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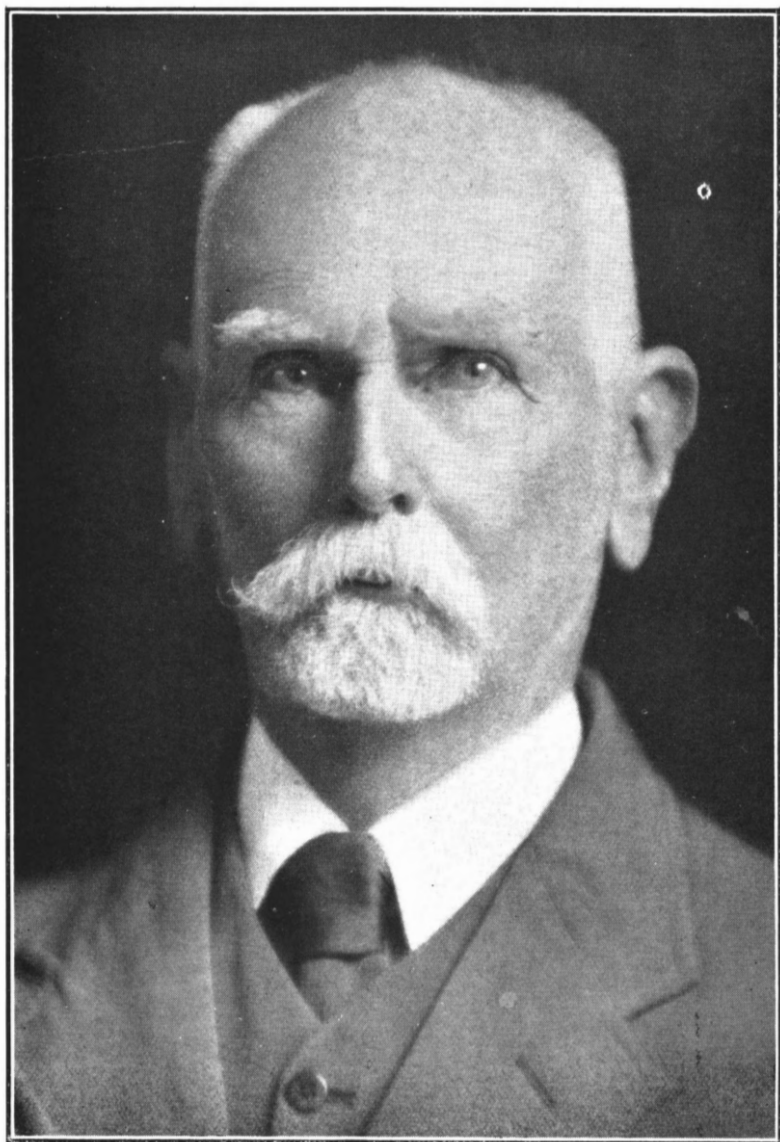
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Leonard Cockayne

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No. 3.

BULBS FOR THE ROCK GARDEN.

By F. J. SHANKS.

The greatly increased interest in every form of rock and alpine gardening both in the Old Country and in New Zealand has intensified the search for flowering subjects that will extend the season of bloom in these classes of gardens. It must be admitted, however, that very few bulbous subjects are correctly placed in the strictly alpine garden. Moreover, it cannot be gainsaid that it is not good rock-gardening to include too great a variety of plants that will thrive under ordinary garden conditions. There is, however, an increasing number of gardeners who recognize the value of properly selected bulbs for ushering in the first beauty of the alpine plants in spring and giving colour to the rock garden after its summer glory has departed. To those gardeners who consider that the strictly alpine garden should contain only plants that are found in high altitudes, it should be mentioned that many of the most charming bulbous plants are found growing at considerable distances above the sea level in their native lands. For instance, the high plateau in Persia, and much of the high country in the Balkans, Asia Minor, Turkestan and other European and Asian countries are the home of many of the choice bulbous plants. No distinction is made in these notes between plants that produce flowers from bulbs, corms or tubers. For the purposes of rock gardening, it is essential that they be dwarf, to harmonise with their neighbours, and it is desirable that their foliage be not too obtrusive, so as to avoid an untidy appearance during the ripening process. The inclusion of anything that is not thoroughly hardy only leads to disappointment, and, moreover, such plants are distinctly incongruous in a strictly alpine garden. It should be mentioned, however, that many plants that are somewhat "tender" will survive even 16 degrees of frost if given a sheltered place in the rock garden. In this connection, it is desirable that plants that are suspected to be "tender" should be placed in a western aspect in the rock garden so as to avoid the early morning sun in winter. The same aspect is an advantage in regard

to plants that flower during the winter months, as it will be found that the blooms will last much longer in condition if they are not subject to the sun's rays before the frost has disappeared from their leaves and petals. It is mentioned that only really hardy plants are included in these notes.

A well-drained soil containing about equal parts of loam, well-rotted turf and leaf-mould, with enough sand to ensure good drainage, will suit all the bulbs mentioned in these notes. Some English writers on this subject recommend the use of certain low-growing alpine plants as a ground cover for bulbous species. I have found, however, that the protection afforded by these plants is not necessary in New Zealand gardens and, moreover, it is considered that there is an element of incongruity in this close association of bulbous and alpine plants. If the experiment is to be tried, it is suggested that only the dwarfest growing plants should be used, any of the small *Raoulia*s being suitable for the purpose. However, most small bulbous plants are of sufficient beauty to stand on their own merits. In other words, they should be allotted separate pockets in the rock garden. If the bareness of these pockets after the bulb foliage has ripened in summer is considered objectionable, plants with a trailing habit should be planted in nearby pockets so that the summer growth will cover the bare ground of the bulb pockets.

The following bulbous plants are all very suitable for rock gardening purposes:—

Eranthis hyemalis (the winter aconite) with bright golden yellow flowers, produced in July and August on three to four inch stems, does well in shade or sun, and reproduces itself freely from seed. *E. cilicica* is larger and its primrose-coloured flowers are slightly later. A hybrid between these two (*E. Tubergeni*) has larger flowers and slightly longer stems, and is well spoken of.

Cyclamen coum, like all the hardy *cyclamens*, prefers a semi-shady place, and a little lime in the soil. It produces its bright pink flowers on three-inch stems from early July till the end of August. *C. ibericum* follows later in August, and its flowers vary from purple to lilac and white. *C. repandum* produces its purple flowers in late September. *C. Europaum*, *macrophyllum* and *neapolitanum* flower from December to April. The first mentioned has sweetly scented crimson flowers, and there is a white variety of *C. neapolitanum*. All have very handsome foliage, produced after the flowers have faded. All grow readily from seed. These are among the gems of the rock garden.

Many of the failures to do well with snowdrops are due to too warm a situation and too shallow planting. They love shade, and three inches of soil above the bulbs is not too much. An annual top-dressing of leaf mould is beneficial, and the bulbs should not be disturbed. *Galanthus nivalis*, the common snowdrop, and its double form, are the dwarfest, but other varieties, notably *G. elwesii* and *G. byzantinus* are well worth growing. All flower in July and August. All of these species seed freely, and the seed may be

allowed to fall where it will grow readily under the top-dressing recommended above.

The dwarf varieties of scillas are amongst the most beautiful of bulbs for the rock garden. *S. bifolia* and *S. sibirica* have intense blue flowers on three-inch stems in late August. Both are quite distinct, and both increase rapidly. There is a white form of the latter. Shade is recommended for these bulbs, although they will grow and flower well in open situations. Their intense blue is, however, better appreciated in a somewhat shady position.

Of the three best known chionodoxas, *sardensis* is the brightest blue. *Lucilliae* is a stronger growing variety with a large white eye, while *gigantea* is taller with lighter blue flowers. All are beautiful, and increase well by seeds and offsets if left alone. They are not particular as to situation, but do not like too sunny a place. Early September is the flowering time.

The hybrid or Dutch varieties of the crocus are so robust that they are perhaps better placed as edgings to beds or borders, but space should be found in the rock garden for some of the species. *C. imperati*, violet with fawn reverse, flowers in late July, followed by *C. sieberi*, lavender with yellow eye, *C. susianus*, golden yellow with bronze reverse, *C. versicolor*, white, feathered purple, and *C. tomassinianus*, pale lavender. Of the autumn flowering varieties, the following are perhaps the most vigorous: *C. longinorus*, rose lilac, *C. speciosus*, bright blue, and *C. zonatus*, lavender with yellow eye. These flower from March to early in May, and increase well by offsets and seeds. All like sunshine and a covering of one and a half inches of soil. It is possible by a judicious selection of winter flowering varieties of the crocus species to extend the flowering season continuously from the beginning of March to the middle of September. Amongst the best of the during winter flowering species are *C. chrysanthus* and its varieties, *hyemalis*, *Fleischeri vitellinus*, etc. *Vitellinus*, *longiflorus*, and *imperati* are sweetly scented.

The dwarf varieties of *Fritillaria*, *armena*, *meleagris*, etc., are easily grown in semi-shade, and are very distinct. They are not nearly so leafy as the taller border varieties, and the unpleasant smell is absent. All like leaf mould as a top-dressing in autumn. Some of the other varieties of *F. meleagris* have curious and interesting colours. Some of the most beautiful species of fritillarias are native of the Pacific Coast of North America, and can be acclimated in New Zealand without very much trouble. Probably the most beautiful species in existence is *F. recurva*, which produces lily-shaped, scarlet flowers on six-inch stems in September. Other good American species are: *F. pudica*, *Purdyi*, *pluriflora*, *glauca*, *agrestis*, and *lanceolata*.

The erythroniums, or dog's tooth violets, are charming in half shady places. The European varieties will grow well in a more sunny place than the American varieties. All like a good proportion of leaf mould in the soil, and they flower on four to six inch

stems with the daffodils in September. There are several beautiful shades of cream, pink and light purple in the American varieties, a comprehensive collection of which is well worth while in any garden where choice flowers are appreciated. These, also, can be easily acclimatised within one season after importation.

The dwarf species of *Narcissus* are well suited for sheltered pockets. Of the trumpet varieties, *minimus*, with three-inch flower stems, is the daintiest, while *nanus*, one inch taller, is a beautiful shade of yellow. *Minor* and *moschatus* are other good varieties. *Narcissus Bulbocodium*, the yellow hoop petticoat, and the other species, *citrinus* and *monophyllus*, are very suitable. The last mentioned, being a native of Algeria, prefers a warm place, but is quite hardy. *N. cyclamineus* and *N. triandrus albus* and its varieties have prettily reflexed perianths, while *N. canaliculatus* from Mentone is a dwarf polyanthus-flowered variety, which, however, is rather too leafy to be welcome in the rock garden.

The dwarf species of tulip look well in open spaces in the rock garden. Perhaps the most welcome is *T. kaufmanniana*, from Turkestan, which produces its cream-coloured flowers, up to four inches across, on five-inch stems in early September before the daffodils. *T. persica*, even more dwarf, has golden yellow scented flowers, while *T. greigii*, another native of Turkestan, has light scarlet flowers and handsome mottled leaves. Five to six inches of soil above the bulbs of tulip species is not too much, provided the soil is open in texture.

For shady places the following anemones are beautiful: *A. ranunculoides*, yellow; *A. blanda*, blue, white or pink; and *A. hepatica*, with approximately the same colours. Space should be found for *A. memorosa*, of which there are several beautiful varieties.

There are many suitable dwarf irises, but some of the rhizomatous varieties, even the *pumila* group, are rather inclined to encroach in the rock garden. Of the bulbous varieties, *I. reticulata* is particularly welcome for its dark blue scented flowers in early August.

One of the prettiest of autumn flowering bulbs is *Acis autumnalis*, whose white and pink snowdrop-like flowers appear in pairs on four-inch stems in March. A sunny place with a good deal of sand in the soil suits it, and it will increase rapidly where well placed.

If rather long foliage is not objected to, the following will give a good display in the bare autumn months:—

Sternbergia lutea, large crocus-like golden yellow flowers, *Zephyranthes candida*, white flowers with pretty narrow foliage, and the many beautiful varieties of *Colchicums*.

In conclusion, it should be said that nearly all the above-mentioned bulbs should be planted on the lower levels of the rock garden, provided they are in well drained soil.

A KEY TO THE SPECIES OF EUCALYPTUS GROWING IN NEW ZEALAND.

BY NORMAN HALL.

INTRODUCTION :

The aesthetic and economic value of the genus *Eucalyptus* is not yet fully appreciated in New Zealand. Various species of the genus are of outstanding value for aesthetic planting, and while limited use has been made of some species for this purpose, the economic value of the genus both for farm planting and for more extensive commercial plantations is not yet fully realised. However, this is not the case in all countries, and in South Africa, for example, the Forest Department has carried out extensive investigations and trials with the view of the greater use of the genus in the forest economies of the country.

There has been a certain amount of prejudice against the genus in New Zealand. This is largely due to observations on unsuitable species and species planted under unsuitable conditions. It appears that many of the species planted during the last forty years have not been planted under their correct names, and that nomenclature and dendrology needs careful attention in any study of the genus. Taking into consideration the range of climate in Australia, from the winter snowfall areas of Tasmania and the higher parts of New South Wales and Victoria to the moist sub-tropical coastal parts of Queensland, and to the arid, almost desert-like areas of South Australia and other parts of the continent, and the immensity of the genus, it is not surprising to find that, in its range, we can secure species suitable for growing under almost any environmental factors of soil and climate, and adapted for almost any purpose. Unfortunately a very large number of the species have been taken from a cool, upland situation in Australia and planted in a warm, lowland situation in New Zealand. Unsuitable soils have intensified the degeneration of the species. The results have been what were to be expected with most of the species,—the tree form has been poor and the ultimate size smaller than in the natural habitat, though the early growth may have been promising—the tree has been less resistant to insect attack—the timber has been of poorer quality, especially in regard to durability. Conversely many species from the warmer parts of New South Wales and Queensland have been planted in the cooler parts of New Zealand. When the environment has been suitable for the species the results have been all that could be desired. Two examples will illustrate this: *E. botryoides* at 13 yrs. of age in the Auckland Province averaged 68ft. in height and 9.4in. in diameter; spacing originally 6 x 6ft.: *E. pilularis* at 60 yrs. of age was up to 172ft. in height and from 36—68in. in diameter.

The study of the genus appears to be of outstanding importance if it is to take its rightful place in commercial, State and farm forestry in this Dominion.

The name of the genus, *Eucalyptus*, is a Latinised Greek compound, made up of the verb "eu", well, and the verbal adjective, "kaluptus" from kalupto which means "I cover" or "envelop". This is suggested by the peculiar structure of the floral bud, in which the stamens and anthers and style and stigma are covered by an undivided cap or lid, known as an operculum, instead of the usual sepals and petals. When the flower develops the operculum is pushed off, leaving an apetalous flower. The name was given to the genus by a Frenchman, L'Heritier de Brutelle, who worked on material collected by scientists in one of Captain Cook's expeditions to the Antipodes.

The genus is typically, but not solely, Australian and consists of over 400 species, to which number new species are still added, or old "species" split into two or more species. A classical example is the case of *E. amygdalina* (Labillardiere), which name once covered what now constitutes six species. *E. regnans*, (F. von Mueller) was soon separately named and defined, while some time later *E. dives* (Schauer), *E. numerosa* (Maiden) and *E. radiata* (Sieber) were separated from the original "species." Later on *E. linearis* (Dehnhardt) was recognised. Simmonds in his book, "Eucalypts in New Zealand," p. 71 says, "The difficulties of the botanist have by this procedure been greatly reduced, but they have not been ended. For what we actually find in Tasmania in this connection is not a narrow and rigidly defined type, but a group or series in which we have to reckon with a large amount of variation. Botanists have endeavoured to divide the series into two sections and to give each section specific rank. Trees with wider and slightly larger leaves and some amount of dead bark clinging to their stems are assigned to *E. amygdalina*. Trees with extremely narrow leaves, smaller fruits and smoothed barked stems are given the name of *E. linearis* after the botanist Dehnhardt who so named a cultivated specimen in Italy. But between these selected types are intermediate forms that obviously link the two together." This is an extreme example of the difficulties faced in the identification of eucalypts, which is admittedly a very difficult genus to deal with, not only because of the very large number of species but also because of the undoubted variation which takes place within the species. Arbitrary field keys are of most use when dealing with a limited number of species in a given climatic area. There are some 80-90 species represented in New Zealand, many of which are not common or only occur in the warmer districts of the North Island. Simmonds, in his monumental work on the eucalypts in New Zealand, describes 74 species and illustrates 71. Fortunately most of the species are fairly distinctive and their identification not difficult when good dendrological material is available. A key is not necessarily conclusive in the identification of a species, and confirmation should be sought in some standard reference work. The standard work is Maiden's "Critical Revision of the Genus *Eucalyptus*," while Simmonds' "Eucalypts in New Zealand" deals with the principal species occurring within New Zealand.

In this provisional key to the eucalypts the dendrological descriptions have been taken from Simmonds, a publication necessary to all students of the genus in New Zealand. So far as the author is aware he has dealt with all the more common species growing within New Zealand, but there are doubtless some less common species which have been overlooked. The author would be pleased to hear of any such species in order to include them in revisions of the key.

This key is intended mainly for field use and only the main macroscopic dendrological features have been used in its construction. The primary division of the key is based on bark characteristics. The main bark divisions have been treated separately while the minor classes have been grouped under one heading of, "Miscellaneous and Minor Classes." In a few cases one species may have been included under two bark classes. This is intended to cover the case of those species which show variation in their bark characteristics, especially in the case of some of the "half-barked" or "gum-topped" species which at times may wholly retain their bark, and at others shed the greater part. Within each bark division the secondary divisions are based upon what is considered the most reliable feature to separate the species. Further divisions of the key are based upon number of fruit in the umbel, type of fruit and valves, leaves, etc.

The following dendrological notes are for use in connection with the keys:

BARK:

1. Completely deciduous bark. Also included here are a few species which may retain the bark at the base of the main stem for a few feet only.

Example of the main class—*E. maideni*, *E. maculata*.

Example of the sub-class—*E. viminalis*, *E. saligna* (usually).

2. "Half-barked" or "Gum-topped." These are species in which the dead bark is completely deciduous from the branches and limbs and upper portion of the main stem, but persists on the lower portion. While certain species are typically "half-barked," other species retain their bark on the main stem to a variable degree, so that while at times most of the bark may be deciduous, at other times it may persist on most of the main stem. Some species are apparently "half-barked" in youth only. Unfavourable sites may induce a species to retain the bark more than is usually the case.

Example of typical species—*E. tessellaris*, *E. oreades*.

Example of variable species—*E. hemiphloia*, *E. ovata*.

3. Stringybarks. In this division the bark consists of long, tough fibres and is usually persistent to the ultimate branches, besides the main stem. Long cracks or rents running in nearly parallel lines up and down the tree are typical of stringy-

barks. The bark is commonly quite thick, even in young trees. In the main this is a fairly well defined group.

Examples—*E. eugenoides*, *E. Muellieriana*, *E. capitellata*.

4. Peppermints and boxes. For convenience in use of the key and to avoid over elaboration of the bark types, these two types are dealt with together. Simmons describes:

“Peppermints—soft barks in which the successive layers of fibres cross each other obliquely and present, as the tree expands with growth, a reticulated or latticed appearance. The fibres in these barks are at first tough, but through expansion and exposure to the weather they ultimately lose their tensile strength, and can then be easily crushed or broken in the hand.”

“Boxes—soft barks with short, brittle and irregularly arranged fibres. Some of these are coarse and deeply furrowed, others are finely divided, fleece-like, felt-like, or scaly. These barks are described as sub-fibrous when the fibrous texture is obvious to the eye, and as non-fibrous when no distinct fibres can be easily detected. The “woollybutt” barks are also included here.”

Examples of peppermints—*E. amygdalina*, *E. radiata*.

Examples of boxes—*E. melliodora*, *E. polyanthemosa*.

5. Ironbarks. Typically this group is distinctive and only includes a limited number of species. These are hard barks, with longitudinal and sometimes transverse furrows, but no distinctive fibrous structure. The colour is usually dark, grey or almost black-brown and is commonly very thick, even in quite young trees.

Examples—*E. sideroxylon*, *E. crebra*, *E. paniculata*.

Example of a species not a true ironbark, but developing an ironbark-like bark with age—*E. Sieberiana*.

6. Mixed types. This division includes several minor types and species which do not commonly fit into any of the other divisions, and also a few species which, while included in some other division, are not typical of them and have been included here to make for completeness of the key.

Example of “Blackbutt” barks—*E. patens*, *E. pilularis*.

Example of thick, flaky bark—*E. botryoides*, *E. corymbosa*.

Example of species also dealt with in some other division—*E. Sieberiana*, *E. ovata*, *E. Smithii*.

LEAVES:

For purposes of the key only leaves of the adult tree are considered, since they are nearly always available, while juvenile are only so at times.

INFLORESCENCE:

The typical eucalypt inflorescence is an umbel with several flowers. Rarely the flower is solitary as in *E. globulus*; sometimes the inflorescence is a panicle, as in *E. crebra* and *E. paniculata*.

PEDUNCLE AND PEDICEL:

Peduncle—a stalk carrying a group of flowers, or a single flower that fills the place of a group.

Pedicel—a stalklet carrying a single flower.

These two features, taken together, assist considerably in the determination of species. The great number of eucalypts belong to the type with rounded peduncles and distinct though perhaps short pedicels. Only a limited number have distinctly flattened peduncles.

VALVES:

Valves are an important feature in identification. The beginner at first may find it difficult to differentiate the various classes, but a little field work should soon remedy this. The descriptions are based on the condition found in the mature seed-cup.

FRUIT—SIZE:

The dimension of most value in assisting in identification is the diameter of the mature fruit. It will be found that the size of normally grown mature fruit of any one species tends to keep within prescribed limits.

FRUIT—FORM:

As with the operculum, some forms of fruit are quite distinctive while others are rather indefinite.

OPERCULUM:

Operculum—an undivided lid or cover which forms the lid of the flower bud. Most operculi are of little value in identification, but unusual operculi should be noted as being restrictive in identification. The shape should be observed in well developed buds and not in small immature ones in which the typical form may not be developed.

(To be continued.)



PORTION OF L. COCKAYNE'S GARDEN, NGAIO, 1932.



CYCLAMEN NEAPOLITANUM.

LEONARD COCKAYNE

1855—1934.

"One is useful to science, however, not only by work finished but also by work begun. I will therefore make a commencement, though I may advance but a few steps."

ISIDORE ST. HILAIRE.

"For various reasons the plant life of New Zealand is of peculiar interest, especially its extreme isolation from other land-masses, its flora of diverse origin but with an astonishing number of endemic species and group after group of wild hybrids, the numerous and often peculiar life-forms of its members, its having developed unmolested by grazing and browsing mammals, and its vegetation, so diversified that only a continent extending into the tropics can claim an equality." So wrote Cockayne of the plants and the vegetation he loved so well and made the object of his life's work. It was the living plant that interested him—the how and the why of its growth, the places it delighted in, the company it kept, the responses it made to changing conditions, its conduct under adversity and in prosperity. Vividly his researches brought before the botanists and the horticulturists of the world the knowledge he gained by questioning the plants along our many-inletted shores, in our forested or tussock-covered lowlands, among our mountain valleys and ridges, and on our sub-alpine heights with their fascinating meadows and rocky crags.

Born at Norton Lees in Derbyshire, he early showed the bent of his nature. His keen eye and his enquiring mind were early caught by the charms of the hedgerows and the meadows and woodlands that surrounded him. The schooling of nature was more to him than the schooling of the class-room or of books. Some of his treasures he brought to grow in the garden, and gardening remained the great joy of his life through all the succeeding years.

So it was that when he came to New Zealand in 1880 he naturally turned to the wilds of his adopted land and the marvels of their plant-covering. There began his innumerable explorations to gather plants and their seeds, to grow them and watch their development. Seeds were exchanged with all the leading botanical gardens of the world. This led to correspondence with the world's greatest botanists and the awakening of an interest in the more purely botanical aspects of plant-life. Their queries led to closer studies, and his fertile mind sought for explanations of the diversity of form with which he was confronted. Ideas had to be tested, and his garden became an experimental one. Of the many famous men with whom he corresponded, and by whom he soon became recognized as their peer, one, the late Karl Ritter von Goebel, born just a month before him, he was always afterwards to speak of as "the master." It was a fortunate circumstance that in 1898 von Goebel, already acknowledged as the leader of European botany, was able to visit New Zealand, where under Cockayne's guidance he saw much of its

wealth of vegetation, and where he was able to assess at first hand the value of the work Cockayne was doing, and give him heartening encouragement. Goebel was much impressed by the studies in seedling development that had been commenced as a result of the seed-sowing. This work is recorded in the now classical papers of 1899, "An Enquiry into the Seedling Forms of New Zealand Phanerogams and their Development." Cockayne's New Brighton garden of those days will long be remembered as the seat of fundamental studies in plant-life, of the greatest horticultural as well as botanical value.

The result of his studies on vegetation during his early explorations was made public in the pioneering paper of 1900, "A Sketch of the Plant Geography of the Waimakariri River Basin, considered chiefly from an Ecological Point of View." This was the forerunner of a long series of studies that initiated a new method of botanical research and a new outlook on vegetational phenomena. This branch of his work was to culminate in his great book, "The Vegetation of New Zealand" of 1921, of which a second and greatly improved edition was given to the world in 1928. His observations on the behaviour of plants in nature under varying conditions of environment resulted in the famous paper of 1912, "Observations concerning Evolution, derived from Ecological Studies in New Zealand." This work received prompt recognition abroad and he became recognized as a leader in that new field of work "plant ecology," which in brief may be spoken of as the study of the living plant. Writing in 1912 to congratulate Cockayne on the award of the Hector Medal, Goebel was able to say, "It is quite true, that you introduced modern botany to New Zealand and you did more than anyone else for the biological understanding of the New Zealand plant world."

But he was not content to speak merely to the botanist pure and simple; even in his more formal papers he eschewed as far as possible the technical jargon of the formalist. By lucid lectures, by lively popular articles, by the use of camera and lantern-slides, and above all by his inimitable "New Zealand Plants and their Story" he brought the wonders and the uniqueness of our plants and vegetation before that wider world comprising all lovers of nature, however small might be their equipment for understanding technicalities. His services were ever ready, by contribution of advice or plants, to anyone interested in growing our "natives," whether in his adopted homeland or abroad. No one can visit the greater British and European botanic gardens without seeing some evidence of his activities. His paper, "New Zealand Plants suitable for North American Gardens," too, written for the Panama Pacific International Exposition, witnesses to the great services he rendered to horticulture, while his, "The Cultivation of New Zealand Plants," is an invaluable guide to all gardeners, and a revelation of the riches of the New Zealand flora for horticultural purposes. He always felt and taught that New Zealand gardening should be something better than a slavish following of old-world practice. "Our gardens should surely possess a peculiar stamp of their own,

and a national horticulture come into being with not only a rich exotic garden flora, but one where New Zealand plants themselves would play no inconsiderable part." That this view is coming more and more to be accepted and acted on is due in no small measure to Cockayne's persistent advocacy and help.

But the very sense of horticultural values that he possessed so strongly and his gardener's love for novelties forced him into systematic studies. He soon realized how imperfect was our knowledge of the "species" of our flora, whether for scientific or for practical purposes. Neither as a gardener nor as an investigator could he remain content with the Hookerian view that species "varied widely" in nature, and there an end. He sought to understand the "why" of the variability. His search led him to discover two significant reasons, the further examination of which threw a flood of light on the whole problem of the diversity of plant form. His observations in the wild and his cultural experiments showed how greatly the environment can influence the form and structure of plants—how the upright can be made prostrate, the thorny plant rendered thornless, the hairy smooth, the giant a dwarf. So here too he became a pioneer—in the study of "life-form"—a study that is now becoming more and more recognized as basic to an understanding of the distribution of vegetation the world over. Something of the horticultural import of these studies is shown in his paper "Polymorphy in New Zealand conifers and its Relation to Horticulture" of 1932.

Another cause of "variability" was revealed in his brilliant studies on the prevalence of wild hybrids in the New Zealand flora, a striking example of which is given in his paper "On the New Zealand Wild Hybrids of *Nothofagus*" of 1926. This doctrine of wild hybrids has been looked on askance by the orthodox, but is being supported by an accumulating weight of evidence.

Although he collected widely, with special reference to his particular studies, and published descriptions of many "new" species and varieties, Cockayne was never at pains to build up a great formal herbarium. His specimens were readily available to anyone genuinely anxious to study them, and were freely parted with to the great European herbaria. Still a great amount of material remained and was contributed to the herbarium of the Dominion Museum for safe-keeping. In his view the herbarium should endeavour to tell the story of the facts to be observed in the field so that on any particular point that interested him he collected much more copiously than is the usual practice. But this herbarium work was looked on as an unfortunate necessity, not an engrossing task in itself. Always he returned to the living plant for his inspiration.

To the economic application of his work Cockayne was very alive, and there came from his pen publications of vital import to the forester, the farmer, and the pastoralist. Outstanding examples of these are: his report on the New Zealand sand-dunes, his monographic treatment of our beech-forests, and his detailed studies of

the montane tussock-grasslands. All this work is imbued with the spirit of first-hand acquaintance with the facts and independent conclusions from his observations.

To love is to desire to preserve, and Cockayne threw all his influence into any rational move to protect and save for posterity our natural biological monuments. He argued that "the preservation of scenery" and the like can only wisely be effected with full knowledge of what is to be protected, how it has arisen, and what dangers it has to face. Therefore, apart from personal efforts, on Royal Commissions, at public meetings, and discussions among scientists, he contributed many detailed studies—witness the reports on the Waipoua Forest, the scenic reserves of Westland, and the Tongariro National Park, to mention only a few. Impressed as he was by the fact that the vegetation of New Zealand had arisen in the absence of grazing and browsing animals, possessing a knowledge unrivalled of primitive conditions, he was deeply concerned at the depredations of the animals introduced for sport. His support was always given to the movement to check this lamentable damage, and he helped greatly to arouse that national sense of the need for action, based on knowledge, that is now happily becoming more evident. He often sighed for the power to act on the advice Goebel gave him, "Get the fools hanged before they can introduce wild goats, which indeed would eat up not only the herbs of your beautiful alpine flora but even the forests, as they do in Greece"!

Rewards and Honours that can come to a scientist in recognition of his work came in very full measure to him, and these he prized greatly and took great pride in. But more than these he prized the appreciation of "those who know," the quiet word of his colleagues. Never one to suffer fools gladly, he was nevertheless always ready to spend time and energy assisting a genuine enquirer, no matter how trivial the information sought might seem. He gave of his best to all workers at his science, and no worker in New Zealand but will testify to the spontaneous and eager way in which he supported their efforts and encouraged them to proceed. He felt that no matter what verdict the considered opinion of time might make on his actual contributions to science he could claim that he had aroused interest in the hearts of a great many, and had inspired a band of workers to carry on. Those who knew him only in his dogmatic moments when expounding a theme failed to understand the real nature of the man. Those privileged to work with him in the field realized the humility with which he faced the intricate problems that nature presented. His fertile brain evolved many suggestions, but he was always ready to consider objections, to discuss freely the problems, and to withdraw frankly from a position that proved untenable, no matter how strongly he had held it. His direct contact with nature seemed to keep his mind ever fresh and alert for new developments, there was no settling down in a well-defined rut. The views of to-day may be out of date to-morrow, but three things will ever stand to Cockayne's credit—his great achievement in placing on record a detailed and illuminating account of

the vegetation of New Zealand before it was too much destroyed by "progress," his brilliant blazing of new paths in botanical research, his inspiration to younger botanists to advance still a few further steps.

There was the poet as well as the scientist in him, and the wonder of it all never grew faint, so that his exposition was that of the artist. "The world," says Aldous Huxley, "like an ore-bearing mountain, is veined with every possible kind of significance. We are all miners and quarrymen, tunnelling, cutting, extracting. An artist is a man equipped with better tools than those of common men—sometimes, too, with a divining rod by whose aid he discovers, in the dark chaotic mass, veins of hitherto unsuspected treasure—new meanings and values. He opens our eyes for us, and we follow in a kind of gold rush. The whole world seems all at once to glitter with the nuggets which he first taught us to see. What was empty of significance becomes, after his passage, suddenly full—and full of *his* significance." We live in a new botanical world here in New Zealand since Cockayne's freshening influence came upon us.

Forced by advancing years to restrict his activities in the field, Cockayne returned more and more to the experimental garden and to the effort to lay the foundations of a New Zealand horticulture. His little garden at Ngaio became close packed with plants of extreme interest—some of purely scientific, but many also of horticultural value. To his great joy and solace came the opportunity to initiate and direct the scheme for the development of an open air plant museum at "Wilton's Bush." He took never ending delight in watching over and contributing towards the development of the scheme. To the rockery, already a triumph, he contributed many things, a number planted by his own hands. The scheme, as he conceived it, and as it has begun to develop, is a most ambitious one—the like has never been attempted elsewhere. It is fully discussed in his paper published in 1932, "A Scheme for the Development and Arrangement of the Otari Open-air Native Plant Museum." There will be representatives not only of all members of the flora, properly labelled and distinguished, but examples of the chief communities of plants—kauri forest, sub-alpine meadow, tussock grassland, and so on. Plants of special horticultural moment and their appropriate uses will be demonstrated. A scheme in conception worthy of his vision, in execution a monument to his devoted services and a gift of supreme value to posterity.

He lies where he would have wished, on the upland where is to be set out the model garden, looking out over the valley slopes and the forest to the Cockayne Heights beyond. Though his direct control is over, his spirit will ever be present to spur on those to whom the charge is left—all those to whom the wonderful plant life of this our country is dear.

H. H. A.

REPORT OF THE EXECUTIVE COUNCIL FOR THE YEAR ENDED 31st MARCH, 1934.

The twelfth year of the Institute's existence reveals steady progress in its activities although general economic conditions show little improvement.

EDUCATION: The report of the Examining Board deals fully with this phase of the Institute's work. The thanks of the Executive Council are again conveyed to the Board's members and examiners for the efficient and thorough manner in which they have carried on educational work. During the year, the Examination Syllabus was amended and brought up to date and the class for Group B candidates was re-opened from the 1st July 1933 to 31st December 1934. A draft syllabus in respect of examinations for Florists and Seedmen respectively has been circulated for consideration of the bodies and other persons interested.

JOURNAL AND NEWS LETTER: The Executive again extends its thanks to the Editor of the Journal (Dr. W. R. B. Oliver) and also to contributors thereto. As the Journal, for financial reasons, can only be published half-yearly the gap between issues is being bridged by means of a half-yearly News Letter, thus enabling closer touch to be kept with members.

CITRUS: Research work has been continued throughout the year by the Auckland Citrus Council of the Institute in co-operation with the Department of Scientific and Industrial Research. The citrus test area at the Mount Albert Grammar School, Auckland, was planted during the year and the Executive Council extended its congratulations thereon to the Auckland Citrus Council.

PRESERVATION OF NATIVE BUSH: Upon receipt of a copy of a resolution from the New Zealand Forestry League respecting the damage to forests by introduced plant-eating animals, representations, in this regard, were made to the Government. Following on a remit from the Hawkes Bay District Council passed at the last Conference, representations were made as to the urgent necessity for preservation of native forests on hill country, particularly on watersheds. In each case a reassuring reply was received. Assistance has also been given to the Hawkes Bay District Council in its efforts towards the fencing of the Tangoio White Pine Reserve, about twenty miles from Napier, on account of damage by Angora goats and also to the Southland District Council regarding the grazing of cattle in the Upper Hollyford Valley.

PLANT RECORDING: During the year Mr. George Lee of Templeton, Canterbury, was granted the recording of a new variety of apple under the name of "Lee's Red Sport" and Mr. Arthur G. Sainsbury of Mangere, via Otahuhu of a new variety of strawberry "Delicatessen." Legislation was drafted by the Government last session for an amendment of the Institute's Act providing for the establishment of a statutory Nomenclature Board, having power to decide the name of any plant, etc., grown or intended to be grown in New Zealand. The Government however found that it was necessary to obtain further information abroad regarding Plant Patents legislation.

PERMANENT COLLECTION OF N.Z. HORTICULTURAL LITERATURE: On the suggestion of the Dominion Organizer, the Executive Council has made arrangements with the Librarian, Turnbull Library, Wellington, to take charge of collections of horticultural catalogues, literature, etc., published in New Zealand so that these may be permanently available for research and other purposes.

NATIONAL CONFERENCE ON HORTICULTURE: This Conference was held at Palmerston North in January 1934 and consisted of the annual meetings 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 openings of the National Conference and 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. The next National Conference on Horticulture is to be held at Dunedin in January 1935 and the national bodies above mentioned and the Dunedin Horticultural Society have arrangements in hand.

PLANT PROTECTION: This was the subject of the Banks Lecture at the 1934 National Conference which was delivered by G. H. Cunningham, D.Sc., Ph.D., F.R.S.N.Z., Plant Research Station, Palmerston North. A copy of the lecture is published in the March 1934 Journal and is a most valuable contribution to New Zealand horticultural literature.

CONDOLENCE: The Institute has conveyed its sympathy to the relatives of:

Sir William Lawrence—Burford, Dorking, England.
Hon. T. K. Sidey—Dunedin.
D. A. Hay—Auckland.
Hon. G. M. Thomson—Dunedin.
Jas. Young—Christchurch.

Sir William Lawrence, President of the Royal Alpine Society, was elected an Honorary Overseas Member at the last Conference. The Hon. T. K. Sidey and Mr. D. A. Hay, a pioneer nurserymen, were both foundation members and Vice-Presidents of the Institute. Hon. G. M. Thomson was an Honorary Fellow and a scientist and author. Mr. Jas. Young, late Curator of the Botanic Gardens, Christchurch, held the Institute's diploma and was one of its examiners.

FINANCE: The renewal of the Government grant of £100 is highly appreciated and more especially under present general financial conditions. This grant alone has enabled the Institute to avoid a deficiency in its accounts although the financial position shows some improvement when compared with that of the previous year.

JUDGING RULES

On the recommendation of its Judging Rules Committee, the Executive Council has adopted the following definitions for inclusion in its "Rules for Judging."

OPEN OR PROFESSIONAL CLASS: This class is open to any exhibitor.

AMATEUR CLASS: This Class is open to any exhibitor who does not (a) employ a full time gardener; (b) issue or advertise any list of produce; (c) gain any part of his living by gardening work or by growing for sale, or for an employer, flowers, fruit, vegetables, plants, tubers, seeds or general nursery stock.

NOVICE CLASS: This is open to any exhibitor who has never won a first prize when exhibiting flowers, fruit, vegetables, etc., in the particular kinds in which he is competing.

REPORT OF EXAMINING BOARD FOR THE YEAR ENDED 31st MARCH, 1934.

EXAMINATION SYLLABUS.—During the year a complete amendment of the syllabus was submitted to the Executive Council and approved by the 1934 Conference. The amended draft syllabus was published in the September 1933 Journal. Copies of the new syllabus were forwarded to all students and examination candidates, Technical Instructors, etc. The altered syllabus has met with appreciation on all hands.

REINSTITUTION OF GROUP B.—In terms of the original examination regulations or syllabus, candidates under Group B were required to make application for examination not later than the 31st December 1929, and this period was extended in 1931 to 31st December 1931. It was found, however, that from various causes, quite a number of horticulturists with good practical gardening experience had not availed themselves of the concession and hardship had been created, through no fault of the Institute, in imposing on men of years and good gardening experience, the full examinations and periods of supervised practical work allotted to beginners. The Examining Board recommended therefore that Group B should be reinstituted as from the 1st. July 1933 and closed on the 31st December, 1934. This recommendation was approved by the Executive Council and the 1934 Conference.

A number of applications were dealt with during the year and the effect of the concession was reflected in the last November examinations.

SEEDSMEN'S AND FLORISTS' CERTIFICATES.—Draft suggestions from the Seedsmen's Association for a scheme of examination were received just prior to the 1934 Conference and there was no time therefore to finalize the scheme. Conference decided that the schemes of examination for Seedsmen's and Florists' Certificates could be proceeded with after consultation with all bodies affected and referred the matter to the Executive Council with power to act.

EXAMINING BOARD.—Messrs. W. S. La Trobe and F. S. Pope were appointed to the Board during the year.

EXAMINATIONS.—The number of candidates for the November 1933 Examinations was satisfactory, and the following is a summary of the results:—

Examinations.	Complete Pass.	Partial Pass.	Failure.
Preliminary	5	5	2
Intermediate	3	3	—
Diploma	4	3	—
Fruit Culture	1	—	—

DIPLOMAS AND CERTIFICATES ISSUED.—Appended to this report is a list of Diplomas and Certificates issued, after examination, in addition to those shown in previous annual reports:—

						Total
Diploma in Horticulture	..	..	..	..	..	4
Senior Certificate in Horticulture	..	..	..	..	..	3
Junior Certificate in Horticulture	..	..	..	..	..	5
National Certificate in Fruit-culture	..	..	..	..	..	1
TOTAL ISSUED TO DATE						13
						Total
Diploma: Without Examination	..	..	..	..	..	170
Group C. Examination	..	..	..	..	..	27
Group B. Examination	..	..	..	..	..	12
Equivalent	..	..	..	..	..	1
Certificates: Junior	..	..	..	..	..	18
Senior	..	..	..	..	..	12
Fruit Culture	..	..	..	..	..	1
						241

List of Diplomas and Certificates granted under Section 4 of the New Zealand Institute of Horticulture Act, 1927, since the issue of the 1932-33 annual report.

DIPLOMA IN HORTICULTURE.

Bayliss, Eric Lewin; Christchurch.
 Gudex, Michael Christian; Hamilton.
 Hutt, Edward; Lower Hutt.
 White, Archibald, Waimate.

SENIOR CERTIFICATE IN HORTICULTURE.

Allan, Ferdinand Sebastian; Auckland.
 Lannie, Lawrence; Wellington.
 Watling, Allan James; Nelson.

JUNIOR CERTIFICATE IN HORTICULTURE.

Alexander, Miss Edith Winifred; Dunedin.
 Falconer, Miss A. Colina; Dunedin.
 Jollie, Francis John Edward; New Plymouth.
 Mitchell, Llewellyn James; Christchurch.
 Treleaven, Lawrence; Christchurch..

NATIONAL CERTIFICATE IN FRUIT-CULTURE.

Everett, Percy; Gisborne.

THANKS.—The Board records its thanks to Mr. P. Black for preparing the written tests and marking the examination papers and to Drs. Allan and Cunningham for setting the papers in Horticultural Botany and Horticultural Zoology respectively.

INSTITUTE NOTES.

NATIONAL CONFERENCE ON HORTICULTURE AND NATIONAL FLOWER SHOW.—No efforts are being spared in Otago and Southland to make the fifth National Conference on Horticulture and the National Flower Show a success. Schedules for the latter can be obtained on application to the Secretary, Mr. C. Rhodes, 42 Princes St., Dunedin.

EDUCATIONAL.—The date of the yearly examinations has been fixed for Thursday, 15th November. Employers of gardening students are requested to remind them of the necessity for immediate registration with the Institute upon commencement of their garden service. It is hoped to issue the syllabus for the Florists' and for the Seedsmen's Certificates at an early date. On the recommendation of the Canterbury District Council, Messrs. J. A. McPherson and M. J. Barnett have been added to the list of examiners vice J. Young deceased.

ROAD BEAUTIFICATION.—The attention of other District Councils has been drawn to the excellent work being carried out in Canterbury and Auckland in connection with Road Beautification and it has been requested that assistance should be given towards the formation of similar organizations in other districts. A Conference of Local Authorities with the Executive and Advisory Committees of the Canterbury Road Beautifying Association was presided over by the Mayor of Christchurch and the Mayor of Wellington has been invited to take similar action for the Wellington District.

NATIVE PLANTS PROTECTION BILL.—Several minor amendments to the Native Plants Protection Bill have been suggested and a representative deputation from interested bodies, including the Institute, waited on the Lands Committee of the House of Representatives and gave evidence in support of the Bill which has since become law.

CONGRATULATIONS have been extended to:—

Lord Loder, an Honorary Overseas Member, on his elevation to the Peerage. His interest in our native flora and donation of the Loder Cup are too well known to require further comment.

Hon. Sir R. Heaton Rhodes, Honorary Fellow, on his appointment to the Legislative Council.

Dr. W. R. B. Oliver on his attainment of the degree of Doctor of Science.

Mr. F. J. Shanks on his promotion to the position of Assistant Director-General of the Post and Telegraph Department.

CONDOLENCE.—The Institute has extended its sympathy to the relatives of the late Leonard Cockayne, Past-President and Honorary Fellow, who gave the utmost assistance to the Institute at all times notably in its foundation, constitution, legislation and educational programme and also to the relatives of the late Sir Edwin Mitchelson, an Honorary Fellow, who was also keenly interested in our native flora and played an important part in Auckland City Beautification.

Statement of Receipts and Payments for year ended 31st March, 1934.

RECEIPTS.				PAYMENTS.			
	£	s.	d.		£	s.	d.
To Post Office Savings Bank	217	4	8	By Salaries Dominion Secretary ..	119	0	0
„ Bank of New Zealand ..	41	7	4	„ Organizer ..	40	10	0
„ Cash Dominion Organizer	5	0	0				
„ Cash in Hand	2	7	1				150 10 0
				„ Capitation Fees (District Councils):			
„ Subscriptions—			265 19 1	Auckland	12	17	6
Individual: Current ..	132	6	3	Hawkes Bay	4	2	6
Arrears ..	36	10	0	Palmerston North ..	4	3	9
			168 16 3	Canterbury	4	5	0
Affiliated Societies:				Otago	5	17	6
Current ..	36	15	0	Southland	5	8	9
Arrears ..	2	2	0				36 15 0
			38 17 0	„ Conference Rent	7	17	0
			207 13 3	Printing	4	0	0
„ Examination Fees ..			48 6 0	Travelling Expenses ..	3	1	5
„ Publications:							14 18 5
Journals	3	5	0	„ Publications Journal ..			37 13 0
Examination Papers ..		13	6	„ Citrus Grant			105 0 0
Judges Register ..		3	0	„ Seed Industry			51 16 11
Daffodil List ..		1	6	„ Wellington Garden Allotment Scheme			3 19 10
			4 3 0	„ Tangoio Reserve			3 3 0
„ Government Grant ..	100	0	0	„ Office Expenses:			
„ Plant Recording ..		15	0	Exchange	1	3	0
„ Citrus Grant	105	0	0	Postages	16	14	4
„ Seed Industry Grant ..	100	0	0	Telephone	15	7	0
„ Refund Conference Rent		4	14	Rent and Light	28	6	6
„ Post Office Savings Bank			6 10 2	Examinations	1	16	9
Interest				Printing and Stationery ..	19	11	6
				Sundries	6	15	8
				Cleaning	5	14	0
							95 8 9
				„ Post Office Savings Bank ..	223	14	10
				„ Bank of New Zealand ..	115	0	9
				„ Cash Dominion Organizer ..	5	0	0
							343 15 7
			£843 0 6				£843 0 6

Income and Expenditure Account

for year ended 31st March, 1934.

	£	s.	d.	£	s.	d.		£	s.	d.	£	s.	d.
To Conference Expenses: Printing ..	4	0	0				By Subscriptions:						
Rent ..	1	10	0				Individual Current	141	1	3			
Travelling Ex. ..	3	1	5				„ Arrears	36	10	0			
				8	11	5	Affil. Fees: Current	47	5	0			
„ Capitation Fees:							„ Arrears	2	2	0			
Auckland	11	5	0								226	18	3
Palmerston North	3	7	6				„ Examination Fees				49	7	0
Canterbury	3	12	6				„ Government Subsidy				100	0	0
Otago	4	7	6				„ Plant Recording					15	0
Hawkes Bay	2	10	0				„ National Flower Show (Palmerston						
Southland	4	8	9				North) 1/3 Share of Surplus ..				7	3	3
				29	11	3	„ Interest Post Office Savings Bank ..				6	10	2
„ Salaries Dominion Secretary ..	110	0	0										
„ „ „ Organizer ..	40	10	0										
				150	10	0							
„ Travelling Expenses Organizer ..				10	10	0							
„ Tangoio Reserve				3	3	0							
„ Publications				27	7	4							
„ Office Expenses:													
Rent and Light	28	6	6										
Cleaning	5	14	0										
Printing and Stationery	19	11	6										
Postages	16	14	4										
Telephone	15	7	0										
Exchange	1	3	0										
Depreciation	1	11	9										
Sundries	6	18	11										
Examm. Expenses	1	16	9										
				97	3	9							
„ Excess of Income over Expenditure				63	16	11							
				£390	13	8					£390	13	8

Balance Sheet as at 31st March, 1934.

LIABILITIES.				ASSETS.			
		£	s. d.	£	s. d.	£	s. d.
Sundry Creditors		17	4 10			223	14 10
Seed Industry Grant (Balance) ..		48	3 1			115	0 9
						5	0 0
Subscriptions in advance			65 7 11				343 15 7
Examination Fees in Suspense			1 5 0				5 11 5
Endowment Fund			1 1 0				
Accumulated Fund 31/3/33			63 0 0				
Add Excess of Income over Expenditure		198	0 2			30	1 9
						1	11 9
		63	16 11				28 10 0
							14 14 0
			261 17 1				
			£392 11 0				£392 11 0

G. S. NICOLL,
Treasurer.

I have examined the books, papers and vouchers of the Institute, and certify that the attached statement of receipts and payments correctly sets out the transactions and the above Balance Sheet the position as at the 31st March 1934 as disclosed thereby.

Wellington, 20th July, 1934.

J. L. ARCUS,
Hon. Auditor.

**NEW ZEALAND
INSTITUTE OF HORTICULTURE**
(INCORPORATED)

Patrons: Their Excellencies LORD BLEDISLOE, Governor General,
and LADY BLEDISLOE.

Vice-Patron: The Hon. the Minister of Agriculture.

President: F. J. NATHAN, Esq., Palmerston North.

Hon. Editor: Dr. W. R. B. OLIVER, Dominion Museum, Well-
ington.

Dominion Secretary: G. S. NICOLL, P.O. Box 1237, Wellington.

Dominion Organiser: GEO. A. GREEN, 16 Aratonga Avenue, One
Tree Hill, Auckland.

Hon. Secretaries of Local District Councils:

Auckland: J. W. Kealy, P.O. Box 427, Auckland.

Hastings: W. M. H. Diamond, 617 Nelson Street.

Palmerston North: J. J. Stevenson, Boys' High School.

Christchurch: J. N. McLeod, 108 Paparoa Street, Papanui.

Dunedin: C. Rhodes, 42 Princes Street, Dunedin.

Invercargill: G. M. Broughton, P.O. Box 91.

Membership:

Individuals: 12/6 per annum (including Member's wife).

Juniors under age eighteen: 2/6 per annum.

Societies, Firms, etc., 21/- per annum.

Journal (half-yearly):

To Members: Free.

Advertising Rates:

These will be supplied on application.

Examinations:

Examinations are held yearly in November.

Students desiring examination should make early appli-
cation to

DOMINION SECRETARY,

N.Z. Institute of Horticulture,

P.O. Box 1237, Wellington.