owing to the technical difficulties involved in producing good quality varieties from seed.

IV. "BIOLOGICAL CONTROL."

This aspect of plant protection has a popular appeal as it apparently affords a cheap and convenient method of destroying insect pests. Undoubtedly the insect population of any country is reduced materially through the mortality induced by birds, parasitic insects, and fungi. Numerous attempts have been made to secure economic control of troublesome insect pests by the commercial utilization of insect and fungous parasites. The first successful attempt in this direction was made in California in 1889, when a ladybird was imported from Australia to control cottony cushion scale (also an Australian importation) which was said to be menacing the citrus industry. In New Zealand the practice was first employed in 1893, when the Department of Agriculture imported from England parasites to combat the hessian fly, which was said to be threatening the wheat crops of the Dominion. The following year the Department imported from Australia the ladybird parasite of cottony cushion scale; and in 1905 introduced the steel-blue ladybird to check the ravages of gum-tree scale. Many other parasites have been introduced subsequently, but unfortunately few, if any, have proved as successful as the ladybirds mentioned.

It is unfortunate that numerous misconceptions exist with reference to the application of "biological control"; for these have resulted in the production of two extreme schools, one claiming it a panacea for all insect pests, the other holding that it is worthless as an agent in plant protection. The term itself is unhappily chosen, as even under the most favourable conditions a 50 % parasitism is rarely obtained. This limits its application to attempted control of pests attacking plants to which therapeutants cannot be applied. Thus biological control may be of value in reducing insect attacks on certain field crops, or forest trees, but is of little practical use in the orchard, glasshouse, or garden, where a much higher degree of protection is essential. It may be employed as a supplementary aid, provided its use does not clash with established therapeutant practices.

Biological control has been brought into disrepute by the promiscuous employment of parasites that MIGHT be of value in reducing insect pests. A survey of the literature has shown that there have been relatively few cases where success, or partial success, has been secured; whereas the failures total many hundreds. Suc-

cess has been secured only under conditions favourable to the establishment and rapid reproduction of the parasite. Even then no prophecy can be made as to whether a parasite is likely to prove an effective controllant of any insect, as its behaviour must be carefully recorded over several seasons before any definite opinion can be formed. This is well illustrated by the behaviour of the woolly-aphis parasite, which was singularly successful in the first few years of its introduction, but has been of little value in combating this pest in most orchard areas in the Dominion for the past three or four seasons.

The position is no better in the employment of fungi as controllants of insect pests. They have proved useless in New Zealand as controllants of pests of the orchard, despite their prevalence. This is due partly to the effects of sprays, but chiefly to the fact that the conditions necessary for the development of a disease epidemic are not present, and cannot be created artificially.

V. HYGIENE.

This aspect, usually overlooked, nevertheless plays an important part in plant protection. Disease and pest control is materially improved by the removal of sources of infection; removal of weeds which may serve as hosts for certain diseases; and crop rotation. The matter is so self-evident that further discussion is unnecessary.

VI. QUARANTINE RESTRICTIONS.

Most countries pass legislative measures prohibiting the importation of plants or plant products from localities in which are present certain diseases, not present in the importing country. This attitude is based on the supposition that disease can be excluded by legislation. To make this really effective, absolute prohibition is necessary. This measure cannot be enforced, owing to the numerous channels through which material can pass without examination—as by letter post, seed packages, in passengers' luggage, jettisoning of fruits and vegetables by ships in harbour, etc.

Consequently, legislative protection has ceased to be a function of plant protection, but has become rather a means whereby the politician is enabled to enforce trade concessions.

SUMMARY OF PROCEEDINGS OF ELEVENTH ANNUAL CONFERENCE

Held in the Agricultural Society's Lecture Hall, Cuba Street, Palmerston North, on Friday, 26th January, 1934 at 10 a.m.

REPORTS.—The following reports were received and adopted:—

1. Executive (with Statement of Accounts).—See Journal of September, 1933.
2. Examining Board.—See Journal of September, 1933.

ELECTION OF OFFICERS, ETC.—

President: Mr. F. J. Nathan, on the nomination of the Executive, was unanimously re-elected President and it was decided to convey the Institute's deep appreciation of his past services and its earnest wishes for an early recovery from his illness.

Vice-Presidents: Messrs. T. L. Lancaster (Auckland), F. E. Smith (Hawke's Bay), J. G. MacKenzie (Wellington), P. Black (Palmerston North), T. Rigg (Nelson), T. D. Lennie (Canterbury), D. Tannock (Otago) and R. A. Anderson, C.M.G. (Southland).

Executive Committee: Mrs. Knox Gilmer, Professor H. B. Kirk, Messrs. J. A. Campbell, T. Waugh, H. Baillie, R. B. Hammond, W. R. B. Oliver, F. S. Pope, W. C. Hyde, W. T. Goodwin, W. S. Mason, G. A. Green, B. C. Aston, T. C. Brash, A. H. Cockayne and H. Poole, Jr.

Auditor: Mr. J. L. Arcus.

Representative of Horticultural Societies: Mr. F. J. Shanks (Wellington) former President Canterbury Horticultural Society.

N.Z. Native Bird Protection Society (Inc.): Captain E. V. Sanderson.

Honorary Fellow: A. H. Shrubshall.

Honorary (Overseas) Members:—Sir William Lawrence, Bt. (President of the Alpine Garden Society, England) and Mr J. Coultts (Curator, Kew Gardens).

REMITTS ADOPTED.

1. HONORARY FELLOWS: "That the time is now opportune for the appointment as Honorary Fellows of members who have shown undoubted success in horticultural practice, rather than in scien-

tific attainment, as a recognition of good service to horticulture and that such appointment would be an incentive to future horticulturists."

3. CORRESPONDENCE COURSES: "That the Institute should officially recognize any Correspondence Course that will in any way meet the requirements of the Institute's examinations."

FOREST PRESERVATION :

4. "That the Government be again urged to set aside the Waipoua Kauri Forest as a Sanctuary for all time."
 5. "That the attention of the Government be drawn to the urgent necessity for the preservation of all native forests on hill country, particularly on watersheds, with a view to maintenance of regularity of stream-flow and prevention of soil-erosion, scenery preservation, prevention of floods, conservation of hydro-electric supplies and of food for birds."
 6. "That the Government be asked to provide for restrictions on the erection of shacks and leasing of sites on Domains and that no residence sites be leased to private persons in any national park or scenery reserve."
 7. "That the Government be asked to amend "The Public Reserves, Domains and National Parks Act, 1928" by defining an exotic of a National Park, and to declare it a Sanctuary from exotic plants and animals."
 - 8(a). "That the Government be requested, in its forthcoming legislation, to provide: "For any local authority to grant exemption from rating of bush of scenic value facing any main highway, railway, river, lakeshore or seashore, by the deduction of the value of such bush from the value of the whole property."
 - 8(b). "For the prevention, for a period of six months, of the destruction of bush facing any new road or railway or newly designated main highway, pending inspection for the Scenery Preservation Board."
 - 8(c). "For the re-constitution of the Scenery Preservation Board."
- (Note.—Remits No. 7, 8a and 8c were carried but were to be considered by the Executive Council as to wording.)

BEAUTIFICATION :

9. "That all possible support be given to the Canterbury Road-Side Beautifying Committee and to the formation of similar Committees in other districts."

10. "That the attention of all local bodies be drawn to the possibilities that can be achieved in the direction of road beautification and planting, especially by concerted action."
11. "That the Railway Board be requested to give every encouragement to Stationmasters for the planting of their stations with suitable ornamental plants, particularly natives."

NEW INTRODUCTIONS:

12. (a) "That the Government be asked to enforce "The Introduction of Plants Act, 1927."
- (b) "That a register of all new horticultural introductions be prepared with a view to supplying information as to their subsequent development "

LODER CUP:

13. Recommended that the Loder Cup Competition be for Amateurs, that space be restricted, and that the Competition be for growing plants, cut flowers, berries and portions of plants from the larger trees."

OTHER BUSINESS.

AMENDMENT OF EXAMINATION SYLLABUS: Subject to the inclusion of a clause as recommended by the Examining Board re taking examination in toto or in parts, the amended Scheme of Examination of Candidates for the Institute's Diploma and Certificates as published in the September 1933 Journal, was adopted. With regard to the Examining Board's recommendation, through the Executive Council, for amendment of the Examination Syllabus in the direction of recognising a period of two years' training, in a post primary school approved by the Examining Board, subject to one year's subsequent experience in an approved garden, as entitling a student to take the Preliminary or Junior Examination, it was decided to refer this back to the Executive Council for re-consideration but with power to act.

GROUP B CANDIDATES: The recommendation of the Examining Board through the Executive Council that the Group B Class of candidates should be re-instituted as from 1st. July 1933 to 31st December 1934, was approved.

ENROLMENT OF STUDENTS: The Examining Board's recommendation to the Executive Council that publicity should be given to the necessity for immediate enrolment of and keeping of diaries, etc., by garden trainees, was mentioned.

SEEDSMEN'S AND FLORISTS' CERTIFICATES: It was stated that draft suggestions from the Seedsmen's Association for a scheme of examination for Seedsmen's Certificates had been received just prior to the Conference and that there had not been time to finalize the scheme. In the case of the scheme of examinations for Florists' Certificates the Examining Board had considered the matter but, as it was aware that Mr. J. A. Campbell had made a good deal of inquiry regarding this, the Examining Board thought it unwise to finalize the matter in Mr. Campbell's absence. It was decided that both these matters could be proceeded with after consultation with all bodies affected and they were referred to the Executive Council with power to act.

LOCATION OF NEXT NATIONAL CONFERENCE ON HORTICULTURE: It was reported that Dunedin had been decided upon as the place of meeting next year.

NOXIOUS WEEDS IN NATIONAL PARKS: On the motion of Mr. V. C. Davies, it was resolved to draw the attention of the Government to the spread of wild yellow broom and other noxious weeds in National Parks.

RESEARCH WORK: On the motion of Mr G. A. Green (Dominion Organizer) it was resolved "That this Conference place on record its appreciation of the increased financial support given by the Government in recent years to research work and request that, in view of the definite financial benefits being from time to time secured as a direct result from the horticultural and other research work being carried out by the research workers of the Dominion, increased grants be made available so that research work may be speeded up in order to more effectively cope with the insect, fungoid and other pests so destructive of the interests of New Zealand horticulturists and agriculturists."

ARBOR DAY: It was resolved to recommend that the Government should be requested to gazette the first Wednesday of August in each year as Arbor Day.

THANKS: The Conference placed on record its appreciation and thanks for the valuable services being rendered to the community by the Plant Research Station, Massey College and the Cawthron Institute.

BANKS LECTURE

The Banks Lecture for 1934 was given by G. H. Cunningham, D.Sc., Ph.D., F.N.Z. Inst., Plant Research Station, Palmerston North. A copy of the lecture appears in this issue and it will be found to be a most valuable contribution to the horticultural literature of this Dominion.

NATIONAL CONFERENCE ON HORTICULTURE

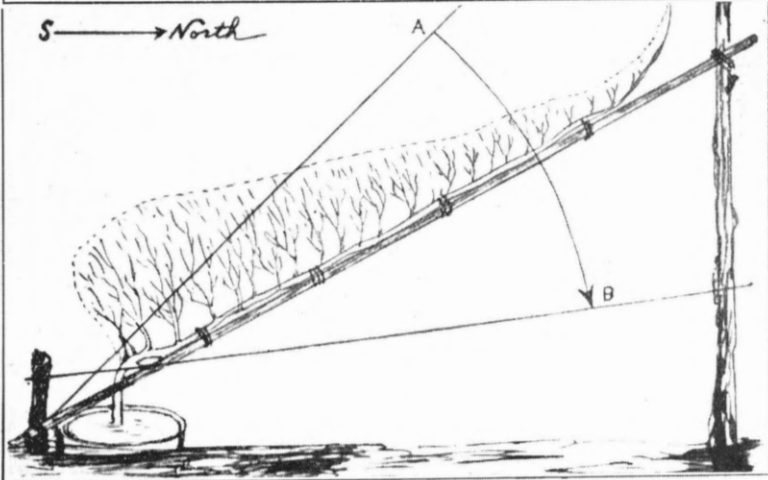
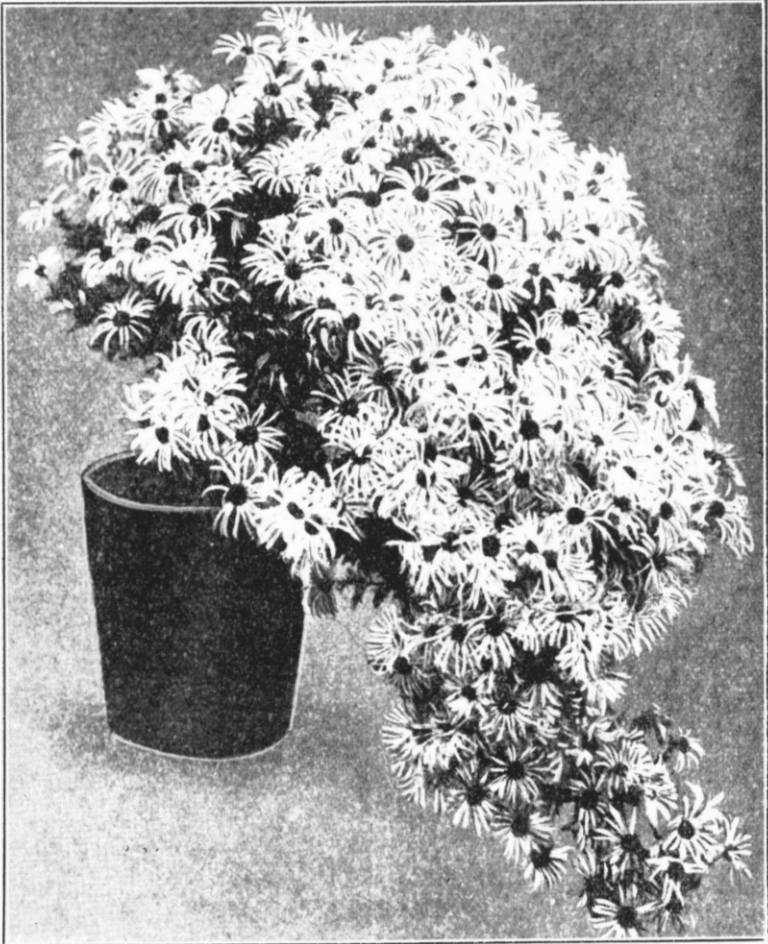
The fourth National Conference on Horticulture, held in Palmerston North, consisted of the annual gathering of the Institute, The New Zealand Horticultural Trades Association and the Horticultural Seedsmen's Association of New Zealand. Owing to extra duties in connection with the Unemployment Scheme and other causes, it was not possible for the members of the Association of Parks and Reserves Superintendents to hold a meeting. It was decided at the previous National Conference that the National Flower Show 1934 should precede the various Conferences. The official opening of the National Conference and of the National Flower Show were therefore combined. The delegates were given a civic welcome by the Mayor of Palmerston North (Mr. A. E. Mansford), and his Excellency the Governor-General, Lord Bledisloe, accompanied by Lady Bledisloe, opened the National Conference and National Flower Show. The Show was a great success and was continued for three days instead of two, as scheduled. The annual meetings of the bodies concerned followed after the first day of the Show and many outings to nurseries, gardens, and other places of interest, including the Plant Research Station and Massey College, were enjoyed by the delegates.

CASCADE CHRYSANTHEMUMS

The popularity of the single, small flowered *Chrysanthemum* in Japan owes much to the ease with which the plants may be trained into cascade or "hanging-trained" form—a form in which the Japanese have taken considerable interest of late. The many exquisite varieties, with their lovely coloured and charmingly shaped flowers, are sure to increase the popularity of this method of training, and I feel sure also that before long this method will be adapted in many other countries where the *Chrysanthemum* is loved and cultivated, as most of the varieties grown are hardier and stronger in growth than those with large flowers; but what arrests the attention and interest of *Chrysanthemum* lovers is the beauty of these "hanging trained" plants, and the charming shapes into which they are trained. Vigour, hardness of stems and branches, bushiness, length of stem, power of resistance to the sun, durability and size, shape and lustre of leaves, are all considered when selecting the varieties. Most of the sorts used for this method of culture are of the Single, small-flowered type, with some raised by crossing the small-flowered single forms with Spidery, plumed, small-flowered Pompon, Anemone, and some other such types. The small-flowered Double sorts are not used generally because they are unsuitable, but some wild types are excellent, although smaller in size, when trained.

Many compost-mixtures are recommended for the culture of these *Chrysanthemums*, all of which are even more gross feeders than other types. The variety, soil, climate, and size of the plant desired should, of course, be considered when preparing the composts, consequently, these recipes vary. Every grower appears to know how to prepare a perfect compost and pins his faith to it. What he thinks is best—at least, for him—so long as he obtains first-rate plants. What queer material he uses, or in how odd a way he prepares his compost, does not matter. No one enquires; he is left alone—that is etiquette among *Chrysanthemum* lovers in Japan.

When plants of the preceding year are concluding their flowering period, say, at the end of November or early in December, suckers are produced quite freely, particularly when the stems have been cut down two or three weeks earlier. Vigorous suckers are selected and potted into five-inch pots, using the compost which is already prepared in one of the ways mentioned. The suckers which appear near the side of the pot are better than those produced immediately at the base of the old stem; they should be about two inches or so in length, and may have some roots attached. The potted plants should be placed in the frame or a cool house, and should receive attention to repotting when the roots have filled the pots. Air is admitted freely whenever the weather is fine, and full exposure to the sun is allowed to secure sturdy growth, although a little shading may be given for a day or two when repotting is done.



CASCADE CHRYSANTHEMUMS.



NATIONAL CONFERENCE ON HORTICULTURE, PALMERSTON NORTH, 1934.

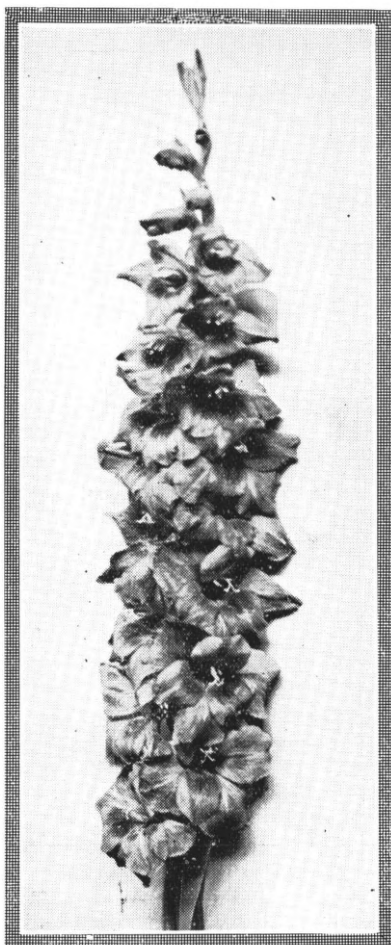


DOMINION MARK FRUIT AT NATIONAL FLOWER SHOW, 1934.

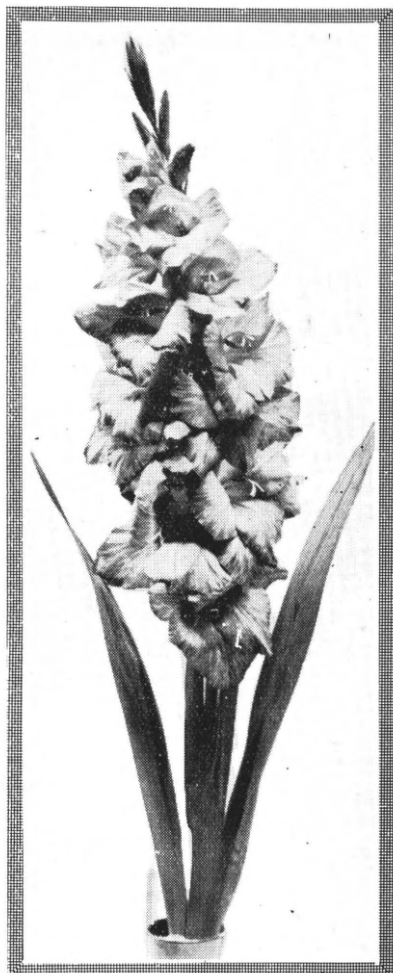


A representative group of members of the Institute taken at the National Conference, 1934. Back Row from left:—Messrs T. Waugh (Wellington), E. Hale (Masterton), H. Bennett (Dunedin), B. P. Mansfield (Invercargill), G. A. Green (Dominion Organiser), J. N. McLeod (Christchurch), E. A. Abbott (Taihape). Front Row:—Messrs G. S. Nicoll (Dominion Secretary), and J. J. Stevenson (Joint Secretary National Flower Show).

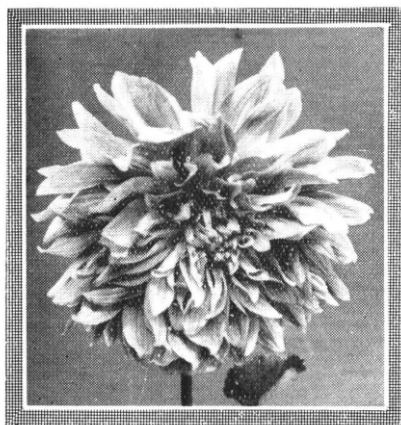
Photos by N.Z. Smallholder.



RED LORY
Mr. P. BURNS (Open).



LIGHTHOUSE
Mr. BELL (Amateur).



HILLCREST MANDARIN
Messrs A. J. SHAILER & SON (Cpen).



Mrs. F. J. NATHAN
Mr. F. J. NATHAN (Amateur).

CHAMPION BLOOMS AT NATIONAL SHOW, 1934.

Photos by N.Z. Smallholder.

but it should be removed soon after that. In April, when the weather becomes warm rapidly the plants are placed out-of-doors, but some protection is afforded in cold districts, in case of frosts. The final potting into twelve-inch or fifteen-inch pots generally takes place in June.

The method of training is as follows:—When the young plant is several inches high and has six or seven leaves, it should be pinched back to four or five leaves, with the result that three or four branches are formed. The topmost one should remain untouched to form the leading stem, while the other two or three branches are pinched back to three leaves generally, and such pinching is repeated in subsequent growths to encourage a bushy habit at the base. When the plants are twelve inches high a Bamboo rod or wire (see Plate) should be placed at an angle of fifty-five degrees, and the main stem tied to it. Some growers, who prefer plants of elongated pyramidal shape never cut the stem. In such a case the plants should be tied to the stake when eight inches long, otherwise the base becomes bare. The growing point is always faced to the north. This is the secret of success. If the stem is turned to the south it fails to grow freely, and a goodly number of leaves turn yellow from time to time. As the weather becomes warm and the plants make rapid growth, pinching should not be neglected and the leading stem should be continuously tied down to the stakes. The upper branches are pinched back to two or three leaves, when three or four leaves have formed, while the side ones are pinched to two or three leaves when three or four leaves have formed. But this is not a fixed rule, because the variety, the condition of growth, and the shape one desires, have to be considered. The final pinching is generally practised about the middle of September, when some flower buds appear towards the tip of the plant. If the final pinchings take place too early, the branches continue to grow after the flower buds have formed, consequently, when the stem is allowed to hang down it looks very unsightly; while, if it is too late, the lower branches form flower buds late, and so the plant does not bloom all over simultaneously. As the plant grows the stake should be gradually lowered until it is nearly horizontal. When flower buds have formed all over the plant, about the beginning of October, the plants should be already horizontal, and this is the best time the operation of “hanging” should be carried out. In the warmer districts, the operation takes place at the middle of October, for if the peduncles continue to grow after the growth hangs down, the plant becomes very unsightly. But if the operation is performed too late and the leading stem becomes stiff, there may be breakage. The lower part of the leading stem is wrapped with Raffia and the stake is removed while the plant is held firmly and gently lowered until it depends by means of its own weight. The wire or more thin wire should then be coiled around the stem and main branches, which are then lowered and bent into the desired shape. The operation needs great care as the plant is brittle. The wires should be removed some twenty days later. When the plant is pendulous it should be turned to the south.

Specimens attaining some six feet in length and three feet in width are not difficult to obtain if started early in April. Seedlings are, generally, very vigorous for three years or so after they are raised, and these are used to obtain large-sized plants.

Early in 1929, I collected *Chrysanthemum morifolium* (or var. *gracile*?) a parent of our modern *Chrysanthemums*, and *C. japonicum*, in their native habitats, and used them for this cascade method of training. They grew about two-and-a-half feet long, but were very fine, showing "the beauty of wildness" with pure colour and modesty of growth. By-the-way, our *Chrysanthemum* lovers who are "fed up" with the large-flowered, modern *Chrysanthemums* are looking for wild species, and some exquisite types, such as *Sagagiku* and *Higogiku*, have been raised from them.

Each year large numbers of varieties are raised by numerous amateurs and a few trade specialists, but comparatively few varieties achieve permanent popularity. The following are some of the best varieties for the cascade or "Hanging" method, to secure plants of large size:—*Hokuto-za*, dark reddish-yellow, one of the very best; *Shiro-Hokuto*, white tubular florets; *Entei*, cherry-red; *Kasugano*, reddish-purple, finely petalled; *Yukitoro*, crimson; *Gozan-no-Yuki*, white, quilled florets; *Kiho*, yellow; and *Hakuho*, white.

For plants of moderate size the best varieties are:—*Kyokomachi*, crimson; *Onshi-no-Koromo*, dark crimson; *Mikageyama*, white semi-double, flat florets; *Shojo*, red; *Takamakie*, yellow; *Momo-Nanako*, peach; *Sakuragari*, light purple, tubular florets; *Hoshi-no-Hikari*, yellow; *Asagasumi*, light crimson; *Yoisugata*, crimson, and *Kin-Nanako*, yellow.

Hybrids between small-flowered Single *Chrysanthemums* and *C. arcticum*, a cosmopolitan from Arctic Europe through northern Asia to America—are raised and cultivated in northern Japan. These are very early-flowering, and derive good qualities from both parents. *Akebono*, one of these hybrids, has flat florets of peach colour; when ordinary small-flowered Single *Chrysanthemums* are still forming flower buds, it is already in flower. I suggest to British and Continental raisers that very early-flowering and quite hardy varieties—the very qualities many amateur lovers are longing for—are obtainable by using *C. arcticum* as a parent. This species is found growing on the seaside of Northern Japan, where it is one foot tall and makes a clump of dark green foliage. I recall that at Kew, *C. arcticum* was attractive, covering about two square feet, and producing flowers abundantly, at the east side of Museum No. 11.

—K. Yashiroda, Tonosho-Hyoku, Kagawaken, Japan.

Extracted from "The Gardeners' Chronicle."

REVIEWS

THE R.H.S. LILY YEAR-BOOK, 1933.

The Royal Horticultural Society's Lily Year-book for 1933, published in November last, fully maintains the high standard set by the Society's year-book for 1932. The issue under review contains several unique features, in addition to a number of articles contributed by well-known growers and a series of addresses to the Lily Conference, together with notes on the interesting discussions that followed; also an account of the Lily Conference, which was held in the lecture room of the Royal Horticultural Society's new Hall in Greycoat Street, Westminster, on July 11th-13th. The proceedings of this august assemblage were brightened by what must have been a wonderful display of lily blooms staged by Messrs Wallace, of Tunbridge Wells, and by Messrs Constable, of Paddock Fields, Kent, two of the best known firms of lily specialists in the United Kingdom. The deliberations of the conference cannot fail to promote interest in this beautiful genus, which contains many species that present few difficulties in cultivation, as well as many elusive gems, some of which are available only to gardeners, whose horticultural practice includes an infinite capacity for taking pains. Overseas gardeners, especially, owe a good deal to the Royal Horticultural Society for placing at their disposal, at a nominal cost, a mine of information on every phase of the cultivation and well-being of lilies. A paper on *Nomocharis*, the recently discovered genus of hardy plants, botanically about midway between *Lilium* and *Fritillaria*, is also of considerable interest. The amount of knowledge and research contained in these papers indicates how, in the Homeland, gardening is so much a part of the national life. As well over ninety per cent. of the lilies in cultivation are true species, the paper contributed by Dr. Fred Stoker on the environment of lilies in nature is particularly interesting. A careful reading of this paper and the application, as far as possible in our gardens of its lessons, should go far to remove the difficulties encountered in attempting to afford hospitality to some at least of the more difficult species. The proved efficacy of copying nature as far as possible in adapting New Zealand alpine plants to our gardens, suggests that a close study of the natural environment of lilies in nature is almost essential to success, in dealing with the less amenable species. This study is simplified by Dr. Stoker's paper, particularly the chapters on plant association and soil. The comprehensive tabulated information regarding the natural habitat, altitude, soil, situation and plant association of most of the European and Asiatic species is particularly valuable, especially to those who wish to apply, as far as is possible, nature's lessons on the subject. The author's theory on the peculiar distribution of lilies, particularly as regards those of the martagon group, sheds light on a hitherto obscure subject.

A survey of lily soils, together with notes and an analysis of various garden soils in which lilies have actually been grown with

varying degrees of success, will be of much value to those who wish to extend their knowledge on the subject. Obviously, the information is not for the beginner. The survey was undertaken at the instance of the Lily Committee. The notes on the presence or absence of lime in the soils taken for analysis will be of considerable interest, as providing easily referable information on a somewhat controversial subject. The discussion that followed this paper produced interesting views regarding the relative importance of soil and drainage on the well-being of lilies in gardens; also, a useful contribution from an American grower regarding the depth at which to plant certain species.

Mr. A. Grove's paper on "Lilies from the point of view of the average garden" commands the respect that is due to any contribution on the subject of lilies from this experienced grower. As was obviously intended, the information contained in the paper will be of great use to the less experienced grower. Many New Zealand growers will not agree with the writer's doubt as to whether *L. regale* should be included in the list of lilies for the average garden. Few perennial plants are of easier cultivation in New Zealand than is this fine lily. In the discussion that followed this paper, some very useful information on the subject of effective plant associations for lilies was made available.

Mr J. Coutts's paper on the cultivation of lilies in pots; also addresses on the subjects of the cultivation of *Nomocharis* and the vegetative propagation of the lily contributed by Mr. A. Harley and Dr. D. Griffiths, respectively, are worthy of close study by interested growers. They are not reviewed in detail, as the subject matter of each paper will be of interest to a limited number only of gardeners in New Zealand at present. Owing to our isolation from the sources of supply of many lily species, the paper on the propagation of lilies from seed by Mr. F. C. Stern is of considerable interest to growers in this country, most of whom will agree with me that, given the necessary patience, this is the cheapest and most reliable method at present of securing the less commonly grown lilies. As the writer states, there is little difficulty in raising lily seed, either in the open ground or under glass, in cold frames, or in an unheated greenhouse. The subsequent treatment of the seedlings presents no more difficulty than the growing of other hardy perennial plants from seed. Interesting observations on the underground germination of the seeds of certain species are included in the paper. The subsequent discussion on the paper showed that well informed opinion is sharply divided on the relative merits of raising lilies from seeds sown in the open and under glass. The fact emerged, however, that both methods produce highly satisfactory results, while all the speakers agreed that propagation from seed ensures healthy plants. A historical survey of the distribution of certain lilies on and from the Continent of Europe by Mr. E. H. Krelage, also a paper dealing with sterilities in certain species, contributed by Dr. A. B. Stout, will be of interest to lily enthusiasts. Comprehensive information on the hybridization of lilies and the detection and

control of lily diseases; also a series of notes on the cultivation of lilies in many localities are included in this valuable and interesting year-book. The illustrations are a feature of the publication, and it is no exaggeration to say that the book should be in the possession of every gardener interested in the cultivation of this beautiful genus.

F. J. SHANKS.

THE R.H.S. DAFFODIL YEAR-BOOK, 1933

The annual publication of the Royal Horticultural Society's Daffodil Year-book has now been resumed, after a lapse of eighteen years, and its re-appearance will be hailed with delight by Daffodil enthusiasts, especially those who were familiar with the early publications.

The Daffodil Year-book for 1933 is an excellent and interesting production and, let us hope, the fore-runner of a series of similar annual publications for years to come. Appropriately, pride of place is given to the Rev. Geo. H. Engleheart, "the Grand Old Man" of British Daffodils, whom, Mr. P. D. Williams, in a short article, describes as "alone and outstanding as the producer of the beautiful hybrid *Narcissi* that are now so popular."

The series of articles in the Year-book can be said to cover every aspect of Daffodil growing and are contributed by writers who in every case are masters of their subjects. Mr. P. D. Williams, V.M.H., also contributes an article on "*Narcissi* for Gardens" dealing with the qualifications necessary for the garden as distinct from exhibition. Mr. H. R. Darlington, F.L.S., in "*Daffodils* for Beginners" gives useful hints on planting, etc., for all growers and a selection of varieties purchasable at reasonable prices. Commercial growers will be interested in Mr. A. W. White's "*Production of Daffodil Bulbs*," Mr. F. A. Secrett's "*Daffodil Growing for Market*," Mr. G. B. Monro, C.B.E.'s "*The Daffodil required in the Flower Market*"—all eminently practical contributions. A most interesting article is that of Professor Dr. E. von Slogteren, Director of the Laboratory for Bulb Investigations at Lisse, Holland, on "*The Early Forcing of Daffodils*" by cold storage of the bulbs after lifting. The history of the Daffodil is well covered by "*Half-A-Century of the Daffodil*" by the Rev. G. Engleheart, V.M.H., and "*The Renaissance of the Daffodil in Britain*" by Mr. Peter R. Barr, V.M.H. Exhibitors are well catered for in "*Exhibiting Daffodils*" by Mr. J. L. Richardson which is well stored with useful hints.

The reports on the English Daffodil Shows as well as the articles on Daffodils in other parts of the world, make interesting reading and enable one to realise the intense world-wide interest being taken in these lovely spring flowers. Notes on shows in New Zealand and Australia have been well edited by Mr. Guy L. Wilson who will be remembered by many New Zealand Daffodil growers as a visitor at our Shows in 1929. Mr. Wilson also contributes several most

readable articles in his own happy style. Mr. C. E. Radcliffe of Hobart, Tasmania, writes most interestingly of his impressions as a visitor to the English Shows.

Other articles deal with the breeding and diseases of Daffodils and there are discussions on its uses in the garden, both under naturalised conditions and in the wild state.

A number of suitable illustrations completes a publication upon which the Year-book sub-committee of the Royal Horticultural Society must be highly complimented, and which should be in every daffodil grower's hands.

H. J. POOLE.

PRESERVATION OF NATIVE BUSH

The following letter has been received recently from the Hon. Minister of Lands:—

“I have to acknowledge receipt of your letter of the 8th ultimo, bringing under my notice the following resolution passed at the recent Annual Conference of your Institute:—

“That the attention of the Government be drawn to the urgent necessity for the preservation of all native forests on hill country, particularly on watersheds, with a view to maintainance of regularity of stream-flow and prevention of soil-erosion, scenery preservation, prevention of floods, conservation of hydro-electric supplies and of food for birds.”

So far as my Department is concerned the position is that the desirability of preserving high country forests is fully recognised, and extensive areas of hill and mountain country have been set apart as climatic and water conservation reserves while large reservations for river protection purposes have also been made.

As you are no doubt aware the State Forest Service controls some millions of acres of permanent and provisional State forests. Included particularly amongst the permanent State forests are large areas which are regarded purely as protection forests and which are administered and safeguarded accordingly.

Scenic reserves throughout the Dominion under the control of the Lands Department now amount to over 650,000 acres and are being gradually extended as opportunity offers. In this connection you may be interested to learn that arrangements were recently completed for the reservation of an area of some 9,000 acres of beech forest extending for some six or seven miles along the new Lewis Pass Road on the west banks of the Boyle and Lewis Rivers. This area was formerly included in a pastoral run, but following negotiations with the licensees, the area concerned was surrendered from the license and so freed for scenic reservation. It may be mentioned also, as an indication of the policy now being followed, that the Department has recently refused to relet for pastoral purposes an area of some 30,000 acres comprising the Travers Valley at the head of Lake Rotoiti, Nelson District. It is proposed that this area shall be set aside as a scenic reserve, and the matter will be brought before the Scenery Preservation Board at an early date.”

NATIONAL ROSE SOCIETY (N.Z.)

The following circular letter has recently been issued and is published for the information of all rose-lovers throughout the Dominion:—

NEW ZEALAND NATIONAL ROSE SOCIETY

AUCKLAND BRANCH.

We have pleasure in intimating that our Society has made arrangements with the Australian National Rose Societies whereby we can supply all our members with a copy of the Australian Rose Annual gratis. This Annual is a very fine production, comprising some 150 pages of matter of special interest and value to rose growers of the Southern Hemisphere, together with beautiful illustrations, some coloured. Several articles and notes from New Zealanders will also appear in each issue in future, thus supplying a long-felt want, viz., a rose annual dealing principally with rose-growing in our own country and sister Dominions.

Seeing that the Australian Rose Annual is sold in Australia at 5s. per copy, we feel sure that every rose lover will appreciate this generous offer that is now made to them. Every person who becomes a member of our Society at the low subscription of 5s. per annum will get this valuable production post free, thus enabling him to keep pace with the latest thought in rose growing, and at the same time assisting our Society in its efforts to foster a love for "The Queen of Flowers."

We would explain that, pending the formation of a National Rose Society fully representative of all parts of the Dominion, the Auckland Society has decided to carry on its operations, feeling that its inauguration has been amply justified, and that even better work can be accomplished in the future. We may add that, through our representations, assisted by generous donations by members of the Horticultural Trades Association, the Auckland City Council has established a magnificent Civic Rose Garden in Auckland, comprising over an acre of roses.

May we ask you, as a rose lover, to enroll as a member of our Society, thus helping forward the good work. The favour of an early application would greatly oblige, as we wish to know definitely how many copies of the Annual to order. If willing to become a member, kindly advise me enclosing postal note for annual subscription, 5s., at your earliest convenience.

Yours faithfully,

FRANK PENN,

Hon. Sec. Auckland Rose Society,
55 Benson Road, Remuera,
Auckland, S.E.2.

EXAMINATION PAPERS, NOVEMBER, 1933PRELIMINARY EXAMINATION (Syllabus No. 1).
HORTICULTURAL BOTANY.

Note.—*Six only* of the following questions are to be answered—including No 8, which is compulsory.

Use diagrams to illustrate your answers where you can do so.

1. What are the usual functions of (a) a root, (b) a stem, (c) a leaf? Describe a case of each where the structure is adapted to the fulfilment of a function other than the usual one.
2. What are the main features of the process known as photosynthesis or carbon-assimilation?
3. Write a short essay on the utilisation of crop rotation in disease control.
4. Give an account of the life-history of the plant producing silver-leaf disease in fruit trees.
5. What is meant by pollination and by fertilisation? Describe these processes in any particular species.
6. How does a typical green plant obtain its nitrogen?
7. Assign to their families the genera *Carmichaelia*, *Dianthus*, *Rubus*, *Antirrhinum*, *Cheiranthus*. Mention a species of each (with botanical and common name) commonly grown in gardens.
8. Describe in technical language the botanical specimen supplied by the Supervisor. (Single Stock).

PRELIMINARY EXAMINATION (Syllabus No. 1).
HORTICULTURAL ZOOLOGY.

Note.—*Only six* of the following questions are to be answered. Use diagrams freely.

1. Discuss "biological control" of insects by means of insect and fungous parasites.
2. Outline the life-history of any specified scale insect.
3. What commercial insecticide would you employ in combating chewing insects, and why?
4. Describe the method of hot-water disinfection of *Narcissus* bulbs.
5. To what insect attack is *Cineraria* especially liable? Give the life-history of the insect. How would you deal with it?
6. In what conditions are woodlice most at-home in a garden? How would you deal with a pest of woodlice?
7. What features in the life-history of Aphides make them especially troublesome? What harm do these insects do to plants?
8. Among the insects known as grass-grubs are the caterpillar of a moth and the larva of a beetle. How would you distinguish between these two?
9. Write a note as to snails and slugs, and as to the means you would take to get rid of each of these from a cabbage patch.

INTERMEDIATE EXAMINATION (Syllabus No. 2).
 PRINCIPLES OF HORTICULTURE.

Note.—*Any six only* of the following questions to be answered.

1. What do you understand by the term "Biology of Soils?" Mention three factors influencing this.
2. The physical condition or "texture" of the soil is improved by cultivation. Explain in non-technical terms how this is effected.
3. Give two crop rotations common to your district and explain why rotation in cropping is desirable.
4. What do you understand by "F1" and "F2" generations as applied to plant breeding?
5. How would you propagate Rhododendrons, Clematis, Brooms, Bouvardias, Daphnes, Holly and Lemons? Where grafting is suggested, name stocks you would use.
6. Write a short essay on stable manure; how to preserve it; its beneficial effect on the soil apart from its manurial content.
7. When fruit trees or other trees are heavily pruned they invariably make a more vigorous growth afterwards. Why is this and how would it influence your pruning practice?
8. What do you understand by a "balanced manure"? Give mixtures of standard fertilisers that in your opinion would be balanced for general garden purposes.

INTERMEDIATE EXAMINATION (Syllabus No. 2).
 THE PRACTICE OF HORTICULTURE.

Note.—*Any three only* of the following questions to be answered also *any three only* of the questions on the Special Subject nominated.

1. Describe in detail the practice of trenching and under what conditions you would (a) invert the relative layers of soil and (b) retain the surface and lower layers of soil in their respective positions and why.
2. Write an essay on the cultivation of *one only* of the following crops:—Lettuce, Cabbage, Broccoli, or Parsnip.
3. Describe your methods of pruning Apple and one of the following—Peach, Cherry, Plum (English and Japanese). Give reasons for your suggested methods.
4. Name four common plant diseases and describe briefly their control methods.
5. Give a calendar of vegetable garden operations in your district.
6. Describe your method of raising from seed half-hardy annuals and give dates of sowing different kinds.

or

Explain when bi-annuals should be sown and their subsequent treatment up to planting time.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

Special Subject: THE FLOWER GARDEN IN ALL ITS ASPECTS.

Note.—*Any three only* of the following questions to be answered in addition to *any three only* from the paper on "Practice of Horticulture."

1. Describe fully your method of propagating Dahlias from cuttings and name nine modern kinds of these.
2. Give a list of flowers from the open ground suitable for cut flower purposes throughout the twelve Calendar months:—three for each month.
3. Give three combination groups of flowers suitable for spring-bedding.
4. Show by diagram your idea of the grouping of herbaceous plants in a border twelve feet long by six feet wide and name the groups.
5. Write a short essay on the cultivation of *one only* of the following:—Pansies and Violas, Violets, Carnations.
6. Describe your method of propagating the following plants from cuttings:—Phlox paniculata, Dianthus, Geranium, Carnation and Aralia. State time of year when each of these should be inserted.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

Special Subject: ROCK GARDENING.

Note.—*Two only* of the following questions to be answered including No. 1 *which is compulsory* in addition to *any three only* from the paper on the "Practice of Horticulture."

1. Write an essay on the general construction of a Rock-garden under the following headings:—
 1. Aspect.
 2. Choice of materials.
 3. Drainage.
 4. Grouping of stones.
 5. Choice of plants for shady and sunny positions. Candidates to use diagraphs where necessary.
2. How is scree formation made? Mention twelve sorts of plants suitable for this medium.
3. What are the popular groups into which the Genus Saxifraga is divided? Give names of species of each group.
4. To what position in the Rock-garden, with respect to sun or shade, would the following plants be placed—Anemone pulsatilla, Dianthus caesius, Saxifraga burseriana, Daphne Cneorum, Campanula barbata?
5. Give a list of nine Rock or Alpine plants that can be raised easily from seed.

INTERMEDIATE EXAMINATION (Syllabus No. 2).

Special Subject: THE SYSTEMATIC BOTANY OF ALL THE FAMILIES, AND THE LEADING GENERA, CONCERNED IN HORTICULTURE.

Note.—*Three only* of the following questions including No. 6 which is compulsory, are to be answered in addition to *any three only* from the paper on the "Practice of Horticulture."

Illustrate your replies by sketches.

1. What are the essential features of the Coniferae, Monocotyledons and Dicotyledons?
2. How do you distinguish between members of the Labiatae and the Boraginaceae?

or

Between the Liliaceae and the Iridaceae?

3. Describe the technical features of any two of the following genera: *Salix*, *Dianthus*, *Clematis*, *Papaver*, *Lupinus*, *Geranium*, *Veronica*.
4. What are the technical floral characters distinguishing the Compositae from other families?
5. Define the terms: achene, berry, capsule, drupe, follicle. Mention plants showing these types of fruits.
6. To what genus does the following description apply? Describe any common garden plants belonging to the genus. "Flowers gamosepalous and gamopetalous, corolla rotate. Stamens 5, inserted on the throat of the corolla. Anthers connivent in a cone about the pistil, and opening at the apex. Ovary superior, 2-celled, many-ovuled. Stigma small. Fruit a berry."

DIPLOMA EXAMINATION (Syllabus No. 3).

THE PRINCIPLES AND PRACTICE OF HORTICULTURE.

Note.—*Six only* of the following questions to be answered.

1. How would you test a soil to ascertain if it is acid or alkaline, and how may these conditions be measured? Give the names of a few plants or crops which (1) require, (2) tolerate, and (3) are very sensitive to, acid conditions.
2. Discuss the fertilisers in general use as regards their tendency to increase or correct an acid condition of the soil.
3. What is humus? Name the different sources of supply. How would you obtain it in good condition? What is its effect in the soil or when spread on the surface?
4. Name a number of typical plants that may be propagated by means of cuttings. For three of these plants, give the time, method, and conditions under which propagation by cuttings is best accomplished.
5. Write a lucid description of the pruning, at suitable stages of growth, of any tree, shrub, or vine, with which you are acquainted, dealing specially with any difficulties which may arise that may be dealt with effectively by means of pruning.

6. Describe the commoner insect pests found in the soil; the conditions under which they are likely to be numerous; and the methods of destroying them.
7. Describe briefly the methods of sterilising soil. To what extent may sterilisation be carried out in the presence of a growing crop?
8. Most of our flowering shrubs and evergreens develop best in partial shade; give a list of those which will thrive well in full shade and full sunshine respectively.

DIPLOMA EXAMINATION (Syllabus No. 3).

Special Subject: NURSERY MANAGEMENT.

1. How would you raise Eucalyptus and six different kinds of conifers from seed, in your locality?
2. Name six hardwood cuttings that may be grown outdoors in your district? When should they be made and how treated?
3. Name six plants you would propagate by budding?
When should it be done?
What precautions are necessary to ensure success?
4. Describe fully the best methods of packing trees and shrubs for transporting over long distances.
5. What popular stocks are used in the propagation of stone-fruit trees and what are their respective merits?
6. In what way is a "shade house" useful in the propagation of plants in your district? Give details of its use.

DIPLOMA EXAMINATION (Syllabus No. 3).

Special Subject: TREES AND SHRUBS, TOGETHER WITH THEIR
PROPAGATION AND USE IN HORTICULTURE.

Note.—*Six only* of the following questions to be answered including No. 1 which is compulsory.

1. Write an essay on the Rhododendron touching briefly on its history, native habitat, and the parentage of some of the newer and better known sorts.
2. What, in your opinion, would be a good selection of New Zealand trees or shrubs suitable for shelter purposes in the case of (a) seaside environment (b) high elevation and (c) inland plain.
3. Give the names of twelve Coniferous trees suitable for lawn specimens, giving habit and usual height.
4. When and how would you prune the following shrubs:—Broom, Hydrangea, Deutzia, Clematis.
5. Explain in detail the layering of Magnolia, Rhododendron, Camellia and three other shrubs selected by you.

6. Give a selection of six trees suitable for avenue planting and state under what conditions the different trees would be selected.
7. Detail your method of preparing a bed for the reception of Roses and name nine of the newer Roses.
8. Describe your method of transplanting (a) large deciduous trees and (b) large evergreen trees.

DIPLOMA EXAMINATION (Syllabus No. 3).

Special Subject: LANDSCAPE-GARDENING.

1. Explain what soil preparation you would give to a large border destined to be planted with permanent shrubs.
2. State suitable grass seed lawn mixtures for:
 - (a) Light land.
 - (b) Heavy land.
 - (c) Shady positions.
3. Show by cross section diagram (not necessarily to scale but with figures denoting measurements) a twenty feet main gravel driveway with adjacent grass borders.
4. What do you understand by "Natural" and by "Geometrical" styles, and what local condition would influence you in adopting one or the other?
5. Show by diagram what system of planting you would adopt to obtain a "perspective" or "vista" effect from any given point.

DIPLOMA EXAMINATION (Syllabus No. 3).

Special Subject: VEGETABLE GARDENING.

1. Explain what is meant by surface cultivation and its special advantages from a cultural point of view.
2. What are the relative advantages of digging and trenching and on what classes of soil would you recommend the former in preference to the latter?
3. Write a full account of the production of one only of the following crops: (a) Tomatoes, (b) Celery or (c) Asparagus.
4. Give a calendar of planting dates for a year's supply of vegetables giving range for a moderate sized hospital.
5. Explain how you would grow and collect seeds from the following: (a) Cabbage, (b) Parsnip, (c) Onion, (d) Swede Turnip, having special regard to purity of strain and viability.
6. If, in your potato crop, there appeared a variant having a specially desirable feature, but liable to fungus attack, how would you endeavour to make your new variety serviceable?

INSTITUTE NOTES

Educational:—1933 Examinations.—The following passes were recorded:—

Junior Certificate: Messrs F. J. E. Jollie (New Plymouth), L. J. Mitchell and L. Treleaven (Christchurch).

Senior Certificate: Messrs F. S. Allan (Auckland), L. Lannie (Wellington) and A. J. Watling (Dunedin).

Diploma: Messrs E. L. Bayliss (Christchurch), M. C. Gudex (Hamilton), A. White (Waimate), and E. Hutt (Wellington).

The Auckland District Council reports that the Principals of Wesley College, Seddon Memorial Technical College and Otahuhu Junior High School, have been congratulated on the steps being taken to encourage Horticultural Education.

The Executive Council recently extended its appreciation and congratulations to the Canterbury District Council on the Syllabus for garden students at the local Technical College.

The Southland District Council's donation of a cash prize for competitive exhibits of indigenous ferns at the Invercargill Garden Club's December Show, produced satisfactory entries.

Condolence.—Sir William Lawrence Bt., President of the Royal Alpine Society, of Burford, Dorking, Surrey, England, died in January last, and his loss will be severely felt. His Society had done excellent work in encouraging the growth of alpine plants, many of which were from New Zealand. Sir William was elected an Honorary Fellow of the Institute at the recent Conference.

Mr. James Young, late Curator of the Botanic Gardens, Christchurch, who died in March, was one of the Institute's oldest members and held its Diploma. He was always willing to assist the Institute in every way and will be greatly missed by his many friends.

NEW ZEALAND
INSTITUTE OF HORTICULTURE
(INCORPORATED)

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