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NEW ZEALAND PLANTS AND GARDENS

The Official Journal of the Royal New
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IMPORTANCE OF PLANNING

The most important step that should be taken by anyone who is faced with the problem of making a home is to plan it in broad principle. And remember that a home is composed of two separate but combining items — house and garden.

No builder would contemplate the construction of a dwelling house without first of all preparing a plan and, where the building is to be something more than just an ordinary type, an architect will be employed because he possesses the specialised knowledge necessary for the work. And that is where, only too often, the planning begins and ends, the garden being so often regarded as an easily conceived affair well within the scope of any householder. The drive is placed to give access to the garage and an area is allowed for a lawn at the back and there the planning too often ends with the boundary borders filled with plants and shrubs that happen to take the owner's fancy regardless of placing them in proper relation to each other.

When it comes to planning, the garden is probably a more difficult proposition than a house. An architect and builder can plan and work to set rules and they handle material that is not living. The garden planner has a very much more difficult task. He has to consider the possibilities and limitations of a site with due regard to exposure, soil and climate. He must possess an irreproachable instinct for proportion without which no garden can satisfy. He must have a thorough knowledge of various types of soil and how best to cultivate them so that the plants that are to be introduced will grow well according to their nature.

He who plans a garden must possess the wide knowledge of the plantsman who knows which genera will thrive under dry or wet conditions, which are most likely to survive severe exposure, the drift of seaspray or the great heat around their roots when the sandy soil in which they are planted becomes baked by the heat of the summer sun. He must, above all, know the ultimate dimensions of the trees and shrubs to be planted so that overcrowding may be avoided.

This survey of the great art of landscape gardening is, of necessity, brief but its importance to all gardens, large and small, must be apparent to all.

G. A. R. PHILLIPS,
Editor.

HAWORTHIAS

F. R. LONG, A.H., R.H.S. (South Africa).

The genus *Haworthia* has a special fascination for the writer for he has collected specimens of this fascinating genus in many parts of South Africa. Up to 1940 when he left in a hurry to carry out important military duties, he had an extensive collection of living plants, some 250 photographs, many of them of type specimens and a large collection of data. All this material has been sent to the National Botanic Gardens of South Africa, Kirstenbosch, with the hope that a qualified botanist will tackle the genus afresh and publish a well illustrated book as a result.

There is no current book or treatise on this interesting group of plants. There is much confusion in nomenclature, nothing of note having been published since *Flora Capensis* Vol. VI., 1897; then *Das Pflanzenreich*, by A. Engler, Sect: *Liliaceae* and *Aloineae*, IV. 38 III. by A. Berger (this details 60 species) in German, published in 1934. True there is an odd chapter in *Succulents for the Amateur*, edited by Scott E. Haselton (1939) which helps the amateur in a small way.

Now haworthias, and to this genus must be added that of *Apicra*, have no distinguishing flower, therefore one must rely on the formation of the plant and arrangement of the leaves. Therein lies their fascination. They are all in the group known as succulents.

CULTIVATION. Generally speaking, good drainage is necessary, a soil mixture of good loam with sharp coarse river sand and leaf mould, some requiring more leaf mould, or peat as a substitute, than others. Manure should be avoided but a little well decayed compost may be added. Shallow trays or seed pans are better than ordinary flower pots which, if used, should be liberally crocked. Haworthias are ideal for collections in bowls or dishes and will remain in such for years on end.

Some require complete shade, others half shade and a few species are found in full sun with very hot summers. One must live in South Africa to know fully what 'full sun' means. Most require a definite resting period in the winter; never over water and never be afraid of neglecting to water, as most species can remain dry, to the point of shrivelling before they die.

Haworthias are all, without exception, small plants — small aloes shall we say. They were once included in the genus *Aloe* (see Salm-Dyck's *Monograph*), and are mostly stemless with a few having elongated growths. They make an ideal collection for those with small gardens where a well made rockery exists or for those with only a verandah (stoep in S.A.) or a window or two. Apricras need more sun.

PROPAGATION. All species can be raised from seed but most are not obtainable on the market. Sow in well drained trays with a light soil — say half coarse sand. Most are dividable as they develop offshoots at the base, and many of those with stems may be increased by cuttings. Altogether, haworthias and apicras are easily cultivated and do not require special atmospheric conditions.

The genus is endemic to Southern Africa, there being well over 250 species plus varieties and many forms. *Apicra* has some 10 species. *Haworthia* was named after an early 19th century English botanist, Adrian Hardy Haworth who specialised in the growing of succulents. He lived at one time at Chiswick, near Kew, England.

The writer first got bitten with the *Haworthia* bug when he was collecting on the road running north from Port Elizabeth to Graaff-Reinet, where the further one drives the drier and hotter it becomes. He frequently came across a small *Haworthia* every dozen miles or so as he went inland. These seemed to vary a little in habit, arrangement of leaves and amount of tubercles and markings the further one collected away from the coast. Were these just variations caused by varying climate or were they distinct species? The idea struck him that if they were all grown under similar conditions at the coast, the point could be proved. Unfortunately the war stepped in and the experiment was never concluded. Certain botanists, including the German, Dr. Carl von Poellnitz, were very inclined to name new species ad lib. The writer implored him not to, with one result, *H. attenuata* with many forms as against *H. tuberculata* with three varieties (see illustration).

Sound advice therefore to collectors is, do not over worry about the variations or closely allied species, rather say — 'Oh! that plant is Mr. Jones' *tesselata*' or 'That *atrovirens* is Mr. Smith's.' This will hold until that new book is published! May it be soon!

As this article is intended mostly for the grower in New Zealand and not for the botanically minded collector, the groups, as laid down by the botanist, namely — *Triquetrae*, *Tortuosae*, *Margaritiferae*, *Tessellatae*, *Arachnoideae*, etc., are being ignored, the idea here being rather to group under their cultural requirements.

Several species are now unknown in the wild state. They may exist in the mountainous districts of the Cape where sheep and goat have left them alone. They may exist on inaccessible cliff faces (Kranz), who knows? This is always a thought that thrills the writer when he is flying over the many mountain ranges. Some of the 'lost species' are however in cultivation, several having been kept going in the collections at Kew and the Liverpool Botanic Gardens. These include *H. hydrida*, *H. tortuosa* (introduced to England by Masson in 1797) and *H. rigida*.

The writer actually secured cuttings of these from J. R. Brown of California who had, in turn, obtained them from Liverpool. They all happen to be hard in growth and easily cultivated. As a matter in

passing, all species travel well by post, the translucent or very soft or watery ones requiring more paper and closer packing.

One species, considered extinct until rediscovered about 1935 viz. *H. sordida*, has an interesting history. The writer had been fortunate in borrowing Salm-Dyck's *Monograph*, published in 1829 or thereabouts, and had noted all the haworthias illustrated therein and had had photographic reproductions taken of all the plates in this unique volume. Amongst them was a queer looking upright rigid species with a few pointed leaves 4 to 5 inches long — *H. sordida*.

In *Flora Capensis* it is stated — 'without locality, introduced in England about 1820.' No trace of a living plant could be tracked down, so it was written off as extinct.

One day in 1935 the writer and his family went for a picnic to the Addo Bush, some 30 miles inland from Port Elizabeth — a noted area full of the succulent bush *Portulaccaria affra*, aloes, euphorbias, *Testudinaria*, pelargoniums, *Crassula* and lots of interesting botanical specimens.

The afternoon cup of tea was taken sitting down under the shade of a bush when suddenly my daughter cried out 'Look, Dad, what's that weird looking little Aloe-like plant?' Dad rushed over and saw a solitary, almost black, olive green, sordid looking succulent. His mind flew back to Salm-Dyck's book. 'Yes,' he said, 'I have seen that figured.' On reaching home I confirmed that the plant was none other than the lost *H. sordida* (See illustration). Only a few more plants were ever found in this area; these were noted and allowed to flower and seed. Seed was collected and duly distributed to many botanic gardens throughout the world. Later, two more plants only were found some 50 miles on the west side of Port Elizabeth, no more. This story gives one some idea of the rarity of many of the South African indigenous species.

Another very localised species is *H. longiana* named in honour of the writer, wrongly he thinks as he did not find the plant originally (see illustration). Dr. von Poellnitz should have named it *archibaldiana*. This has elongated rounded pointed leaves up to 10 to 12 inches long and is quite distinct from any other species.

There are two 'window leaf' species, that is to say, the tips of the leaves are at ground level, like a *Lithops* and are truncate or flat at the tops of the leaves, which are translucent to let in the light to the plant which otherwise is buried. They are:—

H. truncata with oblong topped leaves, from Oudtshoorn district.

H. maughanii, from Calitzdorp.

These have circular tipped leaves just above soil level. Both are steel grey in colour and unless in flower, are almost impossible to locate. Both are very local. *H. truncata* has a variety — *crassa* — somewhat more stunted and thickened (see photo 214 Long's collection).

Now to deal with some species that are found in collections. For this purpose let us divide them into two sections, namely:—

- (a) The hard leaf species most with spotted white tubercules,
- (b) The soft leaf species, with very succulent and watery growth and leaves.

(a) *HARD LEAF SPECIES.* *H. fasciata* is common here in Port Elizabeth and may still be found within the municipal area. It is attractive with one rosette of leaves, 4 to 5 inches in length, with numerous white tubercules. It grows in clumps sometimes in full sun and sometimes under the half shade of a low bush — very hardy and easy of culture. (See Photo No. 8 from Long's collection).

H. attenuata is similar to the above and is also local. It has many varieties and forms, based on more or less spots, one without spots, but it is not recommended that much attention should be paid to these forms. Has been collected in full sun (see photos taken at Addo).

H. radula — spots minute and dense; spreading habit; collected near Hankey, Port Elizabeth district, in bush.

H. margaritifera and its several varieties is a very attractive species found in the Western Cape. It is larger than the three species mentioned above.

H. setata, *H. minima*, *H. atrovirens* and *H. angustifolia* are small, delightful and useful in making up bowls.

In this group *H. bolusii* could be included although it approaches the succulent group. By the photograph it can be seen that it makes a beautiful rosette, covered in silky white hairs and is up to 3 inches in diameter — has no stem, of course. It comes from the hills around Graaff Reinet, a low rainfall area. It is most attractive.

Another similar species is *H. arachnoides*. See that these are not overwatered and are given plenty of coarse sand.

Now for a few upright growing species, mostly in dull copper colouring, all easy to grow and will withstand, when once established, considerably dry conditions.

H. viscosa, *H. indurata*, *H. tortuosa* (now extinct), then *H. coarctata*, *H. reinwardtii*, *H. chalwinii*, *H. glauca* and others. All these are distinct and are easy under cultivation. The average height is 8 inches but they can be recumbent. The writer found plants of *H. glauca*, a greenish steel grey plant without markings on a rocky bank on the Zuurberg, at 2000 feet, some 55 miles from Port Elizabeth but nearby under a large bush used by cattle for shade, he found one huge specimen, at least 18 inches long; it can be presumed that the plant was enjoying the droppings.

H. coarctata, *H. reinwardtii* and *H. chalwinii* are attractively marked with white tubercules.

Let us now look at:—

(b) *THE SOFT LEAF SPECIES* with soft succulent watery growth.

There are 3 species that are outstanding, *H. cymbiformis*, *H. planifolia* (see photo) and *H. cuspidata* with their lovely pale green transparent leaves arranged in circular rosettes. This group requires more water and more leaf mould than do the hard leaf ones. To see a patch of *cymbiformis* hanging precariously on to a rock face on the shady side, is a real joy. They send out side growths and suckers, so multiply rapidly.

Close to these come more beauties *H. pilifera* (see J. R. Brown's picture) and the variety *dielsiana* (see No. 13 Long's collection) the first with a terminal whisker and the latter without.

These both are found in shady nooks of rock ledges. One must mention *H. tessellata* with its lovely marbled markings and *H. retusa*. Both form dwarf rosettes, not more than 2 inches high.

It is so easy to go on enumerating species after species to the bewilderment of the reader who is about to start collecting, that it is difficult for the writer to stop! One other species must be mentioned however and that is *H. woolleyii* (see illustration) a distinct one, neither a 'hard,' nor a 'translucent,' nor a 'rosette'; it must be seen. The discovery came about in this way. Major Woolley, a keen amateur, and the writer were collecting one day in the Steytlerville District. They got out of the car and decided to walk parallel with one another along the road some 100 yards inside the fences, one on each side. A few minutes after a shout from Major Woolley, and almost immediately a shout from myself. Woolley had found a brand new, very distinct species. I had found a new form of *blackbeardiana*. The ground in between had plenty of *H. retusa*, *H. woolleyii*, named subsequently by Dr. von Poellenitz, has never been found elsewhere and here only in one small patch. But that does not mean that more are not growing in the wild and inaccessible rocks of the Cockscomb Mountain away from the goats, the enemy of natural flora. What an exciting pastime is plant collecting, and what a joy it is to grow what one has collected!

OUR LEAST KNOWN NATURALIST

Anders Sparrman, 1748-1820.

A. W. ANDERSON, A.H.R.I.H.(N.Z.), (Timaru).

Least known of all the naturalists who visited this country during the 18th century is Anders Sparrman, a Swedish gentleman who played an important part in the botanical exploration carried out by Captain Cook's second expedition. He does not appear to have had any official status, having been engaged as an assistant by the Forsters when the 'Resolution' called at the Cape of Good Hope. Georg Forster does not even mention the appointment in his *Voyage Round the World* and

the enquiring student is forced to come to the conclusion that Sparrman's work was quietly appropriated without any kind of acknowledgment by his unscrupulous employers. After all, one would scarcely expect the Forsters, who thought nothing of lifting some of Dr. Solander's names and descriptions and palming them off as their own, to give very much credit to an assistant to whom they had paid good money for his services. All the same it is rather remarkable that Sparrman is not cited as the authority for a single botanical name in Cheeseman's *Manual of the New Zealand Flora*, and that not one of the many botanists who have described our plants has given him the honour of dedicating a species to him. He is commemorated in *Sparmannia*, a small African genus of trees and shrubs closely allied to our Whau, *Entelea arborescens*.

Most people know that Banks intended to take part in the expedition but gave up in a huff because he couldn't get his own way about accommodation for himself and retinue, about a fortnight before the sailing date. As a result the British Government appointed two impoverished Germans, J. R. Forster and his 17-year-old son Georg, as naturalists at an inclusive fee of £4000. When the 'Resolution' left England in April, 1772, she had on board Francis Masson, a plant collector, on his way to South Africa in search of plants for the Royal Botanic Gardens at Kew. It had been thought that young Georg Forster would be able to manage all the botanical work of the expedition, but doubts seem to have arisen. It may be that the naturalists were impressed by Masson's knowledge and efficiency during the brief stops at Madeira and St. Jago in the Cape Verde Islands. Be that as it may, the Forsters jumped at the chance of engaging an assistant when Dr. Sparrman came to pay his respects on their arrival at the Cape.

Early Life

I haven't been able to find out very much about Sparrman's early life beyond a statement that he had an aptitude for natural science and studied medicine at Uppsala University, under Linnaeus in the 1760's. After graduating he became a ship's doctor for the Swedish East India Company and in the course of his first voyage we find him botanising on Ascension Island in 1766. With some assistance from the Swedish Government he managed to secure a free passage to South Africa and had been there for about six months, acting as tutor to the Dutch Resident's children, when the 'Resolution' arrived on the scene.

When Sparrman went to visit the naturalists he was astonished to find they wanted him to accompany them. He took the night to think things over, and agreed to do so. Captain Cook seems to have had his doubts as to the necessity for another scientific man in his already over-crowded ship. 'Mr. Forster,' he noted, 'whose whole time was taken up in pursuit of Natural History and Botany, met a Swedish gentleman, one Mr. Sparrman, who understood something of these sciences, having studied under Dr. Linnaeus. He being willing to em-

bark with us, Mr. Forster strongly impuned me to take him on board; thinking he would be of great assistance to him in the course of the voyage. I at last consented, and he embarked with us accordingly, as assistant to Mr. Forster, who bore his expenses on board and allowed him a yearly stipend.'

Forster must have been pretty keen to get Sparrman to help, because the yearly stipend amounted to £200 which was exactly double Masson's salary, and generous in comparison with the £80 a year which was all that Banks paid Sydney Parkinson for his services as flower painter on the first voyage.

At Dusky Bay

When the ship dropped anchor at Dusky Bay in March, 1773, Sparrman admired the beautiful scenery but looked in vain for colourful flowers such as he had seen in South Africa, and the inference is that there was little that was worth collecting. 'I looked as a botanist most eagerly on the green veil of flora: but, from the tops of the mountains down to their utmost foot by the edge of the sea, there was a dense covering of thickets and trees, foliage and pine needles, and in such profusion that not the smallest patch was left for further adornment by green grass and plants.' Then he makes the statement that 'in the absence of flowers in New Zealand, it was fortunate for me that I was able to examine the fish as well and describe some new ones.' He mentions a 'delicious tea, prepared from a myrtle plant found there in great profusion,' a reference to the Manuka which the Forsters were to name *Leptospermen scoparium*. Our common name, tea tree, is a reminder of the fame of this, the best known plant of the South Seas, which was held in high regard by all the early voyagers as the source of New Zealand tea.

Sparrman, with two of the ship's officers, managed to scramble up one of the mountain ridges and it was 'half-way up I discovered for the first time a gynandrist, which I named *Forstera* after my fellow botanist, and have described in *Acta Uppsaliensia*.' This, of course, is *Forstera sedifolia*, for which Cheeseman's *Manual*, following Hooker's *Flora Novae Zealandiae*, of 1853, cites Linnaeus f. as the authority. Strangely enough Hooker overlooked Sparrman's discovery of the plant and gives Forster as his authority for its occurrence at Dusky Bay. Although this would appear to be a typical example of the way in which Sparrman's contribution to the botany of New Zealand has been overlooked, I should hesitate in blaming Hooker. In Merrill's *Botany of Cook's Voyages* there is a copy of an engraving of J. R. Forster made by I. F. Bause in 1781 and beneath the portrait is a life size representation of the *Forstera*. It is described in an inscription in German to the effect that 'This plant had been found by Herr Prof. Forster in New Zealand and named in his honour by Linnaeus.'

Hooker's Opinion

Hooker may have been misled by this portrait and its inscription. He knew all about the Forsters and had a pretty poor opinion of

their work and there is no reason to think that he held Sparrman in any high regard. 'Captain Cook on his second voyage, was accompanied by three scientific men, all more or less conversant with botany, namely the two Forsters (father and son) and Dr. Sparrman who joined the expedition at the Cape.' As an experienced collector he thought little of their efforts and pointed out, 'Queen Charlotte's Sound, in Cook's Strait, and Dusky Bay were the chief points botanised. From the former, as it had previously been explored by Banks and Solander, little novelty was to be expected and from the latter, which has latterly proved so rich in interesting plants little, comparatively speaking, was brought. About 150 species of flowering plants and ferns were collected in all, and these (often inaccurately named) were distributed amongst private and public museums.'

Discussing the 'confusion, synonymy and false identifications' created by all that muddle, he drew attention to the 150 species of New Zealand plants in Georg Forster's *Florulae Insularum Australium Prodromus*, saying 'they are supposed to have been elaborated by Dr. Sparrman, and even for the period are very unsatisfactory.' All the evidence goes to show that Sparrman was a naturalist rather than a botanist. When he published his *Voyage to the Cape of Good Hope* in 1783 he dealt extensively with the kaffirs and hottentots and had comparatively little to say about the flora.

First European Garden ?

Queen Charlotte Sound became the headquarters of the expedition which returned twice to Ship Cove after quartering the ocean from the antarctic ice to the tropics in search of the elusive continent. On their return in November 1773, after an absence of nearly six months they were glad to see, 'in the gardens we had then laid out, turnips and radishes half gone to seed; the cabbages and carrots were excellent, onions and parsley abundant. The peas and beans were mostly spoilt, it seemed by rats, but the natives had spoilt the potatoes.' This would appear to be the first recorded garden sown by Europeans in this country.

One of the 'Adventure's boats had been set upon by the Maoris and ten of her crew massacred, an occurrence that did nothing to assuage apprehensions about the cannibalistic tendencies of these people. It meant 'greater caution and prudence were needed on our excursions and hunting parties, in order to avoid being taken by surprise by these uncivilised man-eating brethren.' Then there was the peculiar mode of greeting by rubbing noses, 'often my nose was close to the teeth of cannibals, and that I lived to return home to Sweden safe and sound often gives me an entertaining and comforting subject for thought.'

Later Years

Sparrman left the 'Resolution' at the Cape and Georg Forster wrote, on 27th April, 1775, 'After taking leave of all our friends, and particularly of Dr. Sparrman, who had shared the perils and distresses

of our voyage, and whose heart had endeared him to all who knew him, we came on board on the 27th in the morning.' Sparrman remained there for eight months and soon after his return to Sweden was appointed superintendent of the natural history collections in the National Academy of Science. He held this position for a number of years and the first volume of his travels was published in 1783. In 1787, by the express command of the King of Sweden, he paid a visit to Senegal to look into the possibility of establishing a Swedish colony on the west coast of Africa. After making enquiries into the slave trade he returned the following year having spent some time in London and in Paris on the way home.

In the meantime he had taken up 'a fairly extensive medical practice' and in the busy years that followed he had little time for writing. At last in 1802 the next instalment appeared and the final section of the second volume was published in 1818, two years before his death. Needless to say there was but little demand for books whose topicality had long since disappeared. On the whole, Sparrman's account of the voyage is a dull one, mainly because he suppressed so many of the small day to day incidents which are the life-blood of the travel book because he thought 'it irksome for the reader were I to relate all the encounters and adventures we had with the natives, as well as their visits to the ship and the various cruises we made.'

MYCORRHIZAE

What They Are What They Do

EDWARD HACSKAYLO

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Frequently plants growing naturally in soil have absorbing roots that are invaded by very specific non-pathogenic fungi that cause unique changes in the root structures. In 1855 A. B. Frank, a German forester, coined the term mycorrhiza (meaning fungus-root) to designate these non-pathogenic invasions of roots by fungi. Studies by many investigators thereafter have revealed that the fungi in some mycorrhizae are very efficient in absorbing nutrients from poor soils for their hosts and in return receive nourishment from the roots, a mutually advantageous relationship. In other mycorrhizae some of the fungus cells may be digested by the root's cells, seemingly a somewhat one-sided affair. These interactions are better understood, however, if one has a knowledge of how mycorrhizae are formed and of what they look like.

On the basis of the interrelation between the thread-like filaments of fungus hyphae and the root cells, mycorrhizae are classed into two

main groups, ectotrophic and endotropic. The kind is usually specific for the genus of the higher plant on which it occurs.

Ectotrophic mycorrhizae are produced by the invasion of actively growing absorbing roots by fungi of the types which with few exceptions produce fruiting bodies called mushrooms. The hyphae of these fungi form a compact mantle on the surface of the roots and secrete enzymes that permit invasion only between the cells of the cortex (Figure 1). There is no penetration by hyphae into the growing tip or vascular system of the root. The infected roots are shorter than the uninfected ones; sometimes they are branched once to many times (Figure 2) and do not develop root hairs. The root branches and the fungus hyphae radiating out in all directions greatly increase the absorbing surface of the roots. Ectotrophic mycorrhizae are commonly found on pine, spruce, oak, elm, beech, birch, chestnut, hickory, and many other woody species.

Endotrophic mycorrhizae are produced by the invasion of absorbing roots by hyphae of certain fungi that do not produce mushroom-type fruiting bodies. The hyphae are present on the root surfaces only as individual threads and penetrate directly into the root hairs and other cells of the epidermis. Penetration of the cells sometimes extends into the root no farther than the epidermis; frequently however, the hyphae grow into the cortex cells (figure 3). Like ectotrophic mycorrhizae, endotrophic mycorrhizae do not penetrate the growing tip or vascular tissues. The gross appearance of the roots may remain unchanged or the roots may become beaded (Figure 4), the beading probably being caused by periods of arrested growth of the roots followed by periods of active growth as the result of changes in environmental conditions such as the soil moisture level in the zone of the invaded roots. Endotrophic mycorrhizae are commonly found on tulip poplar, maple, sweet gum, azalea and other ericaceous genera, orchid, and the majority of herbaceous plants.

Since the latter part of the nineteenth century investigators of the physiology of mycorrhizal associations have sought their significance and an understanding of the mechanisms involved. In Europe there was considerable controversy; one group postulated that mycorrhizae are beneficial and another considered them to be at most invasions by innocuous parasites and therefore of no value to the host. Their conclusions, however, were based on observations of naturally occurring structures.

After the turn of the century N. Bernard in France began to report his findings as to the physiology of orchid mycorrhizae; among his findings is the fact that tuber formation would take place only after the entrance of mycorrhizal fungi. Later studies by several investigators determined that in nature nearly all orchids are invaded by mycorrhizal fungi and that specific fungi are necessary within the seeds to supply enzymes that transform insoluble stored food materials into soluble usable compounds. Thereafter the immature embryo completes

its development, and germination is possible. The current technique of germinating orchid seeds on nutrient agars furnishes readily available nutrients that are provided in nature by the fungus-caused digestion within the seed.

With the advent of pure-culture techniques for growing tree seedlings and inoculating them with mycorrhizal fungi in 1921, Professor Elias Melin at Uppsala, Sweden, started a new and very important trend in studies on mycorrhizae. Melin was mainly interested in mycorrhizae of pine and studied the physiology of the association under very carefully controlled conditions ever since. Because of his researches we are now able to identify many of the fungi that cause ectotrophic mycorrhizae. He determined many of the physiological requirements of mycorrhizal fungi and studied extensively their interactions with tree roots. In recent years, by using radioactive tracers, he and his co-workers provided positive proof that mycorrhizal fungi absorb nutrients from the substrata and translocate these nutrients into the root tissues in far greater quantities than root hairs do. When soil fertility is low, shoots of plants having ectotrophic mycorrhizae have far greater amounts of nitrogen, phosphorus, calcium and sodium than do non-mycorrhizal plants. Melin and his co-workers further proved that radioactive carbon dioxide was photosynthesized into food material in the shoots, translocated to the roots, and utilised by the mycorrhizal fungi. Hence the long-debated significance of the reciprocal exchanges between host and fungus was firmly established as a mutually advantageous relationship rather than a one-sided one. The many reports of the need to establish mycorrhizae by soil inoculation, when pine seedlings are introduced into new regions lacking the appropriate fungi, support these experimental results.

That available mineral elements in the soil have a profound effect on mycorrhizal formation when the other factors are optimal is an interesting and practical aspect of the ectotrophic mycorrhizal association. The formation of ectotrophic mycorrhizae varies inversely with soil fertility. Thus mycorrhizae tend to be present in larger numbers when phosphorus, nitrogen, and potassium are not readily available in the soil. Mycorrhizal formation is most profuse and the mycorrhizae are most effective in stimulating the growth of trees in soils that accumulate large amounts of humus and consequently have low amounts of soluble nutrients. Addition of inorganic fertilizers to soils may completely suppress ectotrophic mycorrhizae. In Sweden it is recommended that tree seedlings be fertilized sparingly to permit mycorrhizal formation if the trees will not be fertilized after being transplanted to a permanent site. High rates of application of fertilizer produce larger stocks but few mycorrhizae and, later when no longer fertilized at their permanent site, the plants may become stunted or die.

Since little more than morphological studies have been made on most species having endotrophic mycorrhizae, the physiological aspects of the relationship are not well established. It has been observed,

however, that the fungi that invade the root cells follow internally the advancing growing root tip and grow from cell to cell. The older hyphae of the fungi are then digested by the root cells and probably the contents of the hyphae are assimilated by the host. Cytochemical studies may be used in the future to assist in determining the physiological interactions.

Mycorrhizae of trees develop most extensively in acid soils probably because the fungi, at least those studied so far, all require an acid medium. It has frequently been postulated that the acid soil requirements of many species of plants, such as some azaleas and rhododendrons, are really the requirements of their mycorrhizal fungi. This has not been definitely proved, but information regarding the effects of acidity on endotrophic mycorrhizal fungi is important and deserves more attention.

In recent years there has been much emphasis on control of soil-borne pathogens by application of chemicals to the soil. Some chemicals, if used in high concentrations, can eliminate pathogens and other micro-organisms including mycorrhizal fungi. In addition to eliminating harmful organisms they reduce competition for nutrients and larger seedlings result. In such a case the reaction of the seedlings would be the same as in the fertilized, pre-transplant site. Some of the chemicals may reduce the population of organisms and prevent serious losses of seedlings but do not kill enough of the mycorrhizal fungi to prevent their redistribution in the soil and on the roots. The soil treatments most widely used at present seem to do the latter.

Inoculation of soils with appropriate mycorrhizal fungi has been found necessary for growing certain trees in some prairie soils of the United States. In most areas, however, natural inoculation appears to occur on native species and thus the mycorrhizal association is established. Fungi forming mycorrhizae are known to vary in their physiological requirements and therefore may be expected to vary in their efficiencies in the mycorrhizal associations. Research designed to select the most efficient fungus associates, for the different species of plants for use in various soils, might result in improved culture. Though complicated and requiring the development of new techniques, physiological studies should be performed both under controlled laboratory conditions and in the field to clarify further the functions of mycorrhizae.

THE USE OF THERMAL POWER FOR HORTICULTURE

H. COBDEN SMITH (*Rotorua*).

It is my endeavour to relate as briefly as possible the tremendous potential of heat that is available in this hot lakes district, which can be utilised for horticultural purposes, also some of our personal experiences in harnessing this heat.

You who live in other districts will wonder why more use is not made of the natural heat. When I came to Rotorua first in 1926, I

wondered at the nonsense of bringing coal from Huntly to heat water when we had the largest hot water lake of the highest temperature in the world situated in the Kuirau Reserve, Rotorua. I wondered why the primary school spent over £300 per annum on coal for the open fires when they were next to a very large and very hot mud pool. But the picture is different today and we know a lot more; we can harness the ground-heat; private enterprise has put down over 150 bores; nearly all the private hotels and all the public hotels are heated from the geothermal; many private homes are either heated from their own bores or share in a communal one, as many as ten homes being heated from one bore. The application of geothermal to glass-houses has been proved to be outstandingly successful.

I wish to suggest with great emphasis that Rotorua and district could be the tropical garden of New Zealand. Heat for almost nothing, good soil in plenty, pure water in abundance and plentiful sunlight.

Rotorua is a long way behind Iceland in utilising the geothermal. In Iceland they have harnessed the whole of the heat from one geyser to heat their capital city. Comparatively, the hot lakes district has an immeasurable amount of heat. Climatic and economic conditions forced Icelanders to make the greatest use of their available geothermal. If our bodily comfort were at stake here as in Iceland you would find that every home in Rotorua and district would be heated and each household would have a heated glasshouse in which to grow potatoes and beans as they do in Iceland.

A stranger in Iceland is immediately conscious of and never forgets the cleanliness of their capital city of over 50,000 inhabitants, unsullied by smoke. There are no railways and few factories but the chief reason for the purity of the air is the absence of furnaces. All the buildings are heated by the natural and inexhaustible hot water. It was in 1930 when the first hot-water heating scheme was started, they had no precedent to guide them and their achievement is maximum warm comfort with cleanliness. Statistics say that the heat loss over the $10\frac{1}{2}$ miles from geyser to town is only $2\frac{1}{2}$ degrees and that is in one of the coldest countries in the World; 100,000 kilowatts would be used to heat the hot water reticulated to the town. Wells are sunk to a depth of 1500 ft. to cope with the expanding town, several acres of glasshouses are heated which provide fruit, flowers and vegetables which would not otherwise be grown.

A map of the central portion of the North Island of New Zealand reveals that all the hot earth areas are almost in a straight line from the volcanoes in National Park to White Island in the Bay of Plenty. Within a score of miles on either side of this line are 19 areas of a total of many hundreds of acres of hot earth where steam can be tapped at pressure. Natural heat is available to heat many miles of glasshouses. I am of the opinion that thermal reserves such as the Kuirau Park will be made into the most wonderful tropical garden and become a very worthy tourist attraction. Adjacent areas

as Waiareki, Taupo, Tikitere, Waikite and Waiotapu will be supplying the rarest of tropical flowers to the World's flower markets which are today only a few flying hours away.

Our experiences in harnessing the natural heat started in 1930 when through many trial and error methods we achieved a heated glass house and a centrally heated home. To do this we first purchased a home and section which very conveniently contained a hot spring on the banks of a stream. There we built a glasshouse and this we tried to heat by passing the town water through a grid of pipes suspended in the hot spring. This was successful to a degree which encouraged us to go on with the idea, but the waste of hot water was on our conscience and we put down a shallow bore of 80ft. This provided us with 208° F. of heat at 12 lbs. pressure, sufficient to heat both our home and an additional 60ft. x 30ft. glasshouse. We found that this glasshouse never fell below 50° F. on the coldest morning. The growing of tomatoes under these heated conditions was much easier than growing them in Auckland. Here we found we could freely ventilate without paying any attention to the outside temperature with the result that we had no mould diseases as we had in Auckland. The plants had more fresh air and they were vigorous enough to resist other diseases, consequently we had a high yield per plant. The natural steam was used to sterilise the soil. A perforated pipe was buried in the soil and connected to the bore. At this stage we added another glasshouse for orchids only and to heat this house we put down by hand another bore very close to the glasshouse and there we struck a most remarkable quantity of boiling water. The water was in such volume that we thought it prudent to stop it, but how? We called up the Fire Brigade and they were able to pump in such an overwhelming quantity of cold water that the bore gave up the ghost. We kept this bore closed down as we realised that hand drilling for hot water was not the right method; it had to be done by experienced drillers with all the modern equipment for handling steam at pressure.

The following are notes made by my wife on the use she has made of ground heat in a glass-house.

I am aware that the resulting plant growth would have been impossible for me to obtain in any other part of New Zealand. In other districts the cost of heat is considerable and the extra work entailed in stoking would have been too great an effort for me. I am sure more people would use it were they to find how simply it is arranged and controlled.

In the first instance I decided to grow orchids but it took me some time to locate growers or people willing to sell plants. Then I discovered in the *New Zealand Gardener* an advertisement for orchids from India. With great trepidation I forwarded about £3 and received by surface mail some months later an unusual bamboo parcel containing weird shaped bulbs and plants. Following the instructions I found in an English gardening book I sorted out the names and placed plants on

damp moss in the heated glasshouse. Several months later it was found that growth had commenced and all retained their vigour. These first plants are still treasured; even though they are native species they flower regularly twice yearly except one which has not flowered in 12 years. The one killed at the outset was a *Vanda coerulea* which is much prized for its lovely blue flowers.

The foregoing will tell you that orchid growing is a slow process and as I wanted flowers I began growing such plants as Frangipani, *Stephanotis*, *Gardenia* all well known for their lovely fragrance and long lasting waxy flowers. We also tried pineapples which fruited and ripened but they occupied too much space. Of course, I tried to take the good advice of others and keep to the most suitable plants but I have yet to find the grower who will not attempt any plant that is offered to him.

Soon the glass-houses were full of such plants as *Gloxinia*, *Begonia rex*, *Saintpaulia*, *Anthurium*, *Caladium* and *Croton*, the latter being useful when flowers are scarce. One leaf kept in water has kept its form and colour for at least six months and in that time has formed tiny roots at the base.

About this time our son was in England and he sent us some lovely hybrid *Cattleya* plants from noted growers. These came by air and they did not suffer a check, being only a few days on the journey. We then set about collecting a potting media of *Dicksonia fibrosa*, Kiekie, Redwood bark, Sphagnum moss and my great stand-by was pumice. We have hardly varied our mixture as all the orchids thrive in this one. Here I would like to mention that it has never been necessary for us to destroy our lovely bush.

At this stage we decided that our activities would have to be curtailed to one glasshouse therefore we removed to an area where steam was available. Here we built another dwelling and glasshouse and we have concentrated on the orchids that require more heat. We also added a bush house made of punga with a polythene roof through which we have run the overflow heat from the dwelling and glasshouse. In this house we grow ferns, fuschias, creepers, geranium and a few orchids.

EDIBLE FUNGI IN NEW ZEALAND

R. F. R. McNABB (*Plant Diseases Division, Auckland*).

It is a widely held belief in New Zealand as in many other English-speaking countries, that the common Field Mushroom is the only edible fungus and that all other fungi should be avoided because of their poisonous properties. This belief is quite incorrect, for only a relatively small number of the thousands of species of larger fungi are actually poisonous. However, the fact that poisonous fungi do occur, as for example some members of the toadstool genus *Amanita*, means that care must be taken when selecting fungi for the table.

The Agaricales or Gill Fungi, which include the mushrooms and toadstools, are the group which immediately come to mind when edible fungi are mentioned, and it is in this group that most of the fungi suitable for the table are found.

First, a word of warning. The Agaricales of New Zealand are not well known by mycologists, and until such time as they have been identified with certainty and their edibility tested, it is only prudent to confine oneself to the species known with certainty overseas to be edible. It must be borne in mind that mushroom poisoning in New Zealand is not unknown.

In most cases, printed descriptions are not sufficient to enable the beginner to distinguish the proven edible fungi from the hundreds of species present in this country. While there is no handbook illustrating edible New Zealand fungi, many English and European species occur in New Zealand, so that English handbooks are sufficiently reliable for our use. Perhaps one of the cheapest and best of those available is *The Observer's Book of Common Fungi*, by E. M. Wakefield. Unfortunately the King Penguins on edible and poisonous fungi by John Ramsbottom are out of print.

The most common edible fungus in New Zealand is the field mushroom, *Psalliota campestris*. Although most people can recognise the field mushroom when seen, surprisingly few can define its diagnostic characters.

The cap or pileus is white or often tinged brownish; the stem is short, stout, and white when young, but becoming brownish when bruised. A ring of tissue is attached to the upper part of the stem. The gills are at first distinctly pinkish but become purplish-brown when older, and are not attached to the stem in any way. The field mushroom usually grows in open grassy places, and any similar looking fungi found under trees should be treated with suspicion for chances are they are not the field mushroom.

The yellow staining mushroom, *Psalliota xantheroderma*, which is similar in appearance to the field mushroom, often occurs beneath trees and hedges and although not fatal, is known to cause discomfort and sickness in some persons. The distinguishing character of this fungus is the bright yellow stain which shows immediately once the cap is cut or bruised, or at the bottom of the stem when it is cut.

Another edible Agaricale, common in paddocks is *Marasmius oreades*, the Fairy Ring Champignon, which as its name implies forms fairy rings among the grass. It is a small rather leathery fungus and by shrivelling up can withstand drying for some weeks without being killed. With the advent of moist conditions the shrivelled caps swell to their original size and continue growth.

The cap is small, 1-2 inches across, smooth, usually with a rounded boss in the centre, and is a pale tan colour. When wet the cap may be dark tan, particularly around the boss. The stem is concolorous with

the cap, straight, slender and tough. The gills are pale buff, thick, and rather far apart. The Champignon, by virtue of its leathery nature, is admirably suited to drying and storing for later use by cutting off the stems and threading the caps on a string.

Certain of the large, white-gilled toadstools are also edible, but in choosing these care should be taken for the poisonous *Amanitas* also have white gills.

The Parasol mushroom, *Lepiota procera* and the Ragged Parasol, *Lepiota rhacodes* are both large fungi with shaggy caps 4-8 inches across, covered with brownish scales. The stems are up to 10 inches long with a ring around the upper part and a bulbous base. The gills are white and free from the stem. Being such large fungi, once seen and identified with certainty, they are easily remembered. Only the caps should be used for cooking, and they may be cooked in the same way as the field mushroom. These two species are not recommended for the beginner as distinguishing them from poisonous species could be difficult. A number of the smaller species of *Lepiota* are known to be poisonous.

The Oyster mushroom, *Pleurotus ostreatus*, differs from the other fungi mentioned so far in that it grows on wood and not on the ground. It forms dense, overlapping clumps on stumps and fallen trees, and is usually found in this country on oaks or other introduced English trees. The caps are smooth, moist, and each cap is fan or shell-shaped, 2-6 inches across, with inrolled edges. The colour of the cap varies from almost black when young to brownish or bluish-grey when mature. The stalk is short and stout and attached to the side of the cap instead of the middle. The gills are creamy-white and form a raised network running down the stem. The spores are white.

The Oyster mushroom requires slow cooking and only the tender young parts should be used for it can be rather indigestible.

Some members of the genus *Boletus* are pleasant to eat, but it is advisable to taste them in small quantities first for some are known to cause stomach upsets in certain persons. *Boletes*, the cepes of French cooking, are usually found in large numbers under pine trees in the late summer and autumn and are readily distinguishable by having the mushroom form but instead of gills they have a spongy tissue composed of minute vertical tubes. The most common *Bolete* found in New Zealand pine plantations is a species closely allied to *Boletus luteus*, which has a brown slimy cap 2-4 inches across, and yellow spongy tube tissue.

Only the young heads should be used and before cooking the spongy tissue should be removed and the caps peeled and washed. The cap and stem if sound, may be sliced and cooked in the usual ways, or the slices dried and stored for use later.

It is of interest that dried *Boletus edulis* is often the main ingredient of commercial mushroom-soup powders, but this species does not occur in New Zealand.

Besides the Gill Fungi, a number of fungi belonging to other groups are edible. Among these, the most easily recognisable are the Puff Balls and their allies (*Gasteromycetes*). No poisonous species have been recorded from this group.

The Giant Puff Ball, *Calvatia gigantea*, and other large puff balls which occur in New Zealand may be eaten when young. The fungus should first be peeled, the flesh cut in slices about half an inch thick, and fried, preferably after coating with egg and bread crumbs.

The small puff balls common on lawns, have been suggested as being pleasant when cut up and eaten raw in salads. Personally, they seem both tasteless and odourless and a doubtful addition to the taste of any salad.

The Rev. William Colenso mentioned that *Calvatia caelata*, a medium sized puff ball 2-4 inches in diameter with a roughened exterior, was one of the few fungi eaten by the Maori.

A few species of the *Gasteromycetes* have been eaten as substitutes for truffles, which unfortunately do not occur in New Zealand. Ramsbottom mentions that *Rhizopogon luteus* and *R. rubescens* are considered edible in the British Isles. Both occur in this country. *Rhizopogon rubescens* is abundant under pine trees and usually occurs in groups. The individual plants are up to 3 inches in diameter, irregularly globe-shaped, and resembling a firm, white or lemon-yellow puff ball when young, often with a reddish tint. The fungus becomes definitely reddish when bruised or cut. The same fungus is much esteemed as a food in Japan and is sold commercially under the name of "shoh-ro."

Generally speaking then, all puff balls and their allies are edible when they are young and still firm and white inside.

The Jew's Ear, *Auricularia polytricha* is another commonly found edible fungus and one of the best known, doubtless because of its commercial value during the earlier years of this century when thousands of pounds worth were dried and exported to China. The fungus has a tough gelatinous consistency and grows like a curled, purplish ear on dead broad-leaved trees. They are suitable for inclusion in soups and stews, but despite prolonged cooking, still remain tough and cartilaginous and must be removed before serving. In Eastern dishes however, the fungus is not removed.

Regardless of the type of fungus, there are several general rules which should be observed when preparing fungi for the table.

1. Be perfectly sure that you know the identity of the fungus you propose to eat. If there is any doubt whatsoever, don't eat it.
2. There is no easy way of telling edible from poisonous fungi. The popular ideas that poisonous fungi when cooked will blacken a silver spoon while edible ones will not; or that edible fungi are able to be peeled, are quite erroneous. The Death Cap (*Amanita phalloides*) which is the deadliest fungus known and is almost

invariably fatal, does not blacken a silver spoon, peels easily, and is just as poisonous after cooking as before. The large red topped white-spotted toadstool common in pine plantations in this country is *Amanita muscaria*, an extremely poisonous species which is fatal if eaten in any quantity.

3. Only young, undecayed specimens should be picked, and those showing signs of attack by maggots should be rejected.
4. The fungi should be cooked and eaten as soon as possible after collecting.
5. Mushrooms that have already been cooked should not be reheated.

As far as food value is concerned, the chemical composition of edible fungi approximates to that of most fresh vegetables, but it is the flavour and interest which they add to the menu that makes them worth gathering.

SOME NEW PLANT NAMES

Part III.

L. J. METCALF, N.D.H.(N.Z.),

(*Assistant Curator, Botanic Gardens, Christchurch*)

In this article it is intended to continue the series begun in the December issue of 1957, but this time the emphasis will be on the nomenclature of plants which are being grown in New Zealand under incorrect names rather than the names of plants which have been changed due to recent work by taxonomists. Some plants in this country have been grown for many years under names which cannot be found in any horticultural or botanical literature and sometimes it is no easy task to correctly place the species or variety. Also in recent years, due to the popularity of indoor plants, many plants have been imported from various sources overseas and with them have come a host of new problems in checking the names under which the plants were imported.

Last year a rather attractive foliage plant was received in the Christchurch Botanic Gardens under the name of *Cyperus* 'variegatus.' The same plant is also offered by some nurserymen as *Cyperus alternifolius* 'variegatus.' However the fact that the plant received had well developed basal leaves and much wider involucreal leaves than *C. alternifolius* precluded it from being a variety of that species. It was eventually identified as *C. diffusus* and a check through horticultural literature revealed that there is a variegated form of this species sometimes offered overseas as *C.* 'elegans.'

Cyperus alternifolius Linn. may be recognised by its more robust habit and much narrower foliage, 1/6in. to 1/3in. wide. The basal leaves are wanting, the involucreal leaves number about 20, and are spreading or slightly drooping.

Cyperus diffusus Vahl, differs in its less robust habit of growth, by having basal leaves, and the basal leaves and involucreal leaves being 1/6in. to 1/2in. wide and rather lax.

Cyperus diffusus Vahl. 'variegatus.'

C. laxus Hort. 'variegatus.'

C. elegans Hort.

Cyperus diffusus 'variegatus' grows about 1 foot high; basal leaves many, 1/6in. to 7/12in. wide; involucreal leaves about 6 to 12 in number and 1/6in. to 1/2in. wide. The umbel is diffuse and the spikelets greenish. In all of its parts the plant is almost entirely creamy-white with greyish-green striations. The type is distributed throughout the tropics.

For a long time the identity of a plant generally grown throughout the country as *Tydaea splendens* or *Isoloma splendens* has been a puzzle. No description for it could be found in any of the available literature and it was assumed that it must be an early cultivar the name of which would be very difficult to determine. However the species was recently determined with the aid of an article in *Baileya* 1, No. 4 by H. E. Moore, Jun., on some of the kohlerias cultivated in the United States. Therefore *Isoloma splendens* is correctly determined as *Kohleria eriantha* (Benth.) Hanst.

In the United States *K. eriantha* is often grown under the names of *Isoloma hirsutum* or *I. amabile* and under this latter name it has been grown by at least one institution in this country.

Kohleria eriantha (Benth.) Hanst.

Gesneria eriantha Benth.

Isoloma erianthum Benth. ex Dec.

K. eriantha is a robust species, densely woolly stems, dark green hairy leaves bordered with prominent red hairs along the toothed margin. The woolly orange-red flowers are usually borne 3 or 4 together from a common short axillary peduncle and the 3 lower lobes of the limb are spotted. It comes from Columbia.

One of the most troublesome genera is *Peperomia* and for a plant distributed throughout the country as *P. hederifolia* no reference could be found whatsoever. However in the *Kew Bulletin* No. 3, 1957, 421-22, T. G. Yunker describes two new species of *Peperomia* and it is into one of these that the plant known as *P. hederifolia* falls. It is now correctly and more appropriately known as *P. griseo-argentea*.

Peperomia griseo-argentea Yunker, is a glabrous rather succulent herb 6-8 inches high. The rounded-cordate leaves are 1 1/2 to 2 1/2in. wide, 1 1/2 to 2 3/4in. long, glossy, and a beautiful grey or silvery-green with the areas along the depressed nerves slightly dark-purplish. The country of origin is unknown.

This species is an easily grown pot plant and the attractive bullate and silvery leaves make it a very popular plant.

Another very attractive *Peperomia* now becoming very popular as a pot plant is *P. caperata* and this is also described by Yunker in the Kew Bulletin, thus legitimising the name by which it is so widely known.

Peperomia caperata Yunker, is a small succulent herb with short fleshy stems and about 4 - 6 in. high. The leaves are ovate to rounded-ovate, bluntly pointed at the apex and cordate at the base $\frac{3}{4}$ - 1 $\frac{1}{10}$ in. wide, 1 - 1 $\frac{1}{2}$ in. long, shining dark green above and strongly plicate-bullate. The petioles are green flecked with red. The flower spikes are white and carried on reddish peduncles. Country of origin unknown.

The Latin epithet means 'wrinkled' and like the preceding species it is most appropriately named.

A distinct form, *P. caperata* 'Little Fantasy,' is also in cultivation in this country and when well grown is even more attractive than the type with which it is sometimes confused in the trade.

It is a smaller growing plant of more compact growth, leaves smaller $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, $\frac{3}{4}$ - 1 in. long, darker green and more strongly plicate-bullate than *P. caperata*. The white flower spikes are frequently fasciated and on their red peduncles contrast very well with the dark foliage.

Geogenanthus undatus (C. Koch & Lind.) Milbraed & Strauss.

This is a very attractive foliage plant which as yet is not very widely known in New Zealand; however its position was discussed in *Baileya* 2, No. 2 41-45, and it is preferable to have it known by its correct name before the old name becomes too well established.

This plant was named *Dichorisandra undata* even before the flowers were known, and in later works was considered to be the same as *D. mosaica* or as a variety of it. However, in 1913 Milbraed and Strauss in the Dahlem Botanic Gardens had enough material to identify *D. undata* as a member of the genus *Geogenanthus*. *Geogenanthus undatus* may be distinguished from *Dichorisandra mosaica* by its unequal stamens, three of which are hairy, the inflorescence which is produced from the lower nodes of the stem and the undulant leaves with broad pale bands running lengthwise along the veins.

Dichorisandra mosaica has 6 equal stamens with smooth filaments and long anthers, a terminal inflorescence, and the non-undulant leaves lacking the lengthwise pale stripes of *Geogenanthus*. Therefore this plant should be correctly known as *Geogenanthus undatus* (C. Koch & Lind.) Milbraed & Strauss. In the United States it is known as the Seersucker Plant because the undulating surface of the leaves somewhat resembles the textile, seersucker. Also it is of interest to note that this plant grows in fissures of rocks and at the entrances to caves on the margins of streams near the headwaters of the Amazon River.

NORTHLAND COUNTRY GARDEN CLUBS' ASSOCIATION

ETHEL M. SANDS (Whangarei).

One hears much today of 'do it yourself' methods and it is most gratifying to find that horticulturists in Northland, with enthusiasm and determination to go ahead in the horticultural world, to use the latest methods in their work and to grow plants that are a challenge to the gardener's art, are doing things for themselves.

Throughout Northland there are many garden clubs and circles composed mainly of ladies who are keen gardeners, and their influence is most obvious as one travels through these lonely districts and finds healthy, well planned gardens with annuals, perennials, shrubs and trees growing very happily, often where a garden is least expected.

A year or so ago these garden clubs and circles began to find that the list of local speakers was exhausted and that many clubs were just marking time instead of going ahead and it was felt that there was so much more to learn.

They were encouraged to send club members to the Annual Conference of the R.N.Z.I.H. and reports were taken back to the different clubs.

Mr. A. M. W. Greig, A.H.R.I.H.(N.Z.), N.D.H.(N.Z.), and Mr. J. P. Salinger, B.Sc., N.D.H., of the Horticulture Division of the Department of Agriculture were appealed to at one conference and the need for authoritative speakers was stressed.

Mr P. Everett, of the Horticultural Division, Department of Agriculture, Auckland, eventually suggested that a meeting of all the scattered clubs and circles be called in Whangarei. This meeting was sponsored by the Whangarei District Council, and called by the District Council Secretary. The chairman of the Whangarei District Council, Mr. C. R. Ensor, chaired this meeting, explaining the function of the R.N.Z.I.H., and the reason for calling the clubs together, and assured the clubs of the support of the Whangarei Council R.N.Z.I.H., which is always prepared to supply speakers for club meetings and to help with advice when requested. Mr. J. S. Say of the Horticultural Division, Auckland, then addressed the meeting, making a special point of the desirability of clubs working for special projects and aims, using as examples the reports of similar work done in America by Women's Garden Clubs. Ideas and projects were discussed and it was decided to form a Northland Country Garden Club's Association to meet in Whangarei every three months:—

- (1) To hear a lecture from a qualified speaker.
- (2) To discuss any individual club problems.
- (3) To find gardeners who specialise in certain groups of plants and who would be willing to pass on knowledge gained to other clubs.

- (4) Clubs to study and find shrubs, etc.: suitable for own districts, to propagate and grow on enough for own use and to use to beautify district.
- (5) Each club to be prepared to find at least two judges to help at flower shows, local schools, and A. & P. Shows. Judges, in the meantime, to study R.N.Z.I.H. Official Judging Rules and new judges to be teamed with an experienced judge.
- (6) A project for the year's work to be decided. 'Colour in your garden all the Year' was the first project, and instead of the cry that there are no flowers in winter, each club made a portion of a floral carpet in a 6ft. x 4ft. frame and exhibited it in the Whangarei A. & P. Winter Show in June. The result was one long carpet extended across the hall which literally stole the show.

The following year the project was 'Gardens of the World' and with intensive study a series of gardens of the world was produced for the following show.

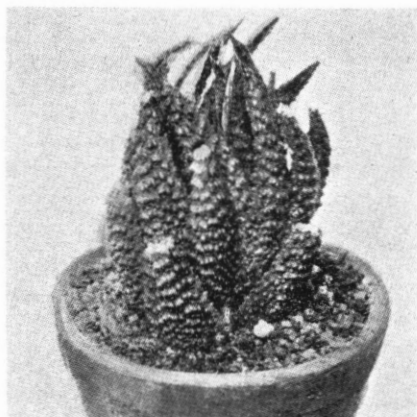
This year it is 'Garden Planning' and the clubs are busy producing a garden plan for a given area and the plan adopted will be used at the next Winter Show, each club being responsible for a certain portion of the garden.

In this way the clubs have gained a new lease of life, the quarterly meetings are always attended to capacity, and members have the opportunity to hear speakers who could not possibly go out to each district, (Some members travel fifty miles each way) and there is studying and reading to provide speakers for club meetings. New clubs and circles are springing up throughout the North and we feel that the Country Garden Clubs Association is very much worth while, not only in the interest of gardening but for the spirit of goodwill and fellowship which is so very evident at our large central meetings.

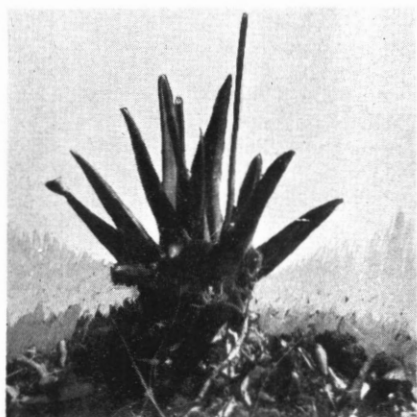
There are now seventeen clubs affiliated and more in the process of being formed. At present there are clubs from Bay of Islands, Kaikohe, Matarau, Otaika, Maungakaramea, Mangapai, Ngungaru, Tangiteroria, Waipu, Whangarei Heads, Parua Bay, Kara-Kokopu, Mangakahia, Whakapara, Towai, Waikeri.

All clubs remain quite autonomus and each pays an affiliation fee of 5/- per annum, and in turn stocks and manages a sales table, or provides morning tea for the central meeting for which members pay 6d. and this is paid into the central fund. As there are seventeen clubs there is no undue strain on any single club, and hall hire and speakers' expenses are met quite easily in this way.

A committee composed of the president, or secretary, of all clubs, with the Association Secretary, Mrs. R. E. Platt, and Chairwoman, Mrs. E. M. Sands, meets at intervals to discuss organisation and arrange garden visits to scattered district and also hospitality to clubs visiting from Auckland, etc.



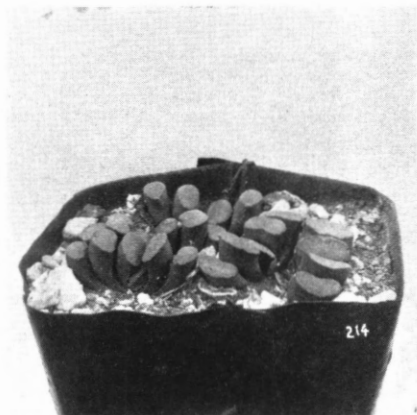
Haworthia tuberculata.
(See p. 287)



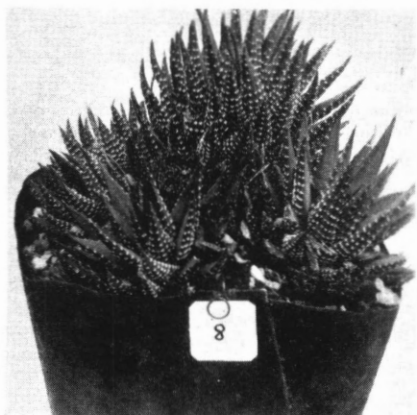
Haworthia sordida in Ado bush.
(See p. 288)



Haworthia longiana.
(See p. 288)



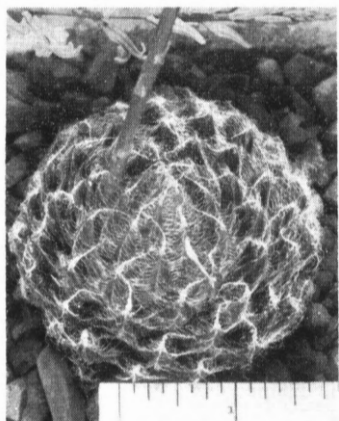
Haworthia truncata var. *crassa*
(See p. 288)



Haworthia fasciata 'Haeforma'.
(See p. 289)



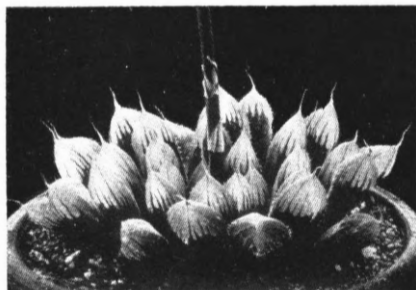
Haworthia attenuata.
(See p. 289)



Haworthia bolusii.
(See p. 289)



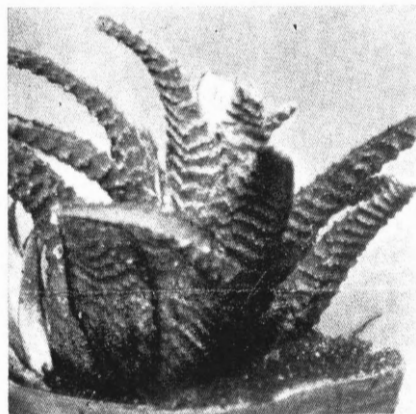
Haworthia planifolia.
(See p. 290)



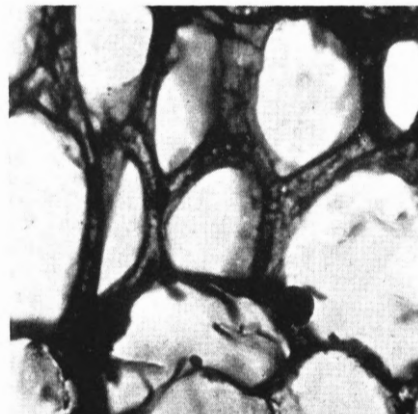
Haworthia pilifera.
(See p. 290)



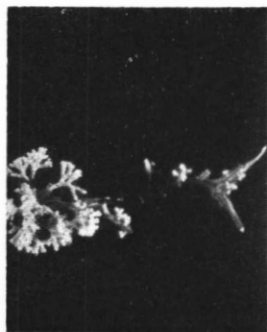
Haworthia pilifera var. *dielsiana.*
(See p. 290)



Haworthia woolleyi.
(See p. 290)



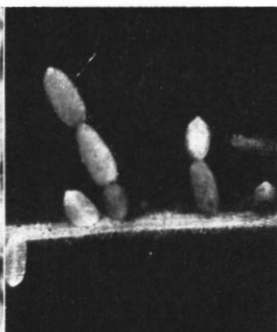
Mycorrhizae. Fig. 1
(See p. 294)



Mycorrhizae.
(See p. 294) Fig. 2.



Mycorrhizae.
(See p. 294) Fig. 3.



Mycorrhizae.
(See p. 294) Fig. 4.



*One of Dr.
Yeates' dwarf
Lilium auratum*
(See p. 319)



The Fairy Ring Champignon, Marasmius oreades. (See p. 301)



Protea cynaroides in the Botanic Gardens, Christchurch. (See p. 310)



Peperomia caperata Yunker 'Little Fantasy' (See p. 306)



Kohleria eriantha
(See p. 305)

In November the chairman of the Whangarei District Council, Mr. E. Arcus, F.R.I.H.(N.Z.) addressed the last combined meeting of the Association and assured them of the Council's interest and support, and guidance when needed, and wished the clubs every success in the coming year.

Of the seventeen clubs now associated the majority just grew, others were helped in the early stages by the Whangarei Council R.N.Z.I.H., or by the Whangarei Ladies' Garden Club, which also willingly supplies speakers for the club meetings.

All clubs remain quite autonomous and each pays an affiliation fee of 5/- per annum, and in turn stocks and manages a sales table, or provides morning tea for the central meeting for which members pay 6d. and this is paid into the central fund. As there are seventeen clubs there is no undue strain on any single club, and hall hire and speakers' expenses are met quite easily in this way.

A committee composed of the president and/or, secretary of all clubs with the Association Secretary, Mrs. R. E. Platt, and Chairwoman, Mrs. E. M. Sands, meets at intervals to discuss organisation and arrange garden visits to scattered districts and also hospitality to clubs visiting from Auckland, etc.

Thus we have a smoothly running horticultural organisation which is undoubtedly 'promoting the interchange of horticultural knowledge' and which is, through all members indebted to the Horticultural Division of the Department of Agriculture and to the R.N.Z.I.H. for encouragement and assistance in promoting the Association of Country Garden Clubs.

NOTES FROM THE CHRISTCHURCH BOTANIC GARDENS

L. J. METCALF, N.D.H.(N.Z.).

(Assistant Curator, Botanic Gardens, Christchurch).

Over the past few months temperatures have tended to be rather cool and March in particular was well below average, the maximum daily temperature failing to exceed 59 degrees on 13 days. On the 29th of March a violent electrical storm accompanied by heavy hail struck Christchurch. Fortunately however, the Gardens escaped with very little damage, the areas around the Port Hills suffering some of the worst damage, where in many cases plants were completely defoliated.

Although temperatures in April were about average the greater than usual number of easterly winds made conditions seem very cool. No frosts were recorded in April for the first time since 1938 and sunshine was well above average. However, the most significant feature and one that seems to have been common throughout the

country was that only about 50% of April's average rainfall was recorded. Also from the beginning of June, 1959 till the end of April this year only 12.60 inches of rain have fallen which is almost 3 inches less than during the well known drought of 1915-16.

Although this last summer did not have the long sunny periods of previous ones a sudden cold snap early in March gave us the best display of autumn colour for several years. In the June issue of last year's Journal mention was made of some of the trees in the Botanic Gardens which colour well in the autumn, and this year all of those and many more have provided an excellent display of colour. In addition to the maples mentioned last year the following have been very good. *Acer cappadocicum* which turns a clear yellow, *A. japonicum* var. *aconitifolium* a rich crimson, *A. palmatum* var. *linearilobum* which turns red and orange, and with *A. palmatum* var. *sanguineum* 'Seigan' the foliage turns a clear yellow and is followed by the bright red stems.

The avenue of Linden trees just west of the show houses is always very beautiful, particularly when the leaves first fall and for its entire length there is a carpet of gold under the trees. There are many other trees and shrubs, too numerous to mention at length; however, the following must be noted, *Metasequoia glyptostroboides*, *Betula* spp., Cherries, *Stewartia*, *Zelkova serrata*, *Fraxinus* spp. and *Tilia* spp.

Turning now to plants which have been of interest or are of interest at the moment the most outstanding is *Protea cynaroides*. Generally it is considered that except on the hill suburbs of Christchurch Proteas are not hardy here, however a specimen of *Protea cynaroides* on the Pine Mound (see illustration) has proved to be perfectly hardy and flowers regularly every autumn. Another plant not often seen here, but worth trying in a sheltered spot, is *Bouvardia humboldtii*. A plant of this is growing in front of the library and although it gets frosted to the ground each winter it quickly recovers in the spring and starts producing its fragrant white flowers in the late summer and continues right through until May. *Asclepias curassavica* is perhaps better known but still not as widely grown as it could be. This is a handsome summer flowering plant which has orange and scarlet flowers in umbels and although usually grown as an annual it may be grown as a perennial in a sheltered situation and in any case it freely reproduces itself from self sown seedlings.

One genus of plants which is useful in the late summer, and early autumn is *Salvia* and looking around the Gardens it is surprising just how many species there are, particularly in the Herbaceous Border. In the Herbaceous Border three species are outstanding. *S. uliginosa* is a well known species growing 6-8 feet high and with light blue flowers. It comes from Brazil, Argentina and Uruguay. *S. fulgens* is a native of Mexico and in the Botanic Gardens is treated as a herbaceous perennial but in a warm situation may be grown as a shrub 4 - 5 feet high. It is related to *S. grahamii*, and has leaves 1 - 3 inches long, crenate-serrate and cordate. The flowers are a showy scarlet

and about 2 inches long. The third species is *S. involucrata* var. *bethellii* sometimes known as *S. bethellii*. The type comes from Mexico and Central America but the variety is a horticultural form. It is a sub-shrubby perennial growing up to 5 or 6 feet in height with large glabrous, cordate leaves and bright rosy-crimson flowers; the tubular calyx is coloured also as are the floral leaves. This species continues blooming right up until the frosts come and is a well worthwhile garden plant.

Other species in the border are the tuberous rooted *S. patens* and *S. patens* 'Cambridge Blue.' The species comes from the mountains of Mexico and has large bright blue flowers. *S. virgata* is a hardy species 2 - 3 feet high with long spires of small light blue flowers and is quite a showy plant, while *S. sclarea* is a tall growing biennial with long racemes of whitish-blue flowers which are surrounded by membranous bracts of white tipped rose. It is a native of Southern Europe.

Several other *Salvia* species may be seen in various parts of the Gardens and one of the showiest which could be more frequently seen in local gardens where a sheltered position is available is *S. leucantha*. This is another Mexican species and is a little more tender than some of the other species. It is a shrub 2 - 3 feet high with white-lanate branches and undersides of the lanceolate leaves. The racemes are fairly long, purplish; the calyx is densely lavender or violet-lanate and the corolla is lavender-lanate outside. It has a long flowering season and the specimen outside Townend House continues until May or June when it is cut by frost.

A lesser known but rather attractive species is *S. canariensis* which as the name suggests is a native of the Canary Islands. It is a shrubby species growing up to 6 feet in height and has rather large-hastate-triangular leaves, while the floral leaves are ovate-lanceolate, membranaceous and coloured. The flowers are borne in about 6 flowered whorls and are purplish. It succeeds well in a dry situation. And lastly there is the well known *S. grahamii* which along with many other showy species is a native of Mexico. Although it is perhaps not seen as often as it used to be it is a very good small shrub which has a long season of blooming.

In the show houses there are many interesting plants at this time of the year and in the Townend House one that is most attractive at present is *Plectranthus behrii* from South Africa. It is a shrubby plant with broadly ovate-cordate leaves, serrated and dark purple underneath. The racemes are 6 - 9 inches long and bear numerous rose-purple flowers. When grown in an 8-inch pot and kept frequently pinched back it makes a good pot plant and flowers for quite a long time. Numerous other members of the *Labiatae* are grown under glass but it is intended to make them part of some future article.

SOME LITTLE KNOWN PERENNIALS

G. A. R. PHILLIPS (*Paraparaumu*).

There are a number of possible reasons why certain herbaceous perennials, familiar in British gardens, are not as well known in the Southern Hemisphere as they deserve to be.

The Burning Bush, *Dictamnus albus* and its purple flowered form, *D. albus* 'Purpureus' provides a good example. Seed has been imported on various occasions but germination has been unsuccessful. It is not difficult for anyone who knew this plant in Britain to diagnose the cause. The viability of seed of *Dictamnus* is extremely brief and the only successful method of obtaining satisfactory germination is by sowing as soon as ripe in summer. Germination is slow but reasonably certain and by the following spring seedlings usually appear freely. If sowing is deferred until the spring germination will be poor; if it is deferred for a longer period it will be nil. The plant likes a sunny, well drained position and, when growing well, is best allowed to remain undisturbed. It has a non-spreading habit and may be left in one position for many years to form large clumps. The flowers are carried on spikes to a height of 3 or 4 feet and appear in late spring. The plant has the peculiarity of exuding a volatile gas which hangs about the plant and if a lighted match is applied to it the whole of the plant is enveloped in flame for a fleeting moment without scorching the flowers or foliage. Hence the name Burning Bush.

An occasional plant of the herbaceous *Clematis heracleaefolia* wrongly named *davidiana* is found in gardens of New Zealand where it is cherished for its clusters of tubular, scented purple flowers. Its form *davidiana* has bluish mauve flowers. Both grow to a height of 2 feet and flower for a lengthy period in summer. *C. integrifolia* is best known by its form *durandii* with bell shaped flowers of violet blue in flower from summer until well into autumn. *C. recta*, besides being one of the most attractive, is vigorous in growth with fragrant white flowers in summer.

No clematis likes permanently wet soil but, provided there is good drainage, there must be moisture at the roots during the growing season. They grow best in a well drained loam and benefit from the soil above their roots being mulched or covered with a few inches of shingle to maintain a cool and moist run for the roots. Planting in late winter just as growth begins is more successful than is autumn planting. The usual method of propagation is from seed which germinates easily if sown as soon as ripe. They have also been raised successfully from internodal cuttings made from firm, mature growth.

One of the loveliest of the hardy orchids is *Cypripedium acaule*, a terrestrial slipper orchid. I never had any difficulty in growing it in my Warwickshire garden where it was quite happy and at home among plants of the Royal Fern, *Osmunda regalis*, on the banks of a pond. In summer the soil about its roots was often muddy and in winter it was frozen hard by degrees below zero, but survived, grew and flowered in the next spring. The flowers are borne singly on 6 inch stems, with brownish wings and a pouch or slipper of a rose shade veined with crimson. A later flowering species of considerable beauty was *calceolus* with tawny brown wings and a deep yellow pouch. I found that if limestone chippings were mixed with the loamy soil in which it grew the plant increased in vigour. The finest of them all is *C. spectabile* (syn. *reginae*, *hirsutum*). This I have grown to a height of over 2 feet in a mixture of black loam, peat and oak leaf-mould. The flowers appeared in early summer with white sepals and a charming rose pink pouch, several being borne on one stem. It was necessary to grow it under the shade of low growing spreading shrubs like *Nandina domestica*, which served the purpose admirably. These hardy orchids are, I think, plants more for the South than the North Island as they appear to need a long period of rest in winter.

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THE AUCKLAND LILY SOCIETY

(This is the second of a series of supplements by leading Specialist Societies. All the articles contributed are from members of the Auckland Lily Society.)

LILIES OF THE FUTURE

The Aurelians

R. D. MULDOON (President, Auckland Lily Society).

During recent years a new name has gradually appeared among the lily offerings of nurserymen, the 'Aurelians' or 'Aurelian Hybrids.' It may well be that this group will finally end the search for the ideal garden lily.

One of the joys of lily growing is the knowledge that the hybrids with which we work are so near their origin in the species. Indeed fifty years covers virtually the whole span of lily hybridising with only a few exceptions. At the same time, the original species are available and grown as garden subjects, so that the whole family tree can be seen in one's garden for comparison.

The source of the 'Aurelians' is the intercrossing of the orange reflexed *Lilium henryi* with the trumpets *L. sargentiae*, *L. sulphureum*, and *L. leucanthum* var. *centifolium*, the latter commonly known as *L. centifolium*. All of these lilies originate in an area covered by North Burma and the Chinese provinces of Szechwan, Yunnan, and Hupeh; but each has its own area of origin. The three trumpet lilies are very close botanically. All of these lilies can be easily raised from seed which is available occasionally, flowering in two to three years; while *L. sulphureum* produces stem bulbils freely and *L. sargentiae* rather less freely unless disbudded.

The trumpet lilies requiring lime to free soil do well in most New Zealand soils although *L. centifolium* is not quite as fastidious in this respect. *L. henryi*, however, while preferring lime will thrive almost anywhere. The robust curving stems, dark green leaves, and huge heads of smallish orange flowers, are a familiar sight in parks and private gardens in January, and no lily is easier to grow. Each of these lilies has a F.C.C. of the Royal Horticultural Society, with the exception of *L. centifolium*, while *L. henryi* also has an Award of Garden Merit.

In 1897 *L. leucanthum* 'Chloraster,' a close relative of *L. centifolium* was pollinated with *L. henryi* and the seedling which flowered at Kew in 1900 was known as *L. kewense*. It was described as being the size and shape of *L. auratum*; but with narrow twisted segments with recurving tips, buff in colour, fading with age to white. It produced stem bulbils. This description will fit many of the present day discards of an 'Aurelian' raising programme. Both the hybrid, which was lacking in constitution, and the seed parent, were subsequently lost.

The description however, stimulated M. Dabras of St. Jean-de-Braye, near Orleans to try crossing *L. sargentiae* with *L. henryi* and after some years he obtained two fertile seeds in 1925. He succeeded in raising only one which flowered in 1928 and was named *L. x aurelianense* after the old 5th Century A.D. name of Orleans, derived in turn from the Roman emperor Aurelian. *L. x aurelianense* was intermediate between its parents being yellowish orange, in the shape of a flattened trumpet with reflexed tips. The success was repeated by Mr. Stooke in England, producing *L. x aurelianense* 'Stooke's Variety' and both forms were back crossed to their parents by the raisers and by hybridisers in America and England. *L. x aurelianense* had an A.M. of the R.H.S.

In 1933 an American, Mr. Tom Barry, crossed *L. sulphureum* with *L. tigrinum*; but *L. henryi* pollen from a near-by plant apparently got on the stigma and the result was *L. x* 'T. A. Havemeyer.' Originally claimed to have *L. tigrinum* as pollen parent, further crossings produced similar lilies with *L. henryi* as pollen parent, and finally a study of the chromosomes put the matter beyond doubt. The appearance of this lily was very similar to that of *L. x aurelianense*.

Having obtained these breaks, breeders, particularly in the U.S.A. embarked on intensified programmes using the original hybrids and the parents. Foremost in this was Jan de Graaff of the Oregon Bulb Farms, on a gigantic scale. But many others worked on similar lines and the results were the 'Aurelians.'

In shape they range from a slightly larger and flatter *L. henryi* to a long slim trumpet, with the intermediate form as in the original hybrids. In colour, orange with red papillae, bicolour white outer and orange inner, buff with gold, pure white, and pure yellow are common. Pink introduced from selected trumpets has been intensified, while a most striking deep apricot trumpet is now being produced. The yellow form of *L. henryi* var. *citrinum* has also been used with success. The culmination of this advance was the award of a F.C.C. to Jan de Graaff's hybrid Aurelian 'Limelight' at the R.H.S. Lily Conference in 1959. This is one of the few lily hybrids ever to win a F.C.C. the only other that comes to mind, being the same raiser's 'Enchantment.'

Because of the speed with which these bulbs can be flowered from seed, there is a tendency for growers to distribute from seed, rather than to propagate clones, and then carry on trying for further improvements. If healthy virus-free lilies are required this practice has merits, but it will not readily fix outstanding types in such a mixed race. Local raisers who have had access to the best overseas seed for some years are producing some wonderful hybrids, although not in the quantity of the American commercial growers; but New Zealand gardens can look forward to increasing supplies of these fine lilies.

Combining the beauty and grace of the choice trumpet lilies with the colour, robust growth and adaptability of *L. henryi*, these easily propagated newcomers may indeed be the lilies of the future.

L. Davidii and Some Hybrids

JEAN ALDRED

On any list of 'easy lilies for Auckland conditions' you will see *L. davidii* a slender-stemmed lily with reflexed orange-red flowers, spotted purple-black. It comes originally from China, and as it has a white bulb which is used as a vegetable by the Chinese, has been carried further afield as the native population spread, and various forms of *L. davidii* have been introduced, such as the Manipur form from Captain Kingdom Ward, and Dr. Rock's form.

There is an unspotted variety named *unicolor* var. 'Wilmottiae,' with a stem almost too slender to carry the weight of its flowers; var. 'Macranthum,' which has two, sometimes three flowers on each of the lower peduncles.

L. davidii is fertile both to its own pollen and to that of its varieties, so that many cultivars have arisen. Most famous are *L. x 'Oriole,' L. x 'Davmottiae,' L. x 'Lady Byng,'* and the excellent plant of disputed parentage, *L. x 'Maxwill,'* first lily to win for its raiser (Dr. Skinner) the coveted Cory Cup, in 1933. 'Maxwill' will grow in the most adverse soil conditions without apparent complaint. Almost all these varieties and cultivars of *L. davidii* can be found growing happily in Auckland gardens, in soils ranging from light volcanic to heavy clay. They do not seem troubled either by botrytis or by mosaic virus. Occasionally bulbs succumb to basal rot, but this should be avoided by making certain of good drainage and soil aeration; and by keeping manure well away from the base of bulbs. Moreover, the horrid grass grub is particularly fond of young lily roots, so an otherwise healthy looking bulb with chewed cotton fragments of root should not be immediately discarded as a spreader of basal rot, but given another chance in an isolated pot, before being condemned to a bonfire.

'Fiesta hybrids' are a strain originally of *davidii x amabile* breeding, and consist mainly of yellow, orange, orange red and red lilies of turkscap shape. These were first produced by a Dr. Horsford Abel in U.S.A., and have been intercrossed and re-selected extensively since then by Jan de Graaff, of world-wide lily renown. He has made special groupings of 'Citronella Strain' — pure lemons and yellows; 'Burgundy Strain' — clear and dark reds; and 'Bronzino Strain' — amber, sand and bronze tones and bicolors.

In New Zealand, Len Tuffery of New Plymouth did considerable hybridising on *L. davidii* using *umbellatum, amabile, tigrinum, elegans* and even *duchartrei* and *martagon* 'Album' in an attempt to introduce white into a strain which he aimed to make as varied in colour as possible. As far back as 1952, Tuffery was offering a selected bi-colour hybrid, 'Sultan' as 'dark ox-blood red, with a bright golden yellow star in the heart of the flower.' As his work with *auratum, speciosum,* and *japonicum* crosses increased in scope, Tuffery had to let his *davidii*

hybridising lapse for want of time and help; but seed and seedlings of his productions have been distributed around the country. The 'Red *dauidii* hybrids' distributed in Auckland from Miss Copsey's plantings were originally from Tuffery's stock, and have been carefully crossed, culled, and selected since, till Miss Copsey can show duplications of almost any of de Graaff's creations.

From England, Constable's catalogue offered 'Violet Constable,' 'Clarity' and 'Queen Elizabeth'; a trio which seem to belong to the slender stemmed lilies of *dauidii* type flowers considered in the article. 'Clarity' was once available in New Zealand. 'Red Max' is a recent addition to English produced hybrids of this type.

In Canada, Professor Patterson, Head of the Department of Horticulture at the University of Saskatchewan, long ago embarked on a new line of hybridising. His main objective is the development of hardy white and pink lilies, able to withstand, without artificial covering, the intensely cold winters experienced in the prairie provinces of Canada. A vast number of lilies was intercrossed, in just about every conceivable combination. This work is summarised in an article in 1955 North American Lily Society Year Book. Sufficient here to state that in 1937 a hybrid between *L. dauidii* var. 'Willmottiae,' and *L. cernuum* was raised. This seedling, numbered '37-538-1,' has not been commercially introduced, but was used as pollen parent in further breeding work. *L. tigrinum*, *L. elegans*, and some of the 'Stenographer' group hybrids have been used as female parents. *L. regale* has also been used, as a male parent, but although creamy-white lilies have been produced, it is not certain that *regale* contributed to the parentage. Failure to obtain even one trumpet-shaped lily from any of the resulting progeny would suggest that it did not. As white-flowered forms of *L. cernuum* have been reported, it would seem that possibly a recessive gene of *cernuum* could have contributed this happy break in colour.

In 1955, the University of Saskatchewan was awarded the Reginald Cory Memorial Cup for *L. x* 'Edith Cecelia.' This cup is awarded with the view of encouraging the production of hardy hybrids of garden origin, to the raiser of a plant which is the result of an intentional cross, and of which at least one parent is a true species. Bestowal of the cup is a high honour in the horticultural world.

This new strain has come to be known as the 'Patterson hybrids.' Selections in lemon, rose, soft pink, and creamy-white lilies, mainly with noded reflexed blooms, 12 to 30 to a stem, have already been made commercially available overseas. Some have the added grace of pleasant perfume. A report in 1959 N.A.L.S. Yearbook indicates that still further progress and improvements will be made, as *L. x* 'aurelianense' has now been brought into the already complex parentage. Not all the exciting Patterson hybrids are fertile, but some are; and already some Auckland lily growers are raising small amounts of seed contributed by U.S.A. friends. Through the courtesy of the N.A.L.S. treasurer,

Mr. Stokes, Auckland Lily Society members were privileged to see colour slides of many 'Patterson hybrids' growing in Mr. Stokes' garden.

Word has recently reached Auckland of a new selection from de Graaff, to be called the 'Harlequin Strain' — 'perky little Fiestas in new party frocks of pink, salmon, orchid, primrose and cream' — to quote our source of information. It is interesting to speculate whether some of the same parentage as the 'Patterson hybrids' has contributed to this new break in Fiesta colours, or whether de Graaff has now managed to bridge the gap with a *henryi* hybrid, as postulated in 1947 *R.H.S. Lily Yearbook*.

Commercial plantmen have to select vigorous growers with prolific increase, to enable them to offer new hybrids in sufficient quantities quickly. This very factor of quick increase is sometimes a nuisance in small gardens. (The average N.Z. garden ranges from $\frac{1}{5}$ to $\frac{1}{2}$ an acre, including house). If a small portion of the vegetable garden can be spared to grow on *dauidii* hybrid seedlings for a year, then out of this population one can pick just the particular colour or shape that appeals most. A bulb that just increases in girth, instead of number, and that sends up a taller stem with more flowers each year, is a better choice for making a small clump in a particular site. Then one can just occasionally part with an odd bulblet or two to a suitably grateful friend, instead of having to lift large clumps every few years and try to dispose of the surplus bulbs — rather like trying to give away unwanted kittens. Also, as the bulbs are not likely to be offered commercially, one can choose as many poly-syllabled pet names as one wishes, without worrying about frowns from the Lily Registrar. Raising one's own lilies can be fun, and the purpose of this article has been to show that an easy lily has many variations and possibilities.

***Lilium Speciosum* var. 'Dawn'**

Lilium speciosum, in its various forms, is of the easiest culture in most of New Zealand and, especially in the Auckland area, it reaches perfection in many gardens. Its use for both garden and indoor decoration is well appreciated. For house arrangements *L. speciosum* is doubly attractive as, after the heavily scented trumpets and auratum, its slight perfume is a great advantage.

Of the various varieties and forms grown in the Auckland area few equal and none surpass the locally raised variety known as 'Dawn' or 'Ashcroft's Dawn.' This vigorous variety has large flowers with a white background flushed with a soft but decided pink. The spotting is of similar colour. The flowers are well placed on a pyramidal head and a good stalk will carry 20 or more flowers. It has been a frequent prize winner at the Auckland Lily Society's shows and has evoked much favourable comment.

This lily was raised by the late Mr R. H. Ashcroft of Meadowbank, Auckland, some twelve or more years ago. It was the best of a batch

of seedlings resulting from crosses between *L. speciosum* 'Magnificum' and other varieties including forms of *L. speciosum* 'Album.' 'Dawn' was not widely distributed but has now become available in limited quantities. In my opinion it is destined to remain for a very long time as one of the best garden lilies raised anywhere.

—B.W.D.

LILIUM SPECIOSUM 'LATECOMER'

D. J. ROSS (*Hawera*).

This attractive variety occurred as a chance hybrid in a batch of seedlings raised from *Lilium speciosum* 'Magnificum' self-pollinated. The colour is a bright pink; the flowers are of excellent form but the really distinctive feature is its unusually late flowering season which may begin in February or March and continue until well into April, when all other lilies of this group have finished.

DWARF FORMS OF LILIUM AURATUM

Dr. J. S. YEATES, Ph.D.(*Cantab.*), Ph.D.(*N.Z.*), A.H.R.I.H.(*N.Z.*).
(*Palmerston North*).

The dwarf type of *L. auratum* which is the subject of the accompanying photograph, is an interesting type. The writer first described and illustrated it in the *R.H.S. Lily Year Book* for 1954 and also in *New Zealand Plants and Gardens*, Vol. 2 pp. 61/62.

Since that time a considerable number of dwarf *auratum* seedlings has occurred in our seedling beds, and several other growers have also reported them. From correspondence, I gathered that the late Mr. A. W. Wastney had raised them before 1954. Mr. H. H. Chittick of Wanganui has also grown them.

The dwarf form appears to be a 'recessive' type. To those unused to this term, it can be described in this way: when a recessive type such as a dwarf is crossed with a normal tall type, the seedlings will be tall, because tallness is 'dominant' over the 'recessive' dwarfness. If this theory — that dwarfness is recessive — is correct, we should expect to get dwarf seedlings only when we cross two plants, both of which are hybrids between dwarf and tall. That would account for the rareness of dwarf forms. Once we have two dwarf types and cross them, all the seedlings should be dwarf.

So far as our experience goes, the facts fit the above theory.

As to the place of the dwarf *auratum*s in lily growing, only time will tell. We have now many types, all very stiff, short-growing plants, but with a wide range of flower types. There are the normal spotted *auratum* types, 'Virginale' types, 'pictum,' a very good red-banded one, and now a pink 'Parkmanii' hybrid.

All have flowers of excellent quality — they have heavy texture and wide, strong petals. Some are about 5 inches wide but others are only 2 or 3 inches across. These latter types appear to have great possibilities for florists' use. They are small enough not to dominate other flowers in an arrangement, and, in the 'Virginale' form at least, are reminiscent of water lilies. One stalk about 2½ feet high will often bear twenty or thirty of these flowers.

Another use for the dwarf forms is likely to be as pot plants. A fully grown specimen in a pot would have a succession of flowers lasting for three weeks or so. Interspersed with other pot plants they would give added variety and enough fragrance to make a considerable improvement to the increasingly popular indoor displays of pot plants.

VERNALISATION OF LILY SEEDS

G. O. PAYNE.

Vernalisation is a common term used by Lily folk the world over, it is meant to imply the methods used to speed up the germination of the slower germinating group of lilies.

Lily seeds are divided roughly into two groups:—

The Epigeals: These are quick germinating seeds which usually show growth above ground within a few weeks after sowing. The seed leaf is rounded like a small onion leaf and looped. This seed leaf is then followed at intervals by the true leaves. Below ground a bulb is formed from the thin stem.

The Hypogeals: These are slow germinating seeds which usually take up to one season or more to show growth above the ground. No seed leaves are present, only true leaves coming at intervals. Below ground a small bulb is formed before top growth appears.

There are exceptions to the rule. I have had seed of *L. speciosum* and *speciosum* x *auratum* hybrids germinate in the opened seed pods during a mild damp autumn. Sown immediately in pots, they showed top growth within six weeks. There are various methods of dealing with seeds of these slow germinating types:—

- (1) First dust the lily seeds with a good fungicide. Then mix the seeds with clean river sand, chopped sphagnum moss or horticultural vermiculite, just damp, not wet, and place in clear glass jar, making sure a few seeds are showing on the inside of the jar. Seal the jar and place in warm place — a hot water cupboard is suitable. After a few weeks tiny white bulblets will be seen about the size of a sweet pea seed; sow these bulblets in prepared pots or boxes 1 inch deep. Place the pots outside, protected from heavy rain, but allow them the benefit of the cold weather, this being essential for quick top growth during early spring.

- (2) Place lily seeds in jar with mixture as above, but after a period in a hot cupboard, when tiny white bulblets are seen, shift jar to refrigerator or other cold place for a month, then sow the bulblets in prepared open ground beds, boxes or pots 1 inch deep.
- (3) You may use polythene bags in place of glass jars.
- (4) Sow lily seeds in prepared boxes, pots, tins, etc., containing a mixture of leaf mould and loam, and place containers in warm dark cupboard for about six weeks. Keep damp, not wet. Then shift to refrigerator or cold place, and keep reasonably dry for one month. After this, place pots in a cold frame, keeping damp, not wet. Within a few weeks top growth will appear. The above is a good method for germinating small quantities of valuable seeds.

J. E. Saville, M.B., in his paper *Lilies from Seed*, states: 'Slow germinating varieties should be sown in the autumn because frost appears to have a highly beneficial effect on germination, and if sown in the spring they usually lie dormant in the soil until the following spring, with the loss of a year's growth.' To test a theory such as this, I carried out an experiment some years ago, with remarkable success (See *R.H.S. Lily Year Book*, 1953).

'Fresh *L. speciosum* seeds of many varieties were put into 5in. flower pots in the following seed compost on 28th May, 1951: 3 parts good loam, 1 part leaf mould, 2 parts fine scoria, 1 part old sheep manure, 1 part old brewer's grains. A good sprinkling of bone flour and the lot well mixed and passed through a $\frac{3}{8}$ sieve.

An average of fifty seeds were placed in each 5in. pot, covered with $\frac{1}{2}$ in. of the above mixture and $\frac{1}{4}$ in. of fine scoria. The pots were given a good soaking and allowed to drain. One hundred pots were done in like manner. Then twenty pots picked at random were packed in boxes and taken to the freezing works. There they were kept at 14° F. for three weeks in the freezing stores. After that they were brought back and given a good soaking and placed in a cool frame with damp sawdust up to the rim of the pots. The frame was kept closed. During the seventh week in the frame, top growth started to show.

The eighty pots that never received the cold treatment did not show top growth until 20th February, 1952, and will not be ready for transplanting until next spring (1953). By planting in pots the seedlings can be transplanted with a minimum check into nursery beds.

In some cases where difficult species are concerned, I just tip the contents of flower pots, that have become nearly pot bound, into a friable and open soil nursery bed just as they are. I find that the following season they have spread themselves out and the new roots have gone

straight into the ground. They can then be transplanted into their permanent quarters when the bulbs have made sufficient growth and size.'

To conclude here is a list of the slow germinating types:—

<i>auratum</i> and hybrids	<i>medeoloides</i>
Backhouse hybrids	<i>michiganense</i>
Bellingham hybrids	<i>monadelphum</i>
<i>bolanderi</i>	<i>parryi</i>
<i>brownii</i>	<i>occidentale</i>
<i>canadense</i>	<i>pardalinum</i>
<i>chalconicum</i>	<i>philadelphicum</i>
<i>columbianum</i>	<i>polyphyllum</i>
<i>duchartrei</i>	<i>pyrenaicum</i>
<i>giganteum</i>	<i>rubellum</i>
<i>grayi</i>	<i>rubescens</i>
<i>humboldtii</i>	<i>speciosum</i> and hybrids
<i>japonicum</i>	<i>superbum</i>
<i>kellogii</i>	<i>szovitsianum</i>
<i>mortagon</i>	<i>tsingtauense</i>
<i>maritimum</i>	<i>washingtonianum</i>

PUBLICATIONS RECEIVED

CURTIS'S BOTANICAL MAGAZINE, Vol. CLXXII, Part IV, edited by W. B. Turrill, O.B.E., D.Sc., V.M.H., F.L.S. (Published by the Royal Horticultural Society, London.).

The leading botanical magazine among the English speaking peoples, now in its 173rd year, still maintains its high standard of publication. This part completes the present volume and is dedicated to a past president of the Linnean Society of London, Arthur Disbrowe Cotton, O.B.E., V.M.H., F.L.S. Of the eleven coloured plates in this issue that of *Laguinaria pattersonii* has probably the most interest for New Zealand gardeners as it has proved so valuable as a coastal shrub, producing its flowers when most other shrubs have finished flowering. Other plants that are illustrated comprise *Cassia stipulacea*, *Daphne longilobata*, *Erica curviflora* var. *sulphurea*, a South African heath with long greenish yellow tubes and dark centres I have not seen under cultivation in New Zealand, *Erigeron aurantiacus*, *Lapeirousia rhodesiana*, *Pelargonium zeyheri*, *Salvia dorisiana*, *Streptocarpus vandekeuri*, *Veronica turrilliana*, *Wahlenbergia consimilis*.

THE LILY YEAR BOOK, 1960, Conference Number, (Published by the Royal Horticultural Society, London).

This is the 23rd issue of this book so valuable to lily enthusiasts the world over. Being the special Conference number, it is of considerable interest containing all the papers read at the Lily Conference, 1959. These cover items of interest from all parts of the world including 'Lilies in Australia' by Gilbert Errey, and an interesting and well written article by Dr. B. W. Doak, on 'Lilies in New Zealand.' In it he tells the story of lily development in our country and the names of Dr. J. S. Yeates, Dr. and Mrs. Fullarton Johnston, Mr. L. Jury and Mr. L. Tuffery are given honourable mention for the great

work they have done in the *auratum-speciosum* group. There is also a special article on Dr. Yeates' productions with six of his *auratum-speciosum* crosses illustrated in colour. Articles on genera other than *Lilium* cover fritillarias and *Nomocharis*. There is also the report of an interesting discussion on *Eremurus*, whose cultivation in New Zealand does not appear to have been attended with success.

THE RHODODENDRON AND CAMELLIA YEAR BOOK, 1960 (Published by the Royal Horticultural Society, London.).

For those interested in the breeding of rhododendrons this issue contains more than ordinary interest. A symposium of the aims of well known breeders of rhododendrons and azaleas gives a suggestive guide to what we may expect in the future. But, apart from the more advanced subjects of *Rhododendron* lore, there are articles for the beginner. These comprise 'Rhododendron Problems Answered' by Mr. F. E. W. Hanger, V.M.H., who also, in company with Mr. C. E. Puddle describes thirty-nine popular camellias of the *japonica* group. New Zealand is well represented by an excellent article by Douglas Cook who describes the work at Pukeiti and lists the best of the Ilam rhododendrons. From Colonel Durrant there is an article on 'Camellias in New Zealand' with illustrations of New Zealand raised varieties. There are also articles from rhododendron and camellia authorities in the U.S.A.

AUCKLAND DISTRICT CARNATION AND GERBERA SOCIETY, Bulletin No. 9, May 1960.

This excellent bulletin that holds so much of value and interest for growers of these two popular genera never fails to contain a number of interesting and informative articles. A very detailed report of a talk on the cultivation of gerberas by Mr J. H. Hitchcock contains information that should prove to be invaluable to the would be grower of this colourful flower. In addition to cultivation, the control of disease, and insect pests and some very sound advice on propagation is given. I am pleased to see, also, that attention is being given to the garden pinks, one of the most delightful of the dwarf plants of our gardens.

REPORT OF THE EXAMINING BOARD

On behalf of the Examining Board, I have pleasure in submitting the following Report:—

MEETINGS of the Examining Board have been held on 5 occasions throughout the year. Set out hereunder is a brief report on the matters dealt with by the Board:—

SYLLABUS OF EXAMINATIONS: The Examinations Syllabus of the Institute includes the following Diplomas and Certificates:—

- (a) National Diploma in Horticulture — N.D.H.(N.Z.).
- (b) National Diploma in Fruit Culture — N.D.F.C.(N.Z.).
- (c) Certificate in Vegetable Culture — C.V.C.(N.Z.).
- (d) Certificate in School Gardening — C.S.G.(N.Z.).
- (e) Seedsman's Certificate — S.C.(N.Z.).

"GUIDE FOR STUDENTS": The revision of this booklet which contains valuable guides and suggestions to examination students, has been completed and will be distributed to students in 1960.

APPLICATIONS FOR REGISTRATION FOR EXAMINATIONS: During the year applications were received from new students for the following examinations:—

National Diploma in Horticulture	-	-	-	-	15
National Diploma in Fruit Culture	-	-	-	-	2

SPECIAL EXAMINATION PRIZE AWARDS: The four special Prize Awards offered annually at examinations were awarded at the 1959 examinations as follows:—

- (a) Cockayne Gold Medal (to the most successful Candidate completing the National Diploma in Horticulture)—
To R. Boggust of Palmerston North.
- (b) J. A. Campbell Memorial Prize (to the most successful Candidate completing the Intermediate Section of the National Diploma in Horticulture Examination) —
To E. J. Martin of Christchurch.
- (c) David Tannock Memorial Prize (to the candidate gaining the highest marks in the Oral and Practical Stage III Examination for the National Diploma in Horticulture) —
To R. Boggust of Palmerston North.
- (d) Junior Memorial Prize (to the successful candidate gaining the highest marks, in his/her first attempt, in the Oral and Practical Examination Stage I. for National Diploma in Horticulture) —
To R. F. Millichamp of Christchurch.

1959 EXAMINATIONS:

(1) Results — these are appended hereto.

(2) Statistics — the following tables will be of interest. (1958 figures will appear in parenthesis for comparative purposes) —

<i>N.D.H. Examination:</i>		<i>Junior</i>		<i>Intermediate</i>		<i>Diploma</i>	
Number of Entries	(43)	48	(27)	22	(24)	21	
Number of Passes	(21)	29	(22)	18	(16)	18	
Percentage of Passes	(48.8)	60.4	(81.5)	81.3	(66.6)	85.7	
Average Marks (passes only)	(59.7)	62.2	(63)	66.2	(62)	64.3	

N.D.F.C. Examination:

Number of Entries	(7)	4	(—)	6	(8)	1
Number of Passes	(6)	4	(—)	6	(6)	1
Percentage of Passes	(85.7)	100	(—)	100	(75)	100
Average Marks (passes only)	(64.1)	66.2	(—)	67.4	(68)	57

ORAL & PRACTICAL EXAMINATIONS: The holding of these examinations in one centre for all candidates was approved at the 1959 Dominion Conference and inaugurated at the 1959 November examinations. The examiners are of the opinion that the holding of these examinations in one centre has distinct advantages for the candidates as well as for the examiners. In 1959 the examinations were held in Christchurch, where the conditions and facilities are considered to be very suitable, and proved successful. The assistance and co-operation received from the Christchurch City Council, the Director of Reserves and his staff and others was deeply appreciated by the Examining Board.

It transpired that some candidates, particularly from the North Island, either withdrew or failed to report for these examinations, and it is understood that the cost involved in travelling to Christchurch has some bearing on these deflections. The Board is aware that this matter is the subject of a remit for discussion at the 1960 Conference.

The Board is concerned to note the rather high percentage of failures amongst candidates for the Oral & Practical examinations, particularly the Junior candidates — 11 out of 17 examined. The examiners have expressed their general concern at the apparent lack of preparedness by candidates for the examinations. The Board hopes that District Councils, and the employers of these candidates, might be able to co-operate in some way to ensure a better knowledge and wider experience by these candidates before they submit to examination. It is uneconomic for the Institute and the candidates for them to present themselves obviously before they are ready.

COMMUNICATION OF RESULTS AND COMMENTS TO CANDIDATES: To assist students the board has resolved to circulate to candidates the examiners' general comments on the examinations each year. The returning of marked answer papers to candidates was not approved by the Board.

PASS MARKS: The Board has re-affirmed its ruling that a candidate must obtain not less than 50% marks in the School Certificate examination subjects — General Science, Chemistry, and Bookkeeping — to qualify for a pass in these subjects for the purposes of the Institute's examinations.

JUNIOR MEMORIAL PRIZE: The Examining Board, and Dominion Council, acknowledge with thanks the donations received during the year, amounting to £67/4/- (to 31/12/59) towards the special Junior Memorial Prize Endowment Fund. It is hoped to build this fund up to £100 by soliciting further contributions. This special prize is a memorial of the sacrifice made by horticultural apprentices and young journeymen who gave their lives in World War II. The following names have been received of young men whose memory is revered and commemorated by this award:—

Morris George Edward Barnett.
Walter Lander.
Laurence William Treleavan.
Ian McNarey.

EXAMINATIONS IN BEEKEEPING: The syllabus for the examinations in Apiculture (Beekeeping) has now been finalised with the National Beekeepers' Association and should be ready for official gazetting early in 1960, after which the Institute will be able to proceed with the conduct of these examinations and the issuing of Certificates and Diplomas.

ACKNOWLEDGMENTS: The Examining Board expresses its thanks to all who have assisted them throughout the year in the successful conduct of the examinations:—

- (a) The panel of Examiners.
- (b) The panel of Examiners responsible for Oral & Practical Examinations.
- (c) The Christchurch Parks & Reserves Department for facilities and assistance with Oral & Practical Examinations.
- (d) The honorary supervisors at the centres for written examinations.
- (e) The Director and Officers of the Horticulture Division.

On behalf of the Examining Board,

H. D. GORDON, Chairman.

1959 EXAMINATION RESULTS

LIST OF SUCCESSFUL CANDIDATES

The subjects in which passes were gained are shown against each candidate's name in code numbers as follows:—

NATIONAL DIPLOMA IN HORTICULTURE — N.D.H.(N.Z.).

Junior Examination:

- (2) Bookkeeping.
- (3) Horticultural Botany.
- (4) Plant Protection Stage I.
- (5) Oral and Practical Stage I.

Intermediate Examination:

- (6) Principles of Botanical Classification.
- (7) Horticulture Stage I.
- (8) Special Subject.
- (9) Oral and Practical Stage II.

Diploma Examination:

- (10) Horticulture Stage II.
- (11) Plant Protection Stage II.
- (12) Oral and Practical Stage III.
- (13) Thesis.

NATIONAL DIPLOMA IN FRUIT CULTURE — N.D.F.C.(N.Z.).

Junior Examination:

- (3) Horticultural Botany.
 (4) Plant Protection Stage I.
 (5) Oral and Practical Stage I.

Intermediate Examination:

- (7) Horticultural Stage I.
 (15) Fruit Culture Stage I.
 (9) Oral and Practical Stage II.

Diploma Examination:

- (14) Horticultural Economics.

Auckland:

- Anderson, R. J. (N.D.F.C.), 3, 4, 5.
 Barber, E. M. (N.D.H.), 11.
 Curtice, R. L. (N.D.H.), 4.
 Fillmore, J. (N.D.H.), 2, 3, 4.
 Hubbers, P. J. (N.D.H.), 12.
 McLeary, W. H. (N.D.H.), 3.
 Otto, J. W. S. (N.D.H.), 8, 9.
 Robinson, J. A. (N.D.H.), 7, 11.
 Rogers, W. M. (N.D.H.), 13.
 Walker, C. M. (N.D.H.), 11.
 Wood, G. A. (N.D.H.), 12.
 Young, C. C. (N.D.H.), 2.

Christchurch:

- Aitken, N. A. (N.D.H.), 4.
 Bell, D. C. (N.D.H.), 7, 8.
 Drain, N. W. (N.D.H.), 11.
 Duthie, D. (N.D.H.), 3, 4.
 Gunn, G. S. (N.D.H.), 4.
 Martin, E. J. (N.D.H.), 6, 8, 9, 10.
 Millichamp, R. F. (N.D.H.), 2, 5.
 Paterson, G. (N.D.H.), 3, 4, 5.
 Scherp, L. A. (N.D.H.), 5.

Hastings:

- Thomas, T. S. (N.D.H.), 3, 4.

Hamilton:

- MacArthur, A. D. (N.D.H.), 5, 6, 8.

Levin:

- Dallenger, J. (N.D.H.), 6, 7, 8, 9.
 Van der Mespel, G. J. (N.D.F.C.),
 7, 9, 15.

Invercargill:

- Curson, A. D. (N.D.H.), 11.

New Plymouth:

- Jellyman, A. D. (N.D.H.), 5, 6, 8.

Roxburgh:

- Davy, R. G. C. (N.D.F.C.), 14.

Palmerston North:

- Baker, L. (N.D.H.), 2, 5.
 Boggust, R. (N.D.H.), 10, 11, 12, 13.
 Hunter, A. J. (N.D.H.), 3, 4.
 Laurenson, J. B. (N.D.H.), 9, 11.
 Ryan, H. H. (N.D.H.), 2.

Wellington:

- Carter, A. B. (N.D.H.), 3, 4.
 Cadigan, P. J. (N.D.H.), 10, 11.
 McGregor, I. A. (N.D.H.), 8, 10, 12.
 Robinson, W. D. (N.D.H.), 4.
 Walker, R. W. (N.D.H.), 4.
 Troy, T. P. (N.D.F.C.), 3, 7, 9, 15.

The following candidates have completed sections:—

Junior N.D.H.:

- A. D. Jellyman.
 A. D. MacArthur.
 G. Paterson.
 H. H. G. Ryan.

Final N.D.H.:

- R. Boggust.
 W. M. Rogers.
 G. A. Wood.

Intermediate N.D.H.:

- J. Dallenger.
 E. J. Martin.
 I. A. McGregor.
 J. W. S. Otto.

Intermediate N.D.F.C.:

- G. J. van der Mespel.

DISTRICT COUNCIL REPORTS

WAIROA

The April meeting of the Wairoa District Council of the R.N.Z.I.H. was attended by nearly 60 members. Appreciation was expressed by the president concerning the floral decorations arranged on the occasion of the opening of the Dargaville Town Hall.

It was also announced that, during the Vice-Regal visit, Lady Cobham allowed a dahlia, raised by Mr. E. Le Feuvre, to be named after her. The flower was of the semi-cactus group, white tinted mauve. It was raised from the variety "Dawn."

The official speaker for the evening was Mr. D. Purser of Whangarei, who spoke, on perennials and climbing plants. He laid special emphasis on those plants most suited for difficult positions, particularly in wet land and under shaded conditions. A vote of thanks was proposed by Mr. H. Gaukrodger.

WHANGAREI

February 1960

The February meeting drew a large attendance of members and visitors. A warm welcome was accorded Mr. V. C. Davies of New Plymouth who is chairman of the North Taranaki District Council. A number of new members were present.

Short reports on the Annual Conference of the R.N.Z.I.H. were given by Mesdames Sands and Martin, two of the delegates who represented this District Council at Rotorua. Full reports were to be made to the Executive.

Display Table: This was an especially attractive one, and well supported by members. Pride of place must be given to the beautiful basket of *Gardenia thunbergii* from the garden of Mr. and Mrs. Finch. This *Gardenia* is a native of South Africa, and is the hardiest of those grown in New Zealand. Though slow to come to flower, it is well worth waiting for. Mr. Finch's plant was grown from seed, is now about 8ft. high and at the peak of blooming carried about 250 flowers.

A beautiful large hybrid pink *Clematis* was grown by Mrs Lees of Kamo, and is catalogued under the name of 'Madame Beauchamp.'

A rare flower not previously known to be in cultivation in New Zealand was from the garden of Mrs. Sanson, Kamo. It was the double form of *Clethra arborea*, sometimes known as the Lily of the Valley tree, a most misleading name, as it is not in any way related to that plant.

Mr. R. Drummond was the guest speaker for the evening and entertained us with some lovely colour pictures of gardens, public and private taken on his recent tour of England, Scotland, Belgium, Switzerland, Canada and Honolulu.

We were astonished to see the great extent of commercial tulip growing at Spalding in England. Many of these pictures were reminiscent of fields in Holland. The azaleas at Kew gave us ideas for our own plantings, and we marvelled again at the extent of the roof garden on Derry and Toms' building in London. It looked like some country home with lawns, trees and flower beds and even a little stream all with only three feet of soil beneath them. A very up-to-the-minute home in Belgium, scarcely out of the builder's hands had its garden, lawns and paths complete to the last detail. In Switzerland we saw hotels and restaurants with enchanting arrangements of flowers in pots and baskets adorning entrances or hanging over lakesides. In Canada the autumn colour in trees was brilliant and almost unbelievable to eyes accustomed to evergreens throughout the year. Crotons in Honolulu in all their variations made us wish to be able to grow them outdoors as well as in glasshouses.

In all it was stimulating to see what is done in other countries, faced with such difficult and severe climatic conditions. We in Northland could do so much with our mild climate and plentiful rainfall.

March, 1960

The March meeting was addressed by Mr Alex Cameron, F.R.I.H.(N.Z.) his subject being the popular one — The Home Vegetable Garden.

Mr. Cameron opened his lecture by stressing the importance of home grown vegetables, and their superiority in food value over those bought in the market. Not only was this important for health reasons, but it was a great economy, saving as much as £2 per week for the average family.

Vegetables should be grown in smaller quantities, but in succession, so that a glut was not followed by a famine. A common mistake was to plant too many at a time, so that with cabbage and cauliflower for example, they all matured about the same time and some were wasted. Little and often was the remedy, and he showed two large panniers of vegetables, filled with two dozen varieties, all from his own garden. Keeping a garden diary with dates of sowings and plantings and notes on success or failure helped to prevent mistakes the following year.

The most important job in the vegetable garden, or in any garden, was to secure soil fertility and to maintain it. The vegetable plot should be situated in an open sunny position away from orchard or shade trees. Sow a green crop in autumn and dig it in when mature. Lupins, oats or mustard were recommended, the last being a preventive of wire worm. A plentiful supply of compost made from garden and household refuse was essential. This, with lawn clippings, blood and bone and cow manure should be dug in and covered lightly, always keeping all manuring agents near the surface.

A number of vegetable varieties were specially recommended. Scarlet runner beans were considered better for flavour than 'Fardenlosa.' Carrots with small cores were preferable, 'Chantenay' being one. An early tomato 'Rue du monde,' known in the trade as 'R.D.M.' was excellent, to be followed by 'Break o' Day' for main crop. In lettuce 'Mignonette' was a quick grower and a useful type.

Cultivation hints for success with vegetables were given. Never water lettuce during the heat of the day and keep water off the leaves. Cultivate and water on alternate days, never both on same day. Raise the beds a few inches for winter crops. Open drills for seed sowing to sun and warmth before planting. Use Lindane along the drills for carrots before sowing. This was a sure prevention of carrot fly. Make three thinnings of carrots. All plantings and sowings must be firm.

A good garden layout was illustrated on the blackboard. A plot 60 x 30 feet was adequate for the average family. A fence of wire or strong netting could be used for small fruits and vines which would increase the value of the area, without cutting off sun. Scarlet runner beans might be used on one fence with passion fruit on another. The species *Tacsonia van volxemii* or the variety of the ordinary black called 'Nellie Kelly' were recommended. A grape vine could also be utilised and feijoas would act as a wind break on an exposed side.

Shorter rows, more frequent plantings or sowings to obtain continuous supplies and the maintenance of soil fertility were the most necessary elements for success with vegetables.

QUESTIONS AND ANSWERS:

The following questions were submitted:—

Question: What is a good carrot for gum soil ?

Answer: 'Top Weight.'

Question: Why does a *Bignonia* (species not given) not flower though it has made good growth ? It is planted in a gully among trees.

Answer: Probably too much shade. Bignonias, and allied genera such as *Campsis*, *Pandorea*, *Pyrostegia* and *Phaedranthus* all need sun warmth.

Question: How can I get rid of Russian Comfrey ?

Answer: Spray with the hormone P 44.

Question: Is anything known about the use of mint for preventing attacks of the green vegetable bug.

Answer: A solution made by boiling mint in water has been effective. Lime sulphur and colloidal sulphur have both been found effective preventives of the green bug.

Question: A mandarin has become sickly and unthrifty ?

Answer: Cultivation too close to the plant has cut the surface roots and so given entry to disease. All citrus are surface rooting and care should be taken not to damage them.

Question: How can one deter cats from damaging garden plants ?

Answer: Household ammonia placed in small bottles sunk to ground level near plants which it is desired to protect. A small quantity to each bottle which may be renewed as necessary.

Question: Identification of a plant with cypress like foliage and pinkish flowers was sought.

Answer: This was a Tamarisk — very commonly grown in coastal areas, good in dry and sandy soil. Quite ornamental when in bloom. The botanical name of the genus is *Tamarix* and there are about 60 species found in many countries. One has become famous as a drought and sand resister and has been used to make a green belt around Broken Hill in N.S.W. a dreary and desolate area subject to very great heat and dryness. This is *Tamarix aphylla* coming from India. Several species are grown in N.Z. some spring and some autumn blooming.

Specimen Table: There were a number of unusual plants — *Acalypha hispida* a pot grown shrub from New Guinea was shown by Mr. Cates. It bore pussy tails of attractive red flowers. A white *Buddleia* with an exquisite perfume was much admired. As it is evergreen it is most likely a white form of *B. salwifolia* hailing from South Africa. 'Peace' is the name of a form of *B. davidii* recently introduced, but the plant shown came originally from the garden of the late Mrs. H. Given. Mrs. McInnes was the grower in this case.

Calocephalus Brownii a small shrub, with almost white stems is an effective and very unusual type for a dry well drained spot. It was displayed by Mrs. Christie.

An unusual and very well grown pot plant was brought by Mr. Christiansen. It was the species *Fuchsia thymifolia* native of Mexico with tiny thyme like leaves, as its specific name indicates. It bears tiny reddish flowers, but is attractive both in leaf and habit of growth.

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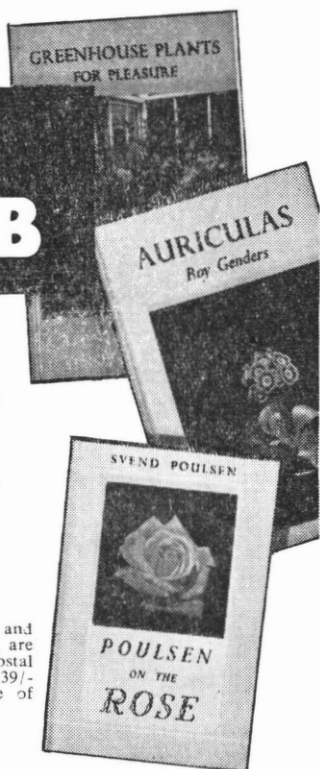
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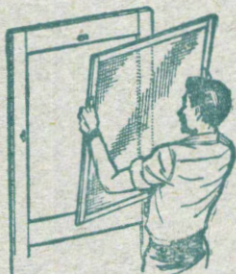
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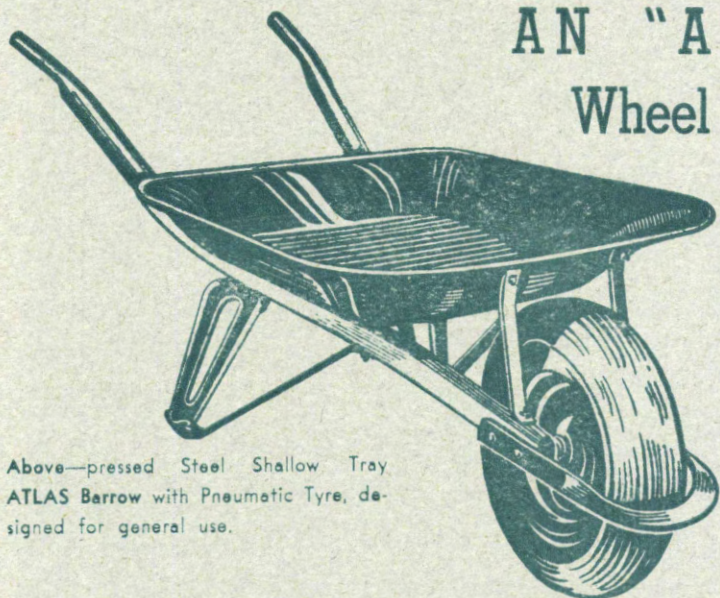
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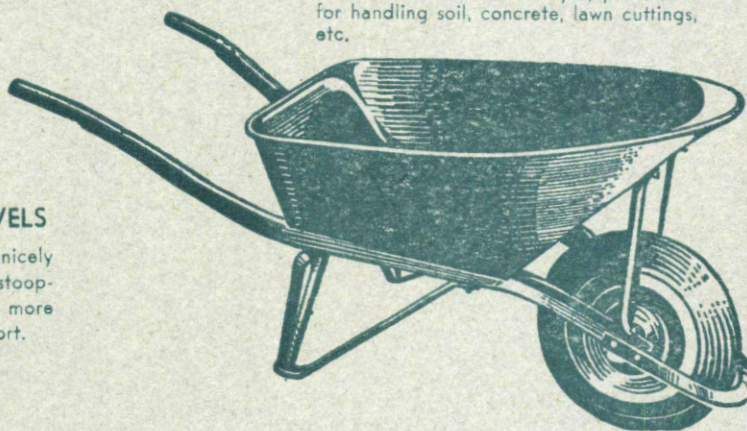
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