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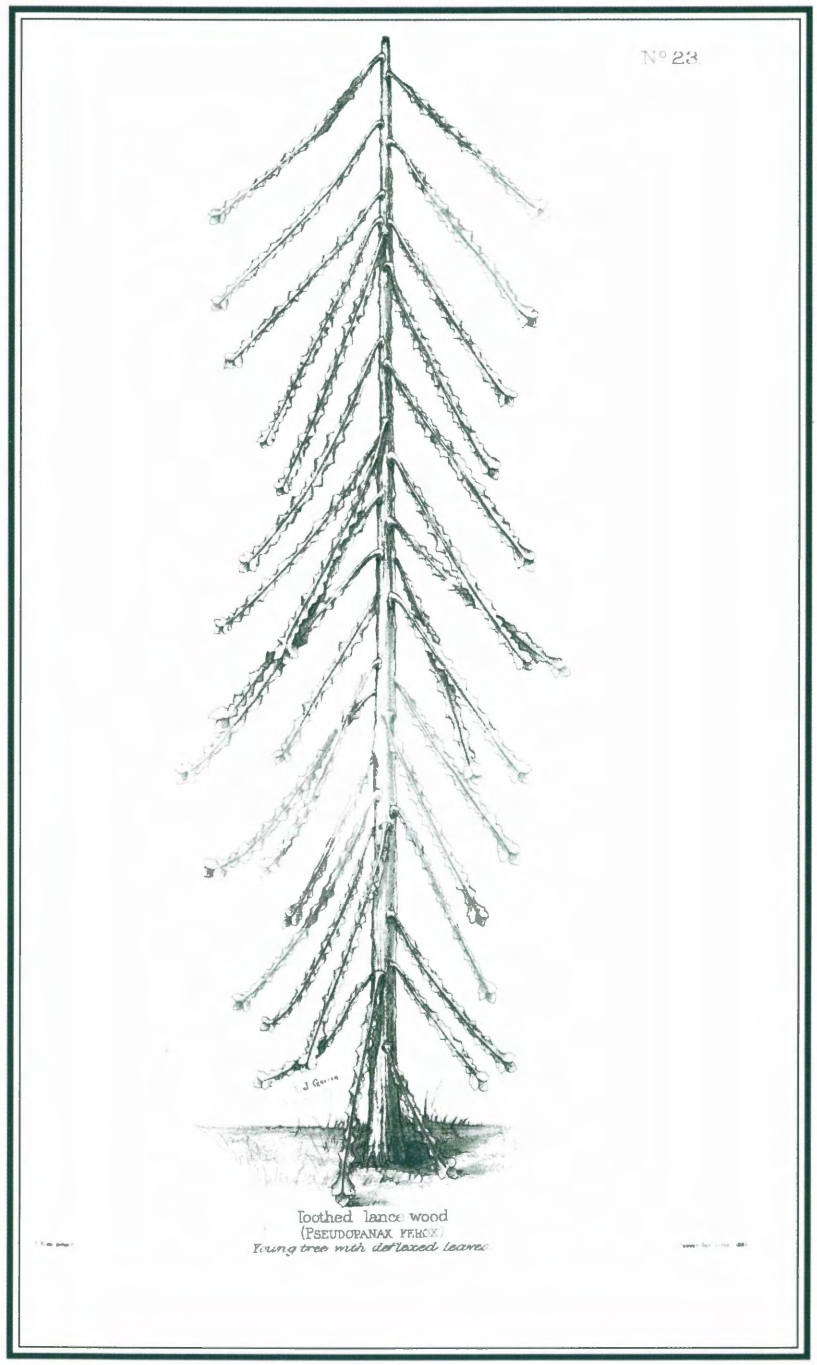

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Editor
Mike Oates FRIH

Contributors
Alice Lloyd-Fitt
R.A. Edwards
R.N. Rowe
M. Trought
Brian Molloy

Advertising sales
Mike Oates

Editorial Address
29 Mysore Street, Khandallah,
Wellington.
Ph&Fax (04)479 4453
Email derenzy-oates@clear.co.nz

ISSN 1173 7425

For Membership information please write to:
Royal New Zealand Institute of Horticulture,
PO Box 12,
Lincoln University,
Canterbury.
RNZIH@xtra.co.nz

Cover illustration: Toothed lancewood, (Pseudopanax ferox), young tree with deflexed leaves. No.28.
The Forest Flora of New Zealand, T. Kirk, 1889.

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'What to do with our girls?'

Women and the Occupation of Gardening

Alice Lloyd-Fitt

Gardening is generally regarded as a restful hobby or occupation which serves a retreat from the stresses of life, but gardening can also be associated with 'politics' in the widest meaning of the word. The history of gardens and gardening reflects the politics of the day if the term is used to describe the exercising of authority. The division of labour along gender lines is an example of the politics which rule everyday life. This essay seeks to review women's involvement in horticulture leading towards the adoption of gardening as a career.

The word garden comes from the old English word 'geard', meaning fence or enclosure and from 'garth' which means yard or enclosed piece of land. This etymology indicates that something or some one is being kept in or out of the garden and is reflective of the authority status of the gardener. Enclosure is essential to gardening and indicates possession of land. The act of cultivating or tilling the land has always been a central part of the European interpretation of land rights and ownership. Most garden history studies concentrate on the garden itself, rather than those who made it. When reference is made to individuals, it is usually to those who owned or devised the garden, not the people who actually laboured in it. Well known examples are the English landscape gardens of the 18th century designed by Humphrey Repton and 'Capability' Brown who often had whole villages displaced to make room in the new landscape. The men who carried out these massive works are rarely mentioned and if there was involvement by women, we have been left ignorant of it.

Gardening has traditionally been a low status, poorly paid occupation. In London during the 1880s a gardener's wage was less than half that of a dustman, bricklayer, labourer or street cleaner. So poorly paid and precarious was the occupation of gardening that in 1839 the 'Benevolent Institution' for aged and indigent gardeners and their widows was formed. Nineteenth century garden magazine editor and writer John Louden constantly called for better conditions and pay for gardeners. He compared an illiterate brick layer's wage of 5 to 7 shillings a day to that of a journeyman gardener who had studied botany, entomology and surveying of 2 shillings and six pence a day. Even head gardeners, who were frequently the only permanent members of the gardening staff, received about a tenth of a cook's salary and half of a footman's wage. Men were hired on a casual basis and reasons for dismissal were often as fickle as those recorded by William Anderson, curator of the Chelsea Physic Garden in 1815. John Hutchins was discharged as a dunce, Henry Wood for being 'too wise' and another for being a blockhead. With these conditions you might expect the profession to have accommodated women who were traditionally even lower paid than men, but paid gardening was almost exclusively a male domain.

Three of the first female gardeners at Kew in 1898, dressed in breeches as decreed after their earlier uniform of bloomers had been abandoned.
Royal Botanic Garden, Kew.

The gender division in gardening is as old as Western culture. In ancient Greece and Rome the role of women gardeners was to tend the vegetable beds. Democritus gave the following advice in the 5th century.

'Usually the growth of green stuff is checked by contact with a women. Indeed, if she be in the period of menstruation, she will kill the young produce merely by looking at it.'

In the middle ages women were relegated to weeding. In 1577 Barnabe Googe refers in his 'Foure Bookes of Husbandry' to women being able to be judged as good housewives by the state of their gardens.

'Herein were the olde husbandes very careful and used always to judge that where they founde the garden out of order, the wyfe of the house (for unto her belonged the charge thereof) was no good huswyfe'

The practice of separating food crops and ornamentals developed in larger gardens and by the 18th century this segregation had become complete with the vegetables hidden away in the kitchen garden. The role of women as care takers of the vegetable garden diminished and food production became the male domain. Women began taking respon-

The earliest group of women trainees in 1929 at the Dunedin Botanic Garden wearing the uniform of monogram blazer, white shirt, knee breeches and woollen knee socks. Left to right: (back) Bina Martin, Kathleen Partridge, Gretchen Williams, Edith Alexander, (front) Maud Howden, Eva Allen, Alma Browne, Collina Falconer and Louie Eason. Dunedin City Council Archives

sibility for the flower garden. William Temple outlined this trend in 1685 when he wrote,

'I will not enter upon any account of flowers having only to please myself with seeing or smelling them, and not trouble myself with their care, which is more to the ladies part than the men's.'

This division of labour along gender lines became firmly implanted and by the 19th century, flower gardening was being proposed as a healthy and moral pastime for young ladies. This belief is promoted by William Cobbet in his book *The English Gardener* published in 1829.

'How much better, during the long and dreary winter, for daughters, or even sons, to assist, or attend their mothers in a greenhouse, than be seated with her at cards, or in the blubberings over a stupid novel, or at any other amusement that can possible be conceived! How much more innocent, more pleasant, more free from temptation to evil, this amusement than any other ? ... the taste is fixed at once and it remains to the exclusion of cards and dice to the end of life.'

Such views were not exclusive to male writers and authorities. In Lousia Johnson's book 'Every Lady Her Own Flower Gardener' the writer advances the idea that single women should take up gardening as a distraction from 'the disappointments in life' and be content with raising plants instead of children. In the recent historical period, women gardeners have generally fallen into two groups, both usually unpaid. The first is the 'subsistence' gardener or cottager providing fruit, vegetables and herbs for their families. The other more prominent group is that of the 'lady gardener'. These were women of wealthy families or of independent means who gardened for pleasure rather than production of food or profit. Well known gardeners such as Ellen Willmont employed 86 labourers in her personal garden at Warley Place in Essex, England. Among other 'lady gardeners', Jane Louden, Vita Sackville-West and Gertrude Jekyll stand out as those who worked physically in their gardens as well as employing staff.

Although these women made a major impact in horticulture, the involvement of women in paid employment as gardeners remained marginal during the 19th century . Early references for paid work reveal that women were consigned to the lowly role of 'weeders'. During the 14th century, weeding women were paid 2 pence per day which was half the rate of a male weeder. By the 19th century this disparity had widened with women weeders receiving 8-9 pence per day compared to a male jobbing gardeners' rate of 5-6 shillings per day. Jennifer Davis emphasises this point in her recent book 'The Victorian Kitchen Garden' where she writes,

'Certainly there would have been no girl apprentices.

Equipped for work in the Native Plant Collection in 1930. Back left, Maud Howden, back right, Gretchen Williams, seated Alma Browne.
Dunedin City Council Archives.

If a woman were employed, she would have been a weeding woman, paid a pittance to spend hours on all fours scratching weeds out of the gravel paths with spiked tips of leather gloves. This was in order that every path would be immaculate for the owner and his family and friends when they walked around on tours of inspection. Women might also have been given casual work, picking off caterpillars or hoeing, but it was a man's world and the God within it was not the master of the house but the head gardener.'

One of the few women gardeners to be mentioned by name was Goody Hampton, employed by the naturalist Gilbert White. He writes of her,

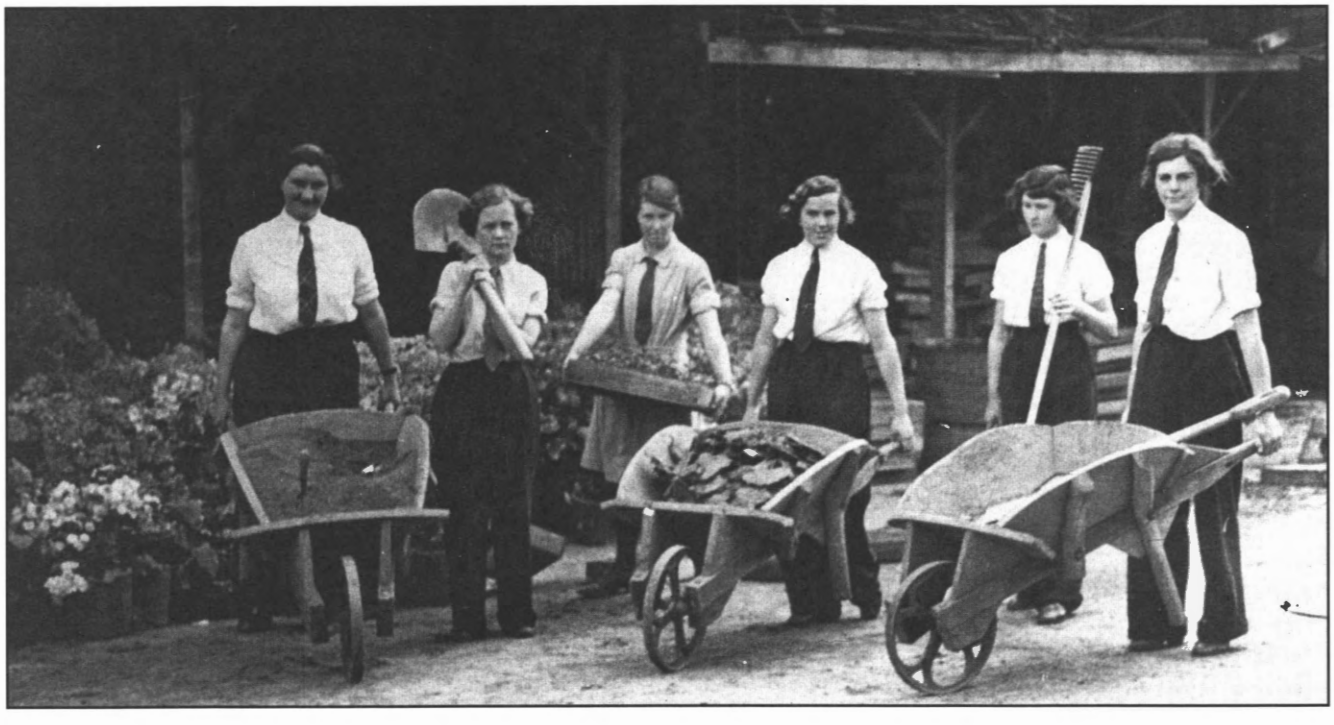
'Goody Hampton was employed as a weeding women in the summer months. She is a doughty worker and indeed excepting that she wears petticoats and has a child now and then you would think her a man.'

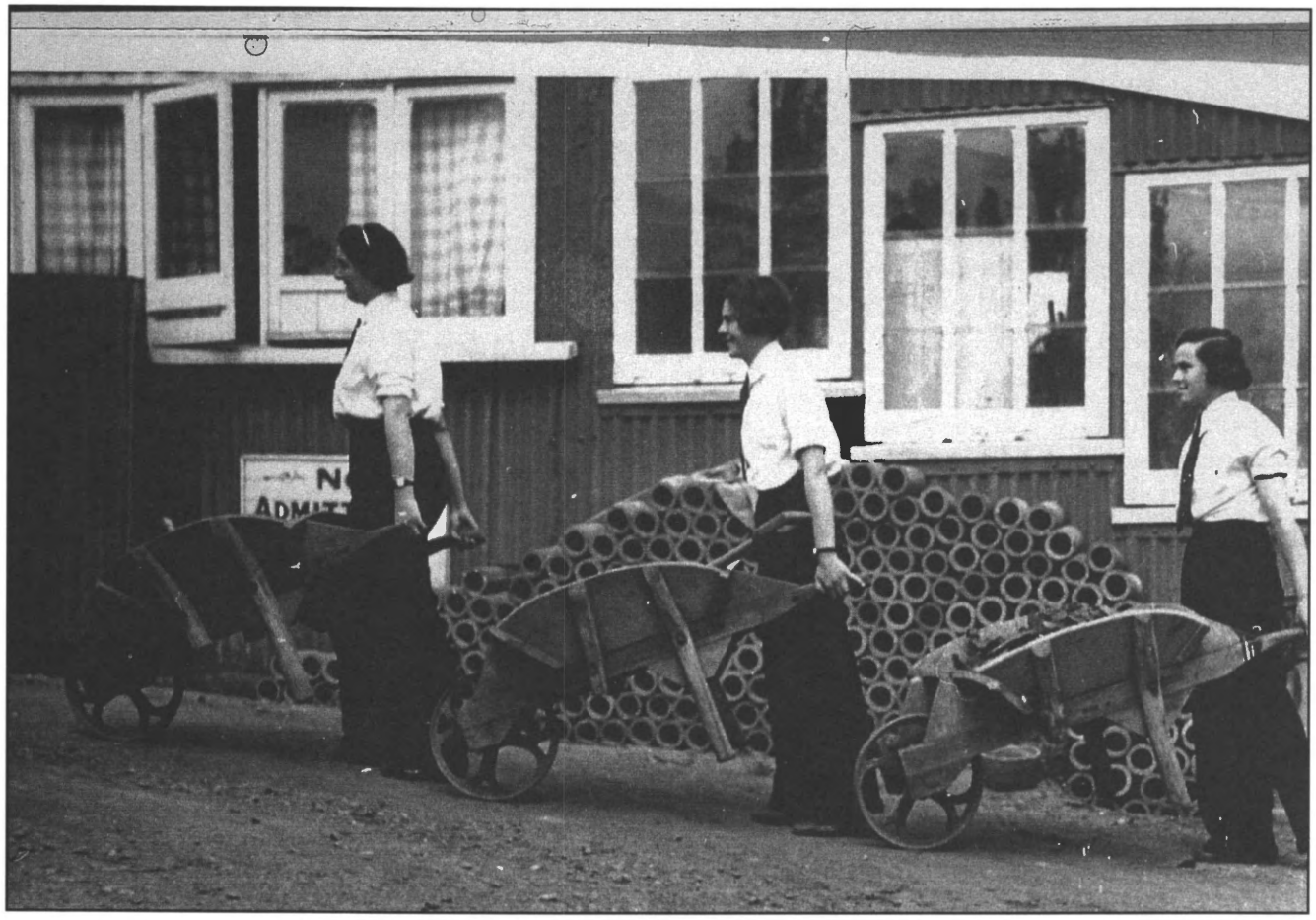
Regardless of how competent they were, no women gardeners received any formal training in European horticulture until the late 19th century. The horticultural college at Swanley in England, which first accepted female students in 1891, was totally given over to female students by 1903 when it had a role of 63. In 1897, the philanthropic Mrs Earle who visited the college wrote,

'Yesterday I paid a visit to Horticultural College at Swanley with its branch for women students. It immediately struck me as quite possible that new employment may be developed for women of small means out of the modern increased taste for gardening'

But not all were as supportive as Mrs. Earle. When Kew Gardens began employing women in 1895, they were made to wear clothing similar to that of an 'ordinary gardener' which was a uniform of thick brown bloomers, knee socks, boots, ties, waistcoats, tailored coats and peaked caps. The women were ridiculed by the press and mocked by the public. To avoid harassment, they were instructed to wear long mackintoshes to hide their bloomers on their way to work. A little rhyme popular at the time demonstrated the attitude of the public to this expression of independence.

The women in the later more formal uniform of 1930 with serge trousers, white shirt, and tie, ready for work armed with rakes, spades, plants and wooden wheelbarrows. From left to right, Alma Troup, Joan Denny, Joan Tasman-Smith, Eva Allen, Alma Browne and Gretchen Williams.





In front of the propagation sheds in 1931 before moving out to work. Left to right: Alma Troup, Joan Denny and Joan Tasman-Smith.
Dunedin City Council Archives.

They Gardened in bloomers the newspapers said,
so to Kew without waiting all Londoners sped,
from the tops of buses they had a fine view,
of the ladies in bloomers who gardened at Kew.

Paid work for women gardeners in the colonies was a little slower in developing. Burnley College in Victoria, Australia, began taking female students in 1911, including the now well known landscape gardener Edna Walling. In New Zealand the situation was similar with few women being employed in horticulture at the turn of the century. The 1911 census shows that 25% of New Zealand women were in paid employment. Of this 90,000 strong work force, 33,000 were in some sort of domestic service, 20,000 in factory work with the balance being divided between teaching, nursing and the commercial area. A small number of women had entered other fields. This census recorded 5 female draughtsmen, 4 coal merchants, 7 bee keepers, 74 actresses and circus performers, 29 doctors, 7 tea tasters but only one horticulturist.

Prior to the 2nd World War and the establishment of horticultural courses at Massey and Lincoln Universities, most training was provided by nurseries and gardens through apprenticeships or the R.N.Z.I.H. examination system. There was a marked reluctance to accept female trainees into these areas. The exception to this rule in New Zealand was Dunedin Botanic Garden which was established in 1863 but came into its own at the turn of the century under the guidance of David Tannock.

Tannock was appointed to the position of Superintendent of Reserves for Dunedin in 1903 out of a field of 95 applicants and at the time of his appointment was in charge of the Agricultural School and Botanic Gardens at Dominica in the West Indies. Tannock's vision was to establish a botanical museum for the education of the gardening public. He was a far sighted and liberal man who brought many firsts to the Garden including the employment and training of women. During his time at Kew Gardens he worked along side some of the first women trainees and was impressed by what they could offer to horticulture. He first began promoting the notion of female gardeners for the Dunedin Botanic Garden in 1916 during the labour shortages of the first World War. Tannock proposed that the positions left by men could easily be filled by women but the idea was not well received by the City Council. The cautious reply from the Town Clerk dated 3/7/1916 read,

'I consider that council is treading on thin ice in dealing with a proposal such as this, it may be doubted that the time has fully arrived when employment of female labour

at the gardens should be formally undertaken.'

Despite Tannock's efforts, the first formal appointment of a female trainee did not take place until 1924, a full eight years later. Joan Hogg from Invercargill began her training straight from school followed soon after in early 1925 by Mary Watt and Dora Nicholson. A further five women - Nan Lynn, Dorothy Boyd, Bina Martin, Wendy Foster and Edith Alexander, were employed by 1929. By 1930 the group had grown to eight and would remain at six to nine female employees for the next decade.

The women began to form their own identity wearing a uniform they had designed themselves of knee breeches, knee socks, tie, blazer and wooden soled clog style shoes. Embroidered on the pocket of the blazer were the letters D.B.G. around a stylized *Ranunculus lyallii*. Over the years the uniform changed to serge trousers, white shirt and tie in the mid 1930s and eventually to a simple outfit of jodhpurs and white shirt. Most of the women wore the uniform with one exception being Louie Eason who lived with an elderly aunt who disapproved of women wearing trousers. The other women thought the aunt might have appreciated the practicality of the uniform if she had seen Louie bending over the propagation frames.

This group identity developed further during the 1930s as the long term employees left for further careers or to raise families, and younger women were taken on. There was interest in the group from the popular magazines of the day and they were pictured in the Weekly News during 1935 in their uniforms working in the Garden. The article was entitled 'Still in the Nursery - but how different. What to do with our girls?'. The article reflected on the situation of what to do with women who had gained a degree of independence during the war years and were now reluctant to relinquish this new found freedom. Dunedin, the article claimed had the answer, 'make them gardeners'and for this group of women this is exactly what they wanted to be. The older women were mentors for these new employees and strong bonds were formed. The women collectively called themselves 'The Shed' for the simple reason that they were based in the propagation shed. They produced their own newsletter called the 'Shed Times' which contained horticultural and gardening information as well as gossip and puzzles. They socialised together and had what they called 'shed parties' to celebrate birthdays and other important occasions. These were held at one another's houses and usually excluded the male employees. They gave each other nicknames which indicated the informality of the group while strengthening the bonds between them. Gretchen Williams was Bill, Maud Howden was Tim (she came from Timaru), Alma Browne was Mike, Collina Faukner was Colin and - just to break the pattern - Eva Allen was Sally. Although the

Dunedin Botanic Garden female staff in front of the Winter Garden in 1993. Left to right: Barbara Wheeler, Robyn Freeth, Jane Wright, Merideth Malloy, Allison Jenks, Linda Hellyer, Alice Lloyd-Fitt and Marianne Grothius. Dunedin City Council Archives.

nick names were almost all male, the women insisted they were not trying to be masculine although they were doing male work and were proud to do so.

Tannock considered the women as serious horticulturists and they received the same pay as the male trainees. It was not a great amount, but equal none the less. They had the same opportunities for advancement as the men and, most importantly, they received the same training. Tannock encouraged all students to attend the lectures he gave on week nights and Saturday mornings at the King Edward Technical College which enabled them to enter the R.N.Z.I.H. examinations. Between 1929 and 1940 only 12 women in New Zealand gained any of the Institute's horticultural qualifications and 8 of theses were from the Dunedin Botanic Garden. Tannock also provided considerable on the job training and the students had access to his extensive personal library. The Botanic Garden library still has several of his books.

The work undertaken by the women was structured on seniority and experience. Newly arrived trainees carried out the more mundane tasks such as washing the terra-cotta pots. The day began at 7.30 a.m. and in the early years there was no morning or afternoon tea break. The day ended at 5. p.m. They worked mainly in the propagation department with some work outside, usually in the Azalea Garden, Rhododendron Dell, and Native Sections of the Upper Garden and occasionally in the Lower Garden. Each gardener was allocated a glasshouse to look after and the first part of the day was spent tending to this. The trainees would start in the unheated houses with the hardy plants while learning the necessary skills. The more senior staff were in charge of the tropical plants and orchids where considerable care and knowledge was required. Work outside was often undertaken in pairs or groups as there was some concern at young ladies working alone in the more remote parts of the Garden. At times the work was directed by the male supervisors but the women soon filled some of the positions reporting directly to David Tannock. Eva Allen, Nan Lynn, Wendy Foster and Gretchen Willliams were all appointed to supervising roles at various times.

The women's jobs were retained during the 1930s despite the rising unemployment of the depression era. Tannock and the women received some criticism as the Botanic Garden also provided work schemes for the unemployed men of the region. The number of female staff did not change noticeably until the Second World War when the staff were still predominantly female. After the war the situation was reversed and the number of women employed dropped dramatically due to the sentiment that jobs should be given to the 'boys returning home'.

Many of 'Tannocks girls' were able to further their careers because of the sound training they received. Two of the earliest women trainees went on to run their own businesses. Joan Hogg went to New York Botanical Garden in the mid-1930s and on returning to New Zealand set up a business with her sister Sylvia. Together they operated a nursery and tea rooms near Wellington. Dora Nicholson, a young widow with a family to support, established a successful nursery at St Clair in Dunedin. Dora was able to buy herself a car in 1929 after being in business for only two years. Mary Watt became a tutor at Ambler Horticulture College in North America. Bina Martin went to South Africa as guide on plant tours and later joined the staff of the Kirstenbosch Botanic Garden where she stayed for many years. After the Second world War Gretchen Williams returned to Dunedin Botanic Garden from the North Island where she had been working and teaching at Massey University. She became the supervisor in the plant propagation department where she stayed until her retirement in 1971. Collina Faukner became the gardener at Ashburn Hall, a private hospital in Dunedin. Joan Tasman-Smith and Pamela Long both became horticulture teachers and gardeners at New Plymouth Girls High School. Pat Middleditch, a well known and talented Dunedin florist, found her professional gardening background most useful in her chosen career. Not all the women stayed in gardening. Some changed careers and became teachers or nurses while others left to raise families or work on farms.

From these strong beginnings the Dunedin Botanic Garden has carried on its tradition of equal employment. Staff are appointed and promoted strictly on merit only, which might have something to do with the fact that six out of the seven current Plant Collection Curators at the Dunedin Botanic Garden are women.

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Dunedin City Council Archives

Otago Settlers Museum Archives

Using geotextile fabric bags for long term control of tree size

By R. A. Edwards, R. N. Rowe and M. Trought

Introduction

In 1993 a field experiment was set up at Lincoln University to determine if geotextile fabric bags could be used as a suitable long term method for controlling the size of ornamental trees. Geotextile fabric bags are in ground containers of varying sizes that have been used by the nursery industry to grow trees in. The bag is planted in a close fitting hole in the ground with the top 30-50mm of the bag sitting above ground level. The tree is then planted in media within the bag. The purpose of the bag is to allow easier harvesting of the trees at the point of sale. The trees are easier to harvest as the majority of the tree roots are within the bag and no wrenching is required. The net advantages cited are that a tree has a greater root : shoot ratio, which allows the newly replanted tree to re-establish more quickly in its new site. Estimates of root loss for trees that are wrenched can be as high as 90%, whilst estimates of roots growing within the bag volume are as high as 91% for one year old hollies (Ingram 1988). Suggestions that fruit growers can obtain more fruit on smaller plants have researchers and fruit growers interested in determining the potential of geotextile fabric bags for both vigour control and increasing yields.

Geotextile fabric bags

Geotextile fabric bags are commonly made of layered or felted, non biodegradable polypropylene fibres. The fabric has punched needle holes which allow roots to penetrate the fabric, but once roots expand beyond about 3mm in diameter the fabric constricts the root. The root outside the bag then dies and finer new roots of a second order develop inside the bag near the point of constriction (Root Control Systems Pty. Ltd., 1993). Some references imply that the nature of the bag restricts tree growth by continuously pruning roots, and that the effect of this is to 'bonsai' tree growth if trees are left in the bags too long (Sallee, 1987). Assumptions have also been made that the nature of the bonsai process may be linked to the creation of new finer roots within the bag through a process of root death and decay allowing new roots of a second order to develop, providing some sort of continuum which would allow the tree to remain smaller than it would otherwise be (Rowe, 1993). Geotextile bags have reportedly been successful in producing medium sized trees for transplanting, in producing a system that continuously root prunes, possibly acting in a similar way to the bonsai process. It has also been shown to produce higher fruit yields per cm trunk area than trees grown conventionally over a period of time (White, 1995).

Experiment at Lincoln University

Purpose of experiment:

To determine whether geotextile fabric bag use will control the growth rate of street trees or other amenity trees to reduce costs of conventional pruning techniques. If fabric bags work in a manner analogous to the way bonsai control tree size, this technique could open up new ways to manage trees in urban settings. Cost savings could be made in areas like Christchurch which has an estimated 42,000 street trees, with approx 30 new streets planted annually (Watson 1996). In the USA 40-50 million trees are pruned annually, producing 50,000 tonnes of biomass per day to dispose of at an estimated cost of $1.5 billion (Redding et al., 1994). Other options such as growth regulators to control tree size were not part of this experiment. Growth regulators while successful in controlling tree growth are potentially problematic in cities because of public concern about the use of chemicals.

Experimental Design:

In September 1993 an experiment was set up to evaluate the effect of four geotextile fabric bag sizes plus a no bag treatment with two media types on two different tree species. The experiment was a randomised complete block design.

- 4 bag sizes plus control (4l, 24l, 65l, 139l and 139l no bag)
- 2 media (potting mix and field soil)
- 2 tree species - *Dodonaea viscosa* 'Purpurea' and *Populus* x *canadensis* 'Tasman'
- 5 reps for each treatment

Materials & methods

Holes were excavated to the exact size for each bag volume and no bag treatment. Bags were planted slightly proud and filled with either soil or potting mix. Field soil from the area (Templeton silt loam with a pH of 5.6) or a bark / sand potting mix was used in the bag and no bag treatments. The potting mix was 80% crushed bark and 20% washed crusher dust sand. Lime was added to the potting mix to bring the pH to 5.2, slow release fertiliser was also added to the potting mix, but not to the field soil. Bulk densities for both mediums were measured, the soil at 1.11 and the potting mix at 0.75. Cuttings from a shelterbelt of *Populus* x *canadensis* ' Tasman' were struck before planting. Cuttings were of a uniform length and diameter with small variation in size. The *Dodonaea viscosa* 'Purpurea' were a seed line of uniform size grown in the nursery at Lincoln University. Trees were planted 3m apart in each row and

rows were 3m apart. The ground beneath the trees was kept clean with both desiccant and translocated herbicides as required. In the field a dripper irrigation system was set up with emitters capable of supplying one litre per hour per tree. Irrigation was only supplied over summer when thought necessary. The experimental area was fenced with electric rabbit fencing. Toward the end of the first season's growth some of the *Dodonaea* were being rocked around by the wind so a decision was made to stake all trees. The trees were staked using 2 stakes outside bags at standard distance apart, flexible bicycle tube was used to tie trees. Measurements were made throughout and at end of each growing season for height and trunk diameter. (Marks were painted on the trunk at a standard height, these were re-applied as the trees grew). The *Dodonaea* were harvested at the end of two seasons growth and the *Populus* at the end of the third seasons growth. Final measurements at harvesting included fresh and dry weights. Calculations were made to establish how the bulk density of the medium within bags altered based on increasing root volume. (Measurements were analysed using Minitab for analysis of variance and graphs were produced on Sigmaplot).

Main Results:

a) Media effect

- Early results showed there was a media effect on both species of trees. Trees in potting mix grew taller and had larger trunk diameters than those in soil.
- Toward the end of the second season and in the third season, the rate of growth for height and trunk diameter reduced or was less for trees in potting mix compared to those in soil.
- At the end of the third season all measurements for poplars showed the trees were larger if grown in potting mix. This was mainly a result of the faster growth initially, but it is interesting to note the plants were able to maintain that advantage.

b) Bag size effect

- Early results showed bag size had little influence on the growth of either tree species.

- Later results showed bag size had major effect with small bags restricting height, trunk diameter, fresh and dry weights more than larger bag sizes.

The largest trees at harvest were the trees grown with no bags.

c) Changes in the bulk density of the media

After harvesting poplars at the end of three seasons growth, measurements of weight by volume displacement of root systems were made. Assuming no loss of media during the growing period, calculations showed media compaction was at extreme levels in the smallest bags, slightly less so in the next size up and least in the largest bags. Morris & Lowrey (1988) showed a compacted loam reducing growth would have a bulk density of 1.45. Mean bulk density levels in the smallest bags in this experiment was calculated to be 1.803 after three seasons growth. See Table 1. (Calculations used the Original Volume / Current volume - Root Volume). Changes in root within bag: shoot ratio, and tree size were strongly related to bag volume and media compaction. The root within bag: shoot ratio increased with bag size, suggesting that the trees in smallest bags at time of harvesting were under the greatest stress. (Media compaction was strongly related to media composition and initial bulk density). The root: shoot ratio was also strongly influenced by media type.

Table 1. Media compaction index calculated for poplar after three seasons growth

Bag volume (L)	Bulk density at harvest gm/cm³
4	1.803a
24	1.148b
65	1.065b
139	1.026b

P = 0.018

LSD = 0.53 (level of significance 0.05, figures with the same letter are not significantly different).

d) Change in fabric under pressure

Tests on the geotextile fabric bags showed the nature of the fabric altered when subjected to lateral tension from within, as occurred with secondary root thickening within the bag over time. Needle punched holes reduced in both number and diameter as lateral tension was applied. The reduction in pre- punched hole size and hole number is thought to reduce the possibility of new roots exiting the bag as they would have done in the early stages of growth before the bag comes under any tension. (Plates 1 and 2).

e) Root escapes

For the purposes of this study, root escapes were defined as roots that emerged from the bag wall and appeared to be able to grow more or less normally as for a non bagged tree. Root escapes were able to grow normally in length and in diameter. (Restricted roots that grew through the bag fabric did not grow normally in the sense that they are constricted by the geotextile fabric).

- The greatest number of root escapes measured at harvest were from trees grown in potting mix. It was observed that roots in the larger bags containing potting mix were more likely to grow back in toward the trunk or in any direction compared to field soil where the roots tended to radiate directly from the trunk to the bag wall.

- In some of the smallest bags often just one escape was produced, ultimately causing the tree to blow over in high winds as it pivoted on the one major root. (Plate 3).

- Root escapes all exited the bag wall obliquely (Plate 4), whereas restricted roots grew directly through the wall. Roots restricted in what could be described as the normal or expected manner exited the bag fabric at more or less right angles to the fabric.

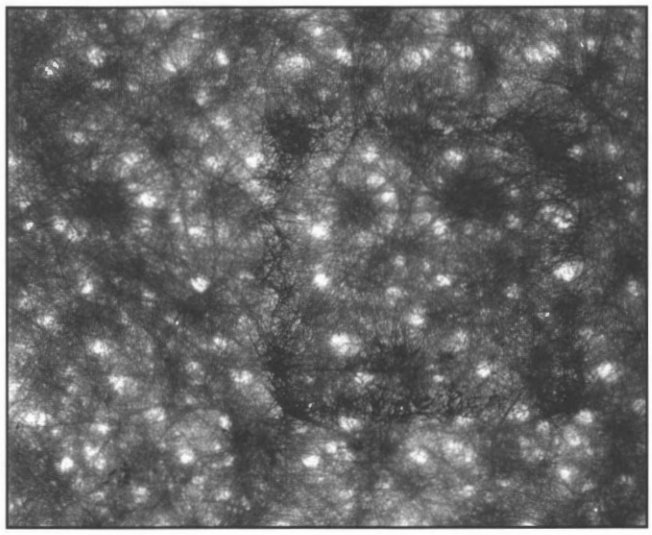

Plate 1 Geotextile fabric showing needle punched holes - no lateral tension applied. (The square represents 1cm² mag.50x)

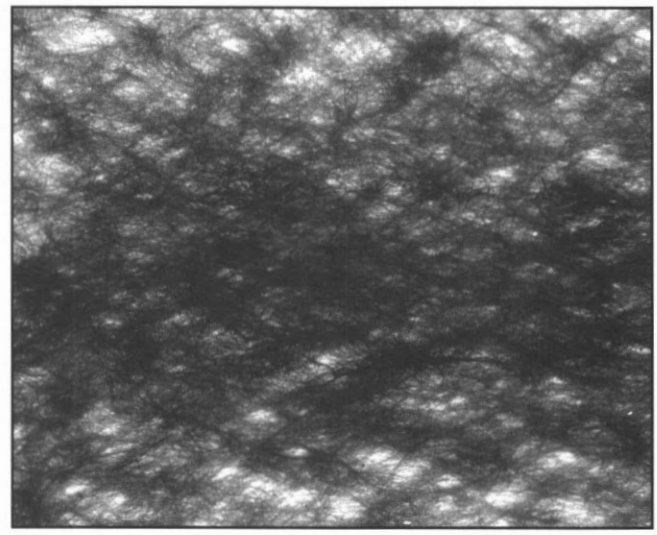

Plate 2 Lateral tension applied (20 newtons) in the direction at right angles to the holes (mag 50x)

Conclusions

- Growth restriction by geotextile fabric bags is a different process to that of bonsai. See Table 2
- Different media had an effect on the speed of growth for both species
- Secondary thickening leads to change in bulk density in the medium within the geotextile fabric bag
- Increasing bulk density appears to be a major factor effecting growth rate changes as trees get older.

- Geotextile fabric bags will eventually restrict growth, a smaller bag size has an effect sooner than larger bag sizes. It is not known how large a bag would need to be to have no perceptible effect on tree growth.
- Bag fabric alters as it comes under increasing internal pressure, with the number and size of pre punched holes reducing, in turn the bag appears to acts more like a root impermeable container. This effect is thought to occur faster with smaller bags.
- A second experiment showed with the bag fabric that sits above ground level that there was no wicking effect of water being drawn away from the bag. Bags do not act as wicks drawing moisture away from the root system

Plate 3. Tree blown over after pivoting on a single large root escape

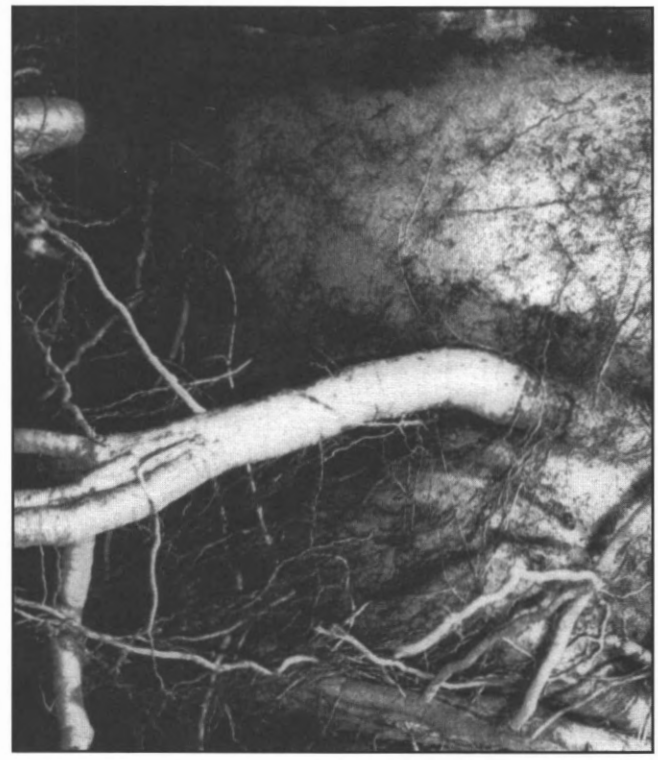

Plate 4. Root escapes exit the bag fabric obliquely, greatest numbers were in potting mix in large bags

• The process of restriction, causes secondary root development leading to root escapes. Roots growing through the bag fabric were restricted once the diameter of the root in the fabric appeared to grow to about 2mm. This then caused the affected root to produce swollen roots on either side of the constricted root portion within the bag. From the swollen restricted root within the bag new laterals were produced. These roots were now growing in the direction of the bag wall circumference. In many instances roots were observed to have grown into the fabric itself and along the bag wall. Once the root was able to do this, and with increasing length within the bag fabric, an increase in root diameter easily split the bag fabric. This led to a root escape, which in all cases emerged from the bag wall obliquely. The thickness of the geotextile fabric walls which allowed unrestricted root growth laterally within the fabric was the weakness in the bag that allowed the tree to produce root escapes.

• Trees in small bags tended to produce only one root escape. This was in contrast to large bags where many root escapes occurred. Even though the fabric to volume ratio was greatest for the small bags compared to the large bags, the volume of the smallest bags meant media compaction occurred more quickly and the bag fabric would stretch more quickly reducing the number and size of the needle punched holes within the bag fabric. The total amount of fabric available for roots to grow laterally into was significantly less than for the larger bag. The single root escapes that occurred in the smallest bags lead to trees toppling as they pivoted on that root escape in high winds. The likelihood of the tree being blown over is also increased once the root escape begins to allow the top of the tree to grow larger again as the effect of root restriction is lost. In larger bags where many root escapes occurred the trees may remain stable in the ground, but it would appear that the restriction effects of the bag would be lost as roots again grew in an unrestricted manner.

The suitability of geotextile fabric bags for controlling urban tree growth

The current bag design appears unsuitable for long term growth restriction for street trees or urban trees generally. Improved bag design that reduces the potential for roots to enter the fabric laterally may restrict the roots more effectively. There is a need to determine what size bag volume would be suitable for a particular tree size for any particular species and over the long term more careful management of the media type to reduce compaction and bulk density may be critical. There is another problem, which while not part of this experiment may be an issue with urban trees. Excess carbohydrate produced by a root-restricted tree, but not able to be stored in a limited root volume, may be shed more freely as botanical fruit. In urban trees, excessive fruits are often seen as messy trees and this may present another problem with this method of restricting tree growth. Edible fruit trees that unload carbohydrate through high levels of fruit may be suitable for growing in bags for the longer term as reports suggest, but growers of these trees should also be aware that root escapes may occur based on the Lincoln experience.

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Table 2. The difference between the process of restriction by geotextile fabric bags and that of bonsai.

Bonsai system	Geotextile fabric bags
Container depth to diameter shallow	Container depth to diameter greater.
Container walls impermeable to root growth, therefore the space available is simply the volume within the container itself.	Container walls are permeable to root penetration, the roots are free to exit the bag exploiting a volume considerably larger than the bag volume up until the period when constriction occurs. Linear, in bag restriction was not significant in *Populus* until the end of the 3rd growing season, and in *Dodonaea* harvested after 2nd season .
Process of bonsai cuts roots and removes media from just inside container annually allowing space at periphery of roots to grow each year.	Roots occupy space in bags until max. volume is filled. Media in bags becomes highly compacted. Geotextile fabric is placed under increasing tension internally, needle punched holes become occluded, reduce in number and diameter.
Roots removed equate to biomass lost, which is replaced from within the plant, helping control total tree growth.	No roots are removed from the system during growth in the manner of the bonsai system.
Roots removed from container, allowing regeneration and high root tips to root length ratio to occur.	Roots kept inside container, regeneration eventually slowed. Ratio of root tips to root length variable.
Roots form normally radiating outward from the trunk.	Roots radiate outward from the trunk initially, but when restricted may orientate in any direction within the bag.
Restriction occurs inside container.	Restriction occurs outside container.
Roots are relatively similar in size and are evenly balanced around the base of the trunk.	Root escapes may lead to the formation of just one large root escape as observed in the *Populus*
Root tip to root length ratio may be kept relatively constant over much of the life of the tree.	Root length to root tip ratio, may change in favour of high root tip number to root length only after the bag volume has been largely exploited in terms of available space.
Growth is slow and appears to be more uniformly incremental. Continual creation of a small space at the periphery of the roots allows for longevity.	Initial growth may be rapid and slows only as the system is restricted within the bag, the inability to clear space for new growth will leads to root escapes or senescence and death .
The aerial parts of the tree remain in a physiological balance with the root system through the life of the tree.	Ultimately the architecture of the aerial parts of the tree will be out of balance with the root systems ability to service it, leaves and shoots will have to be closed down to match the now seriously compromised ability of the root system.

THE 1997 BANKS MEMORIAL LECTURE

History and Management of Riccarton Bush

Brian Molloy

Fig. 1 Aerial view of Riccarton Bush in 1973 (NZ Aerial Mapping)

Riccarton Bush, in the heart of the city of Christchurch, is arguably one of the oldest and best documented protected natural areas in the country (Fig.1). That this 7.8 ha remnant of kahikatea floodplain forest has survived natural catastrophes and the impact of two human cultures is extraordinary to say the least. It has done so largely by a combination of its own intrinsic qualities and the foresight and dedication of committed people, beginning with the Scottish settlers William (1816-1851) and John (1820-1854) Deans in 1843.

Today, Riccarton Bush stands as a constant reminder of the city's natural and cultural history, a living museum of native plants and animals, a storehouse of information on forest management, both good and bad, and an example of documentation by natural historians and others. Much of this information is captured in the book *Riccarton Bush: Putaringamotu* published by the Riccarton Bush Trust in 1995 (Molloy 1995). Here I want to focus on the management and sustainability of Riccarton Bush, but first a few historical and biological tidbits taken from the book to set the scene.

SOME HISTORICAL FACTS ABOUT RICCARTON BUSH

- Prior to European settlement of Christchurch (Otautahi), the Riccarton Bush area (Putaringamotu) was occupied by Ngai Tuahuriri, an influential sub- tribe of Ngai Tahu with headquarters at the famous pa of Kaiapoi.
- Putaringamotu was one of a number of ridges or wakawaka in the vast swampy area of Otautahi, occupied by the whanau who had the tribal authority to live there.
- 1836 – First recorded European sighting of Riccarton Bush by Captain William Rhodes of the barque *Australian*.

Fig. 2 Profile of Riccarton Bush showing emergent trees of kahikatea

• 1840-41 – First attempt to settle near Riccarton Bush by James Herriot and party.

1840-41 – First attempt to settle near Riccarton Bush by James Herriot and party.

• 1843 – William and John Deans settle at Riccarton Bush with the permission of the Maori owners, signing a formal lease agreement in 1846.

• 1844 – First sketch of Riccarton Bush and the Deans' farm by John Barnicoat, followed by the first map of the same in 1845 by Charles Meryon of the French corvette *Rhin*.

• 1848 – Putaringamotu passed from Maori ownership to the Crown by virtue of Kemp's Purchase, and later that year the Deans' brothers were granted 400 acres there, including Riccarton Bush, but the timber on one half to be the property of the New Zealand Company.

• 1849 – First survey map of the Deans' farm and Riccarton Bush drawn by Charles Torlesse, followed by the first photograph taken in 1860 by the celebrated Dr. Alfred Barker, and the first published list of plants of Riccarton Bush by John Armstrong in 1870.

• 1914 – Riccarton Bush (6.4 ha) gifted to the people of Canterbury by the Deans' family, and the Riccarton Bush Act passed incorporating a Board of Trustees and setting out their responsibilities and the conditions of the Deans' family gift.

• 1947 – Riccarton House and grounds (4 ha) and the remaining 1.4 ha of Riccarton Bush added to the reserve by purchase, followed in 1975 by the purchase of the historic site of the Deans' original houses and other buildings (3 roods 12 perches).

• 1989 – Amalgamation of Christchurch local authorities ushering in a new era of funding and administration of the Riccarton Bush reserve by the Board of trustees.

SOME BIOLOGICAL FEATURES OF INTEREST

• Riccarton Bush is the last in line of similar forests that occupied the site of Christchurch over hundreds of thousands of years between successive ice ages. The remains of these ancient forests lie buried beneath the city between layers of glacial outwash and alluvium like a giant club sandwich.

• Over the last 15,000 years, fires, floods and changing sea level were major factors in the history of the vegetation of Christchurch. The last major flood of the Waimakariri River to affect the site of Riccarton Bush occurred about 3,000 years ago, and the last major fire to affect the Bush, presumably lit by the Maori occupants, occurred about 240 years ago. By the 1840s Riccarton Bush covered a mere 22 ha, largely as a result of periodic fires.

• Kahikatea is the dominant tree of Riccarton Bush, and at the last census (1978), 478 adult trees were counted, with a mean height of 25 m, a mean diameter of 58 cm, and a maximum-recorded age of 550 years, although some of the larger specimens may be older (Fig.2).

• Kahikatea trees are wholly male or wholly female throughout their life. In Riccarton Bush the ratio of males to females is 1:1, the sexes are evenly dispersed, and male trees are larger than females.

• At the last census (1993), 71 species of native trees, shrubs, lianes, and herbs were recorded from Riccarton Bush compared to 73 in 1870. There is also a good representation of ferns, mosses, liverworts, lichens and fungi.

• Riccarton Bush is the southern limit in eastern South Island of hinau, and along with Banks Peninsula, the southern limit of titoki and the native passion vine or kohia.

• Lying within the "Garden City", Riccarton Bush is open to constant invasion by introduced plants, some recorded here as naturalised plants for the first time in New Zealand. At the last census (1994), 188 species were listed; more than twice the number of native species, although most occur in very low numbers.

• About 300 species of moths and butterflies have been collected from Riccarton Bush between 1859 and 1996, and the Bush is the type locality for several genera and species. The Bush also has a rich scale insect fauna and still harbours a few geckos.

• Between them John Deans and Charlotte Godley, who lived alongside the Bush, recorded the following native birds in the 1850s: kaka, kereru, tui, bellbird, South Island robin and kakariki, Today the kereru, fantail, warbler and whiteeye are the hardy survivors.

Fig. 3 Jane Deans in later life (Deans family).

SURVIVAL AND PROTECTION OF RICCARTON BUSH

When the Canterbury Pilgrims arrived in December 1850, Riccarton Bush and four similar patches at Papanui, Woodend, Kaiapoi and Rangiora were the sole survivors of a former widespread forest reduced by floods and Maori fires. By July 1851 that part of Riccarton Bush available to the Pilgrims by agreement had been cut down, and by the early 1860s little remained of the other remnants.

From the beginning, the Deans' brothers used the timber resources of Riccarton Bush judiciously. When William died in 1851 the responsibility for safeguarding the Bush fell upon his younger brother John, and when he died in 1854 the stewardship passed to his young wife Jane. On his deathbed, John expressed the wish that every effort should be made to preserve the Bush from destruction. That Jane carried out this wish implicitly is now well documented, and we owe this somewhat frail but determined woman our deep gratitude (Fig.3).

Some doubt has been raised over the motives of the Deans' brothers in retaining the Bush. As both have been dead now for almost 150 years, we can never know their personal motives. But let Jane speak for the brothers on this matter (Deans 1882):

"The remaining part of the Bush has been preserved as well as possible, in accordance with the late John Deans' wishes, no timber being now cut up except fallen timber, which is used for fencing purposes, the aim being to preserve the Bush as long as possible; it has been planted round and throughout with forest trees wherever timber has been cut for building purposes, the gaps being filled with oaks, ashes, elms and gums, etc, as the soil appeared suitable for one or the other. *This was done before Sir J. Vogel enunciated his "Native Forest Preservation' scheme."* (italics mine)

There is no doubt in my mind that conservation was the real motive behind John Deans' wish, and in this he showed remarkable foresight. The same motive was undoubtedly behind the purchase of 40 acres of untouched bush at Peel Forest, South Canterbury, in 1881 by Arthur Mills who was appalled at the wanton tree-felling there. Indeed, conservation began very early in New Zealand's history, and we should freely acknowledge that. The formal protection of Riccarton Bush in 1914 was spearheaded by prominent citizens of Christchurch, among whom Harry Ell of Summit Road fame and the eminent botanist Dr. Leonard Cockayne were foremost. Thus the deathbed wish of John Deans had finally come to pass.

EARLY MANAGEMENT OF RICCARTON BUSH

During the Ngai Tuahuriri time of occupation, Riccarton Bush or Putaringamotu was a much-valued resource of plants and bird life. The likely impact of Maori use is difficult to assess and is very much open to speculation. Judging by early European descriptions of the Bush, the impacts appear to have been minimal, apart from the reduction in area by fires.

During the 70 years of occupancy by the Deans' family, certain events and decisions taken were to shape the future of the Bush. Foremost was the felling of half the Bush by the Canterbury Pilgrims by agreement – one of the country's first examples of cutting rights. This clear-felling, together with the selected removal of kahikatea, totara and matai for building purposes, created a fresh boundary to the Bush and several large canopy gaps in the interior. To help offset the exposure of the Bush to the elements and to encourage the re-growth of native species, Jane Deans arranged for introduced trees, mainly oak and ash, to be planted along the boundaries and in the internal gaps from the late 1860s onwards. As Jane Deans noted, the introduced trees did well in the Bush, but instead of protecting young native plants, they tended to smother them out by their shade and fallen leaves.

FIRST SIXTY YEARS OF TRUST BOARD MANAGEMENT

- 1914 – Riccarton Bush Trust Board took over the responsibility of the Bush, appointed its first ranger and decided not to open the Bush to the public until boundary fencing was completed, gates installed, a preliminary walking track put in place, and unwanted debris cleared.

Fig. 4 Interior of Riccarton Bush c.1915 (J.W. Bird).

• 1917 – Riccarton Bush opened to the public on 24 February 1917 by the Governor, Lord Liverpool. That same year the first plan of the Bush showing its present and former boundaries and the initial system of walking tracks was drawn up for the public's benefit.

• In 1914, and for many years afterwards, the Bush was in a dilapidated state (Fig.4), and where trees had been extracted the associated debris and rapid growth of smothering climbing plants required much attention. Unfortunately, the Bush was treated like an English woodland, much of the debris was gathered up and burnt on the spot, and grassy clearings and the forest floor were regularly mown to produce a 'tidy' appearance.

• Initially the Bush was bounded by farmland. From 1925 onwards, this farmland was sold and sub-divided for residential housing. Over time, gates appeared along the boundary, private tracks were formed, garden refuse was dumped in the Bush, and excess runoff water accumulated. Apart from draining the excess water, these problems remained unresolved for many years.

• When the Trust Board took over in 1914 parts of the Bush were over-run by undesirable plants such as elderberry, blackberry, sycamore and many others. Disturbed parts of the Bush provided an ideal environment for this alien flora and the control of these unwanted plants has been an ongoing but important task.

• The initial track system became a permanent feature of the Bush and required constant care and attention. Some parts were systematically built up with hardfill, which introduced drainage problems in later years.

• Exotic trees planted in the Bush interior by Jane Deans were gradually removed, and by 1952 the last of these trees were felled. Some of the rotting stumps can still be seen today. The main border of oak and ash along the Bush boundary remained intact.

• The most extensive damage to the Bush during this period occurred in July 1945 when 45 cm of snow lay upon the ground in the city and suburbs. The debris in the Bush resulting from this storm was still being cleaned up in the late 1950s.

• The introduction of native plants to the Bush was one of the most critical activities carried out in this first phase of management. Sadly, it lacked adequate guidance and documentation, with the result that species not native to the region were often planted, in many cases the sources of plants were unknown, and hybridisation occurred between resident and introduced plants. One of the more invasive species, the North Island lacebark (*Hoheria sexstylosa*) became firmly established, displacing many of the local native trees and hybridising with the resident narrow-leaved lacebark (*Hoheria angustifolia*).

THE LAST TWENTY-FIVE YEARS

From 1974 the Trust Board adopted a fresh approach to the management of Riccarton Bush in an attempt to turn around the unnatural and damaging effects of the previous 'woodland' phase, and to address other problems. As each

Fig. 5 Grassy clearing planted in 1978 (Robert Lamberts).

Fig. 6 View from the same point in 1989 (Robert Lamberts).

project was undertaken, the public was kept fully informed and their support has been consistently strong.

• The boundaries of the Bush have now been secured by new fencing, thus eliminating private gates and walking tracks and the dumping of rubbish.

• A thorough soil and groundwater survey of the Bush has been completed, and the legal boundaries re- surveyed; both essential for management purposes.

• The problem of surplus water from adjoining properties has been resolved, and the ponding effect of the network of compacted tracks corrected.

• In 1974 the Bush was grossly over-tracked to the detriment of the forest environment and public use. Many of the tracks have now been closed, parts receiving the greatest use were replaced with concrete paths to provide an all-weather surface, especially for disabled folk, and a new boardwalk was constructed through the least disturbed part of the Bush.

• From 1974 the practice of gathering up litter and burning it in the Bush was stopped and all litter, including large fallen trees, is now left to rot naturally. The resultant build-up of forest litter has had a marked beneficial effect on the flora and fauna of the forest floor especially, and the micro-environment generally.

• From 1974 the practice of mowing grass clearings and the forest floor was also stopped. This practice was responsible for eliminating native climbing plants such as the white rata and white clematis, which were never abundant, and had caused considerable damage to the butts and large surface roots of kahikatea in particular. Fortunately most of this damage has callused over, although a few trees are now suffering from advanced butt rot

.• New entrances, signs, brochures and other items of interpretive value have been put in place, and a variety of studies are encouraged and supported

.• A consistent approach to the control of troublesome weeds and pests such as "urban" possums and domestic cats has been adopted, with considerable help with weed control by local groups

.• In 1975 the felling of oaks and other introduced trees on the Bush boundary was begun, and completed in 1984. This project, not without controversy from some neighbours, was carried out in stages and the cleared areas were prepared for minimal planting, allowing the Bush to spread naturally to the boundary of the reserve in the years ahead.

• In 1975 work began on the establishment of a nursery for propagating plants from seed sourced entirely from the Bush. Over the following years numerous plants of understory trees such as karamu, ribbonwood, matipo, mapou, lemonwood and others were planted in clearings and along the boundary to provide initial shelter for naturally spreading trees to establish and to suppress the growth of grasses and other weeds.

• Initial plantings in 1975 were monitored from fixed photo points, and their subsequent growth proved to be rapid and dramatic (Fig.5).

• More recently a large-scale project removing the North Island lacebark from the Bush has been undertaken with considerable success and with the help of local organisations and interest groups.

• It is anticipated that the practice of new planting in gaps throughout the Bush will continue for several years yet, and to this end the nursery has been re-organised to cope with the demand, and also to supply surplus plants for other projects around the city.

CONCLUSION

In the last 25 years Riccarton Bush has demonstrated the remarkable resilience of small forest remnants and their inherent capacity to respond to simple and sensible management practices. The lessons learned throughout the Trust Board's stewardship are now embodied in a management plan adopted in 1991 and reviewable at the Board's discretion. In my time I have been astounded by the rapidity and magnitude of the changes in Riccarton Bush in response to the management practices put in place. Substantial parts of the Bush are now difficult to distinguish from undisturbed forests elsewhere in the country. There is still a way to go before the Bush becomes completely self-sustaining, but I am confident this will happen if the present management continues. We all realise that Riccarton Bush is now completely isolated from normal processes of replenishment and the direction of change it will take will differ accordingly. Our main object is to restore the Bush to a state where natural processes can take over. Compared to its earlier open woodland condition, the Bush now has a continuous cover of woody plants, herbs and ground ferns, and in places is quite impenetrable. The dramatic increase in vegetation generally now places greater demand on soil moisture, particularly during exceptionally dry summers, and also increases the risk of fire. With this in mind, the Trust Board's next major project is to install a permanent, dual irrigation/ fire protection system as an insurance against fire, and more especially for the maintenance and enhancement of the Bush.

Over the last 25 years my association with Riccarton Bush, representing the Canterbury Branch of the Royal Society of New Zealand, has been a most fulfilling experience. I thoroughly recommend a similar commitment to forest remnants elsewhere in the country.

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Birds Are Not Biogeographers

Winsome Shepherd

"They Take Their Food Where They Find It And From Where It Comes"

E.J.Godley Sept 1999

PART ONE

At the annual meeting of the Institute held in Wellington last year concern was voiced at the over emphasis being placed by some authorities on the planting of native plants and native plant corridors in order to bring back our native birds. No attention seems to have been directed to the part exotic plants play in encouraging our feathered indigenous friends.

For some time members of the R.N.Z.I.H. have been observing the extent to which pigeons, tuis, bellbirds and other native birds feed on exotic plants especially during the colder months of the year. There is a strong case for planting corridors of these exotics rather than only advocating native plants.

Pat Stuart, a new Associate of Honour of the Institute has sent us a list of plants she grows at Wanaka, on which she has noted native birds feeding.

- **Bellbirds** on banksias
- **Pigeons** on olives, cotoneaster berries and laburnum
- **Tuis** on maples, kniphofias, laburnums, and *Cytisus batandieri* . Laburnum, she noted was host to many birds and was often stripped.

In other areas tuis have been noted on proteas, waratahs,and Australian gums. The kokako on Maude Island is enjoying *Pinus radiata* seed. Tuis seem to have developed the art of being able to keep above the level of cats. Are bellbirds and pigeons learning to do the same.? Conifers too, by offering birds perching places especially at night, encourage the growth of native plant seedlings beneath. Nowhere is this more evident than at Eastwoodhill Arboretum where a thicket of native plant seedlings is springing up beneath the pines. Under the deciduous trees there is relatively no growth. At Mt Bruce, conifers other than pines are used as a food source so it is apparent that we must know more before urging further removal of members of the conifer-family. The literature contains information on the feeding habits of our native birds and we hope to bring you some relevant excerpts as well as views of some experts. There is increasing concern on the effect that rats, stoats etc are having, not only on our native birds, but on many introduced species such as the blackbird in parts of the Wairarapa.

We welcome your observations as we believe there is a place for the R.N.Z.I.H. to advocate the use of exotic plants in helping to bring the birds back

PART TWO

Feeding habits of the New Zealand Pigeon *Hemiphaga novaeselandiae novaeselandiae*

The New Zealand wood pigeon belongs to the genus Heimiphaga, an endemic one dating back to Cretaceous times. Its ancestors probably arrived from Australia, where the nearest relatives appear to be the tropical fruit eating genera *Lopholaimus antarcticus* and *Ducula*. In a study of the Queensland pigeons Crome (1975) found that the breeding season coincided with the time of maximum fruit abundance and diversity of the genus Lauraceae which contributed greatly to the peak of fruit production. In New Zealand, tawa, taraire and mangaeo New Zealand's representatives of the genus Lauraceae fruit in late autumn and are absent in the breeding season. Frequently during the breeding season, native pigeons are seen eating leguminous flowers and foliage, a circumstance thought by RH Falla to suggest a connection between legume browsing and the protein requirement for the production of pigeon milk, with which, as far as it is known, all pigeons feed their young for the first two weeks after hatching.

The contents of the digestive systems and foods eaten by native pigeons was studied by Mary McEwen and published in the New Zealand Journal of Ecology,Vol.1.1978. Mc Ewen noted the buds,flowers, fruits and leaves of both exotic and native plants consumed by pigeons from the areas of Northland Coromandel, Bay of Plenty, Rotorua, Taupo Gisborne, Hawkes Bay, through Wellington to Nelson, Otago and the West Coast. Exotic plants included the following-:

Cytisus scoparius
C. proliferous
Trifolium sp.
Lupinus sp.
Eucalyptus sp.
Laburnum sp.
Erythrina sp.
Brassica sp.
Cotoneaster sp.
Cratageous sp.
Ligustrum sp.
Lotus sp.
Pyrus sp.
Populus sp.
Salix sp.
Vicia sp.
Ulmus sp.
Ilex aquifolium
Clerodendron bungei
Nasturtium officinale
Sorbus aucuparia
Solanum tuberosum
Chamaecyparis lawsoniana
The Prunus family: plums, cherries and flowering cherry

The noting of Lawson's cypress for pigeons is interesting, with tuis also being recorded as feeding on this species. Records of other native birds feeding on conifers-e.g. cedar species at Mt.Bruce and the kokako on *Pinus radiata* at Maude Island should alert us all to the part conifer seed may play in the diet of birds. It would seem unwise to remove these trees where they occur in or near stands of native bush until we know more . Similarly with willows – some environmentalists advocate their removal for the sake of purity of the native vegetation. Could it be argued that plant corridors containing exotic plants may be more beneficial?

The RNZIH welcomes your observations and comments. Please write or fax the RNZIH Head office or send a letter to the author.

W Shepherd
19B Homewood Avenue, Karori, Wellington.

Book News And Reviews

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A FIELD GUIDE TO THE NATIVE EDIBLE PLANTS OF NEW ZEALAND

by Andrew Crowe

Godwit Press 3rd edition 1997

Price $39 95

Reviewed by Mike Oates

This is one of those enduring classics that seems to remain popular despite changing fashions and at a time when there are plethora of books on the market on every aspect of native plants. It has remained, like 'The Native Trees of New Zealand' by John Salmon, a benchmark on the subject. However, just like the most popular motor car brands, this model needs to be repackaged to retain its popularity. The third edition sees a change in format to a smaller pocket guide that is easy to handle and take out in the field where it will be most useful.

The book is based on the experiences of the author whose interest in the subject lead him to spend 10 days in the bush in February 1974 without any food supplies. This was followed with major research leading to the latest edition which contains over 190 plants including trees, shrubs, herbs, ferns, mushrooms, lichens, and seaweeds. Each plant is described in detail with its major diagnostic characteristics, the part of the plant eaten, and its major uses. It finished with short sections on traditional cooking methods of Maori, bush survival and poisonous plants.

This inclusion of poisonous plants is critical to the success of the book. It is easy to mistake plants in the wild and its important that before you eat any part of a plant it is positively identified. The descriptive part of each entry is therefore very important. It is pleasing to see the detailed descriptions as well as the links to similar species that could easily be confused. What is a little bit confusing is the double entry of poisonous plants in both the edible and poisonous sections of the book. Take Tutu for example. All parts of this plant are poisonous except the flower petals. The section on this plant deals at length with the Maori use of the plant. One must question the detail in this section when it finishes with the advice that it should be ignored!!

This is a small quibble though and should not detract from what has deservedly become an enduring classic from an author who is fast becoming one of our most prolific writers on native plants.

THE GARDENERS GUIDE TO GROWING FRITILLARIES

by Kevin Platt and Michael Jefferson-Brown

Published by David Charles (UK) and Florilegium (Australia and NZ)

Price $49.95

Reviewed by Gordon Collier, Titoki Point, Taihape

This attractive book is a worthy companion to the other titles already published in the series, viz Hellebores, hardy Geraniums, Lilies, Hostas and Ivies. It is the first for over 50 years to be devoted to Fritillaries, that most exquisite flowering bulb, and while not posing as a monograph of that genus it achieves the stated purpose of acting as a practical guide to growers and non growers alike.

The authors have had many years experience as growers of fritillaries and freely share their knowledge with readers. Kevin Platt is the English holder of the National collection of Fritillaries and writes with authority. Together they write in a language easily understood by gardeners and in explaining botanical technicalities take care not to baffle their following. Simple black and white drawings and superb colour photographs back up the written word and are an enormous help with identification of these somewhat confusing bulbs.

The book gives detailed information on botany, cultivation, soils, propagation, and planting of fritillaries. Many who grow their prize bulbs in containers will find the section on pot culture particularly useful. The authors believe that plastic pots rather than clay may be best for these plants.

The chapters on Fritillaries in the wild and in North America are fascinating.

The second part of the book is devoted to an A-Z listing nearly 100 species containing information on history, botanical status, availability, behavior in cultivation, and cultural requirements. This will be an invaluable quick reference. Collectors will be inspired to greater efforts but many

of these species we can only dream about. While some information such as "where" to buy and see (fritillaries) will frustrate southern hemisphere gardeners, the appendices with which the authors conclude provide a useful resource.

All who grow these enchanting plants will find this superbly illustrated book seductive reading. I recommend it and look forward to future volumes - Galanthus, Erythroniums, and Trilliums perhaps??

GUIDE TO THE ALOES OF SOUTH AFRICA

By Ben-Erik van Wyk and Oideon Smith,

Published by Briza Publications, Pretoria, South Africa 1996

Price approx $50.00

Reviewed by Dr Philip Simpson,

My appetite for *Aloe* was greatly sharpened by this book. What a genus; such beautiful and interesting plants! There are 125 species in South Africa alone (bigger than the largest genus in New Zealand, *Hebe*, with 100 species), and still more in neighboring Namibia and Mozambique, northwards through eastern Africa, into Saudi Arabia, and across the sea to the ark and cradle, Madagascar. The "Guide" beautifully illustrates each of the species, mostly in their natural habitat, and describes them in an intentionally "user-friendly" way. A responsible tone is established by the authors' plea not to collect certain species from the wild in an attempt to grow them because their requirements are so specific that the plants will certainly die after a few years in cultivation.

Each species is given a double page. One page presents photographs (with each of the many public sources of colour slides acknowledged), depicting the whole plant, any diagnostic feature of the species, the inflorescence and flowers. The other page describes the species, each in the same way: growth habit, leaves, inflorescence and flowers, the flowering season (generally winter, but sometimes summer), diagnostic features and closely similar species, the range and character of the distribution and habitat, and a map of South Africa, showing National and Provincial borders and with the distribution of each species of *Aloe* shown as a patch of blue-green. I enjoyed the maps immensely, not only for the geography lesson about South African places that they provided, but, in conjunction with my larger Atlas map of South Africa and the "Guide" text, a quick habitat survey as well. The maps are also helpful because they picture the size and shape of the range of each species (from very large to very small, as would be expected of such a large and diverse genus), whether it is broadly continuous or not (most seem to be), whether species overlap (they appear to, significantly) and the landscape they are part of (coastal sands, lowland bush, dry shrubland, inland grassland, rock outcrops and high altitudes). Are different species that grow together in the same landscape kept apart by habitat, different pollinators, or what?

The species are arranged alphabetically in groups: tree aloes (5 spp), single-stemmed aloes (15 spp; I might have called these "caulescent"), multistemmed aloes (9 spp.), rambling (5 spp), creeping (7 spp), stemless (23 spp), speckled (5 spp), spotted (26 spp), dwarf (6 spp) and grass aloes (24 spp). The authors admit that some of these groups are not natural, in the sense that all the species are closely related, because some merely appear similar, by converging from different evolutionary pathways. The truth is that the identification of aloes is by no means easy in many cases. Some are naturally very variable geographically, individuals of a species vary according to age and condition, there are colour variants and hybridization is common among several species. However, the authors maintain that aloe identification will now be considerably easier." My ability to judge is very limited, but I think their goal has been achieved. For me, though, the main value lies elsewhere.

There are short background sections on aloe-like plants, such as *Hawarthia* and *Kniphofia*, medicinal and cosmetic uses (the ancient "aloes" resin, a laxative, and the much more mild *Aloe vera* gel), conservation (some species are endangered because of over-collecting, and many are naturally very local), and how to propagate aloes and look after them in the garden.

The authors capture an essence about aloes when they describe "The stark beauty of their often strange and inspiring architectures...." They recognise that botanists might want more information about the natural history of the *Aloe* overall. However, the "Guide" is intended for use primarily for identifying species. It focuses on the question "Which Aloe is that?", and stops sometimes tantalisingly short of the broader picture. The photographs alone achieve most of the story anyway, if you ask the appropriate evolutionary and ecological questions.

Undoubtedly the greatest value for New Zealand readers is the diversity of form, colour and habitat that the photographs and descriptions reveal. There are not many species commonly grown here, and the "Guide" illustrates the wide variety of extremely attractive and interesting plants that we could grow.

The "Guide" starts with the "tree aloes", and opens with *A. barberae* (formerly *A. bainsii*), a forest tree that reaches 1 8m high with a trunk 3m in diameter at the base. This colossal size is equal to or greater than the largest Cabbage Tree *(Cordyline australis)* in New Zealand , or Joshua Tree *(Yucca brevifolia)* in California, or Dragon Tree *(Dracaena draco)* in the Canary Islands, and so joins the select group of the world's largest "tree lilies". Of the endangered tree aloe *A. pillansii* the author's state "This species leaves a last-

ing impression on anyone who has seen it in its natural environment. It qualifies as one of the most exceptional botanical features of South Africa . *A dichotoma*, which features on the hard-back cover, is called the "quiver tree" by some tribes-people, because the hollowed stems were used as quivers. The ethnobotany *of Aloe* would make a fascinating and rewarding study, given the huge time span and diverse cultural traditions over which people and aloes have interacted.

The "single-stemmed aloes" epitomize "stark beauty", and they exhibit a fascinating range of inflorescence structure and floral arrangement. Many have the familiar candelabra of red racemes. Some have yellow flowers, others Callistemon-like bottle brushes, and a few have tall, unbranched 'spears' like those of the Australian Grass Tree *(Xanthorrhoea)*. The inflorescence of one *(A. claviflora)* is horizontal, the open flowers displayed for a ground animal . One "exceedingly abundant" species is named *A. castenea*, for the chestnut-brown nectar it copiously produces. Together, aloes fill a morphologist's dream and a floral ecologist's paradise. What animals, birds, bats, lizards and insects— pollinate these gorgeous structures?

In the "rambling aloes", an almost climbing habit is achieved, to my knowledge an evolutionary first among the "tree lily genera". In the "creeping aloes", the stem grows along the ground, bearing prickly, triangular leaves and inflorescences with more or less round heads of flowers. These two groups are specialized plants. A big group, the "stemless aloes (not really well named from a structural point of view!), present a range of unique adaptations. *A. peglerae* forms a ball of incurved, prickly leaves, from which an unusually short and densely flowered raceme emerges. In *A. polyphylla*, the leaves form a series of perfect spirals, an attracdon that has left the species endangered from overcollection. *A. striata* is one of the only aloes whose leaves have spineless margins. On the other hand *A. melanocantha* has fierce looking black spines, not only on the leaf margins but on the undersurface as well.

Many stemless species also have leaves speckled with yellow, white or grey spots, usually uniformly scattered, but sometimes restricted to part of the leaf such as the base, and sometimes becoming organised into a pattern, a feature of *A. zebrina*, for example.

In the "dwarf aloes" the spots and spines become raised tubercles of hard material, and in these species the leaves are often just a few centimetres long, the rosettes very small, the infiorescences short and the flowers unusually large, almost covering the rosettes of leaves. These seemingly highly evolved aloes are very showey plants and they have been over-collected by gardeners.

The most diminutive species are grouped as "grass aloes" because the leaves are long and narrow, with little or no fleshiness. In some species the individual 'rosettes' are massed together into an almost 'tussock' form. Nearly all the grass aloes have round heads of flowers, sometimes red, some white *(A. aibida)*. In *A. kniphofioides* the leaf bases expand into an underground bulb. The extreme is *A. saundersiae* which has a few grassy leaves forming a single rosette, producing a few-flowered inflorescence, and, notably, spindle-shaped, fleshy roots. *Aloe* is beginning to evolve a focus under the ground. At this highly specialized end of the *Aloe* range of variation it is impossible not to see other familiar South African genera in some of the characters and trends: hyacinth, grape hyacinth, agapanthus, amaryllis, and scilla, all within the large, diverse order Liliales. The range of form within *Aloe* from tree to herb, and similarities with these other genera, suggests that *Aloe* may be a centre for generating evolutionary diversity. There seems to be a sequence from the ancient and large to the modern and small. The "Guide" stimulates such speculation, born from the remarkable diversity that the aloes have achieved. The "Guide" also clearly establishes that there is a serious conservation issue that needs to be respected by those who want to benefit from these unique and wonderful evolutionary creations.

There are also some minor problems with the book. No attempt is made to view *Aloe* in its entirety— the total number of species, the distribution and the patterns of evolution. I don't think that the last word has been written on the most appropriate groupings of species. There is little about the biology of the plants, the pollination, fruit characters, the seeds and the seedlings, which are pertinent issues for the growers of *Aloe*. Finally, while the chemical analysis of the leaf sap is mentioned several times, no references are given on this or any other scientific research on *Aloe*. Perhaps I am unfairly seeking a natural history of *Aloe*. The references that are given, however, clearly open the door to further reading. The South African Succulent Society's magazine, called "Aloe", is one source that I must check out. The book has stimulated many questions that need to be investigated in order to really appreciate this famous group of plants.

The "Guide" is supported by the National Botanical Institute, and is dedicated to Bosch van Oudtshoorn, the pioneer researcher into the chemistry of aloes. For about NZ$50.00, the pleasure that this book can give, the potentially life-long quest for growing new aloes that it opens up, and the evolutionary and ecological questions it stimulates, it is superb value. My life will certainly never be quite the same.