Horticulture

in New Zealand

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IN NEW ZEALAND

Bulletin of the Royal N.Z. Institute of Horticulture
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EDITORIAL

This issue sees the introduction of an Editorial written not by the editor, but by a "guest editor". On this occasion, Alan Jolliffe, The National Executive Chairman has been given the honour.

Q. Who reads Editorials?
A. Everyone should.
Q. Why?
A. It contains a commentary on the state of the Institute and Industry.

I want you to read this one. It is the first guest editorial. It contains some vital information.

Students in 1989 will no longer be *required* to be members of the Royal New Zealand Institute of Horticulture. They can now join at a *reduced* subscription rate. Why you ask? Well we found out that nearly 400 students a year don't pay their subscriptions because they are not sitting exams. That means we didn't get over $10,000 each year in subscriptions and we sent bulletins and an annual Journal etc. to them. The Institute cannot afford that.

We did not know for sure how many members we actually had. That is, those really interested in the Institute. In October 1988 students will be asked if they wish to become members of the Institute and participate in its activities. We all look forward to having many students as members.

Student Membership will give students all the benefits of full membership. You will receive all the Bulletins, Annual Journal and other information. You will be members of the District Council where you live. You will be able to vote. You can participate in District Council Activities.

Student Membership will give you the chance to meet and talk with horticulturists from a wide cross section of the Industry.

Meeting fellow horticulturists is just as important as studying for exams. Exchange of ideas and information gives you a greater understanding of horticulture. Nine times out of ten someone else has or had the same problems you have. Meeting new people, exchanging ideas and information will enable you to progress faster in your chosen career.

I challenge all students to join the Royal New Zealand Institute of Horticulture.

By 1 January 1989 we will know exactly how many members we have. Then we can starting building up our membership.

Students will be required to pay for the full cost of servicing of their examinations. Fortunately computerisation is enabling us to contain our costs. We rely on the voluntary effort of many members for our examinations.

Education in New Zealand is undergoing change. Not *requiring* students to become members is consistent with the Government's desire for open education. We are a major part of New Zealand horticultural education. We must change now and be part of future changes.

Other Changes we are considering are

1. Reducing the size of the National Executive.
2. Changing the production techniques of our publications to keep quality but reduce costs.
3. Different meeting procedures for National Executive business.
4. Changes to the Constitution (any comments and send them to Dave Cameron). Items include — National Executive make-up, Election of Chairman, Student membership, Subscription include annual Journal.

Items of Interest

Certificate in Leisure Gardening we are looking at introducing this certificate for all people who attend a recognised course in Leisure Gardening at various colleges etc. around New Zealand.

Notable and Historic Trees — Tree Evaluation Scheme is to be promoted to Local Authorities throughout New Zealand as soon as possible. It has already been included in some District Schemes.

Awards and Honours. Congratulations to all those who were recognised for their achievements recently. Your efforts in our industry are vital to the future of horticulture.

Don't forget to nominate people for our Awards and Honours. (Dave Cameron has the nomination forms).

The next two years are going to be hard for the Institute. We need to keep a very tight rein on our finances and our activities. That does not mean we won't do anything. We must be involved in the restructuring of Education. We must be involved in conservation, amenity horticulture, production horticulture and horticultural research.

The future is bright. In two years we will be a more responsive, vital, enthusiastic and go ahead Institute. We will carry our Royal Charter boldly and proudly into the 1990's.

Q. Did you read this?

Alan Jolliffe
Chairman
National Executive

THE DESTRUCTION OF A LANDSCAPE

Polesden Lacy near Guildford, Surrey.

The great storm that swept across the south of England last October devastated many of England's finest parks and gardens. In this article, Mike Oates looks at the effects of the storm and the lessons learnt.

The night of October 16th 1987 will live long in the memories of English people, especially those with a love of trees and the countryside. In a few short hours, 15 million trees were blown down in south-east England by the worst storm to hit that area since records began. Casualties included many of England's finest landscape gardens. Of the 1200 gardens in the English Heritage 'Register of Parks and Gardens of Specific Historical Interest in England', about 350 were affected by the winds, with 30 to 40 of these completely devastated. Some of the gardens to suffer severe damage included:

• *Chelsea Physic Garden*, on the banks of the Thames. Fifteen large trees were lost in its 3.8 acres, and more may have to come down. It is thought that loss of shelter may change the garden's micro-climate, lowering winter temperatures and threatening tender species in the garden.

• *Kew Gardens*, where about 1,000 trees were lost or damaged. Many of these trees were over 30 metres high and 100 years old. Amongst the casualties was the oldest recorded specimen of *Zelkova carpinifolia* planted in 1761 and three *Nothofagus obliqua* (>20 metres) dating from the first seed collected by Elwes and Henry in 1902.

• *Chartwell* in Kent, the former home of Sir Winston Churchill. As many as 80% of the trees fell in this property which is now owned by the National Trust.

• *Wakehurst Place* is owned by the National Trust and administered by the Royal Botanic Gardens, Kew. Half the trees have gone in the garden, including the best specimen of *Davidia involucrata* in the country, and a 45 metre specimen of *Abies grandis*.

In many of the gardens, the final damage may not be known for months or even years. Some estimate it will take 5 years simply to clear up all the fallen trees, by which time those trees damaged or loosened by the gale may also have succumbed. The framework of many

gardens has been completely destroyed and will take decades to restore. This is especially true of landscape parks like Scotney Castle where the design depended on the arrangement of trees.

During December, I travelled through the worst affected areas visiting some of the gardens and talked to people about the future and the lessons that have been learnt. I must be honest and say I was overwhelmed by the destruction. I was also heartened by people's attitude to the tragedy, and by the optimism of those who have the clearing up and planning to do — the arborists, landscape architects and gardeners. Most felt that new opportunities had opened up, and that increased public awareness of the value of trees in the landscape would ensure replanting on a large scale. It could also prove a turning point for a landscape that has been ravaged by dutch elm disease and agricultural expansion, which together have resulted in the loss of 50% of England's ancient woodland since 1945.

The main lesson learnt from the disaster was that trees like all living things do not last forever. Many of the trees that fell were overmature and nearing the end of their lives. In most cases, no thought had been given to replacement planting programmes. As a result, a generation has gone with none to replace it. Buchan and Lacey in the Observer newspaper put it bluntly:

'By disregarding posterity we have impoverished the present'.

What lessons can New Zealand learn from the gale? I believe we have to look very closely at the trees in our parks, gardens and town belts and start planning now for their replacement. Many of these trees are over a hundred years old and reaching maturity. The exotic trees in these plantings are the first generation in New Zealand, so little is known about their lifespan in our climate. We must realise however, that one day these trees will die, and need replacing. We can wait no longer. Even if we start planting now it will take decades before this new generation makes an impact on the landscape. Can anyone imagine Hagley Park in Christchurch without its deciduous trees, or Wellington's Town Belt or Botanic Garden without conifers? Of course not, but remember that these trees are a living, changing part of the landscape and must be treated as such.

I applaud the efforts of the Notable Trees Committee in seeking legislation to protect notable, historic and scientifically important trees. Remember though that no legislation can save a tree from old age or the ravages of another 'Wahine'.

The early settlers have left a legacy for us all to enjoy. Let's ensure we do the same for future generations.

Royal Horticultural Society Garden at Wisley.

AWARDS MADE AT THE 1988 CONFERENCE HELD IN CHRISTCHURCH

Congratulations to all these people.

Honorary Membership of RNZIH:

Mr Derek Rooney of Christchurch.

Plant Raisers Award:

Dr Keith Hammett of Auckland, for Dahlias.

Fellows of the Royal New Zealand Institute of Horticulture (Inc.)

Jean Brown	Dunedin
Eleanor Burgess	Wanganui
Marie de Castro	Blenheim
Allan Jellyman	New Plymouth
Duncan McIntyre	Waipukurau
Ellaby Martin	Hamilton
Neville Struthers	Dunedin
Neville Weal	Lower Hutt
Roger Price	Auckland
David Shillito	Christchurch
Mervyn Spurway	Christchurch
Kevin Garnett	Christchurch
Dennis Hicks	Wellington
Ron Flook	Wellington
Joan Swinbourne	Tauranga

Associates of Honour of the Royal New Zealand Institute of Horticulture (Inc.)

Noel Lothian	Australia
Lawrie Metcalf	Invercargill
Graeme Paterson	Timaru (posthumously)

Mr Ballinger, the RNZIH President presented the Certificates to those awardees able to be present, and congratulated all awardees on their services to horticulture.

THE NEED FOR PLANTSMAN'S SKILLS

B. Edwards

RNZIH students and apprentices must make the most of every opportunity to gain the widest horticultural experience possible, says Bob Edwards, managing editor of Commercial Horticulture and RNZIH examiner.

Lack of general plant knowledge is evident when marking examination papers. Valuable marks are lost because students do not have basic plant information at their finger tips. Propagation knowledge, plant nomenclature and uses are two cases in point and evident in this year's examinations.

Students sitting the 1987 NDH examinations had little knowledge of two very common plants — Mercury Bay weed (Dichondra repens) and Bugle lily (Ajuga reptans) two of the commonest plants in cultivation today.

Plant knowledge is one of the most sort after skills in horticulture today.

Garden centres are crying out for staff with plantsmen's skills — identification abilities and cultural knowledge. Details about individual plants and their requirements and the ability to pass information on to customers.

PLANTSMEN WITH THESE SKILLS BECOME LEGENDS

Men like Arthur Farnell, of Auckland, had a fabulous knowledge not only of NZ native plants, but of gerberas and gerbera breeding. Hugh Redgrove, who managed Winstones Garden Centre for over 20 years, and made it a mecca for plant lovers and rare-plant hunters all over NZ. He has an outstanding knowledge of perennials, trees and shrubs, and bulbs.

Joy Amos, MAF horticultural advisor, gave advice to nurserymen and gardeners on many topics for years. Daisy Hardwick, manageress of Mountforts Gardeners Corner, Tauranga, and Bay of Plenty radio garden journalist for many years. Both proved plantsman's skills are not confined to men alone, as the name suggests, and that there is equal opportunity for men and women in horticulture.

Skilled people like these are rare today both here and in Australia. Without these skills can you call yourself a true journeyman or plantsman. Will you be able to command above basic rates of remuneration in the ornamental horticultural trade?

Sir Victor Davies once remarked, in the later years of his life, that a plantsman needed three lifetimes to learn all there was about tree and shrub production. After spending a lifetime building one of NZ's largest nurseries (Duncan and Davies Ltd, New Plymouth), having travelled the world numerous times and rubbed shoulders with some of the world's best plantsmen, he was in an excellent position to make this judgement.

Some horticulturists believe learning plantsman's skills is a matter of observation — watching what happens, when it happens and why. Indeed, this is one way to learn, but it is only part of the story. If you relied on "learning-through-looking" you will be 100 years old before you find out a 100th of what you will need to know. It takes more than that.

LEARNING SKILLS — WHY NOT?

A good tradesman soon becomes a foreman or manager with a crew under his direction. In this position, you not only have to impart knowledge, demonstrate the skill, know the finer points but be able to guide young people through the learning stage. If these basic skills are not second nature the future of our trade is in jeopardy, along with your credibility.

Grafting and budding skills are another area concerning the ornamental horticultural world.

Tradesmen with grafting skills are few and far between. There are few teachers.

This was also evident in this years RNZIH exams. Students failed to be able to discern between grafting and budding. And which varieties are budded and grafted.

This is all fun for people willing to learn. Horticulture is fun. Even after 30 years in the ornamental horticultural trade I still get a "kick" out of learning a new technique, seeing others discover new ideas, reading about research success, discovering what makes plants tick.

While you are young and can absorb a vast amount of information you should be looking at everything in horticulture, asking questions, talking to old gardeners, visiting other nurseries, reading, corresponding with horticulturists in other towns and countries, trying out old and new ideas, practising in your own garden, keeping notes, doing projects, touring parks, walking the bush.

Horticulture is all around us. In towns, in cities, down back streets, up the hills, on the mountains, down the vallies. Indoors and outdoors.

No other vocation offers the opportunity to go almost anywhere and be able to observe and discover something new and different everyday. You have a duty to the future of horticulture. You hold the key to the future in your hand. Unlock the door to the treasure unequalled on this earth ..... become a real plantsman.

FROM THE EXECUTIVE OFFICER

The 1988 Annual General Meeting and Conference was held at Lincoln College from 14-16 May. Those members who attended considered the Conference to be a huge success: Christchurch even turned on unseasonable warm weather complete with "norwester". The Canterbury District Council did a great job. Congratulations to David Shillito and his team.

1. Subscriptions for 1989

Subscriptions for 1989 were set at the Annual General Meeting as follows:

A Individual Membership	$50.00 + $5.00 GST = $55.00.
Discount rate (if paid by 31.10.88.)	$45.00 + $4.50 GST = $49.50.
B Joint Membership (for two people sharing the same household)	$41.00 + $4.00 GST = $45.00 (each).
Discount rate (if paid by 31.10.88)	$37.00 + $3.70 GST = $40.70 (each).
C Associate Membership (over 65 and a member for 10 years +)	$33.00 +$3.30 GST = $36.30.
Discount rate (if paid by 31.10.88).	$30.00 + $3.00 GST = $33.00.
D Student Membership (for people registered as RNZIH students)	$30.00 + $3.00 GST = $33.00.
E Non commercial Societies	$50.00 + $5.00 GST = $55.00.
Discount rate (if paid by 31.10.88)	$45.00 + $4.50 = $49.50.

F	Corporate Bodies	$115.00 + $11.50 GST = $126.50.
	Discount rate (if paid by 31.10.88)	$104.00 + $10.40 GST = $114.40.

2. Student Membership

As noted above, a reduced membership fee has been set down for those people, registered as students with the Institute, *who choose to be members of the Institute.*

In previous years *all* registered students have been *required* to be members of the Institute. For a variety of reasons it has now been decided that as from 1 January 1989, registered students will have the option of taking out a "student membership", which will entitle them to all the benefits of full membership of the Institute, or if they wish, they may cease to be members, and of course pay no subscription at all. In the latter case students will receive all correspondence concerning examinations as at present, but of course they would not receive RNZIH Bulletins, Annual Journals, or other membership benefits.

The National Executive is hopeful that a large proportion of our registered students will in fact choose to remain as "student members" because as most are employed in horticulture there are considerable benefits to be gained from membership of a professional organisation which aims to promote horticulture throughout the country.

All existing students will receive a subscription account in October in the normal way, but if they do not pay the student membership fee by 31 October it will be assumed that they do not wish to remain as members of the Institute. This situation will be explained clearly on the subscription invoice.

3. Loder Cup

Since his retirement from the position of secretary to the RNZIH, Mr Keith Lemmon of Palmerston North retained the secretaryship of the Loder Cup Committee. Mr Lemmon has now decided to relinquish that position and it has been agreed between the Department of Conservation and the National Executive that the administration of the Loder Cup Committee's activities should return to the RNZIH Head Office. All enquiries regarding the Loder Cup should now be addressed to me.

The membership of the Loder Cup Committee (for the next three years) was due for renewal in March this year, and the Institute has nominated Dr Eric Godley of Christchurch as its nominee on the Committee, replacing Professor Bayliss of Dunedin who has served as our nominee for many years. Professor Bayliss' work on the Committee has been greatly appreciated by the Institute.

4. Election of Officers

The membership of the National Executive will remain unchanged for the next twelve months as the four retiring members were all re-elected to the Executive.

5. Constitution Review

A Special General Meeting of members will be held later this year to approve a number of Constitution changes required as a result of recent decisions such as non compulsory membership for students, the Annual Journal being included as part of each member's annual subscription, and a special membership category for students. Details regarding this meeting will be circulated later in the year.

6. Notable Trees Scheme

The National Executive has adopted the Tree Evaluation Scheme as proposed by the Notable Trees Committee following discussions on this topic during the Conference week-

end. Any members with queries regarding the scheme should address their enquiries to Ron Flook, 8 Westhill Rd, Pt. Howard, Eastbourne, WELLINGTON.

7. Publications

The 1988 Annual Journal is now out of stock.

Members who have not yet paid their 1988 subscriptions will not be able to obtain this year's Journal as only enough copies were printed to cover *financial* members, plus an estimate of numbers of new members during this year. Rising costs make it necessary to limit the printing to a number that we *know* have been or will be paid for. The 1989 Annual Journal promises to be at least up to the high standard of this year's production, and members who pay their 1989 subscriptions promptly can be assured of receiving their copies in February.

I hope all members are fit and well, and wish all our students well in this year's examinations, to be held between Monday, 14 November and Friday, 18 November 1988.

Dave Cameron
Executive Officer.

A VOICE FOR GARDEN HERITAGE

A public meeting was held during Heritage week to discuss the formation of a Garden History Organisation. This was a great success with about 40 people attending.

The meeting was held during Auckland's first Heritage Week, in early March, at the Old Government House. Heritage Week was sponsored by Caltex New Zealand with the diverse range of events co-ordinated by the Heritage Trust. The meeting passed a unanimous motion to establish an Auckland Regional Garden History Association. Activities would be confined to within the boundaries of the Auckland Regional Authority.

A steering committee of 5 was elected by the meeting. They are John Adam (convenor), Mrs Ann Patterson, Ross Ferguson, John Stackpoole and Alice Lloyd-Fitt.

"THE PUKEITI STORY" — NEW ZEALAND'S BODNANT

Harold T. Hall

The Lodge at Pukeiti. Built in 1954 and used by members of the trust.

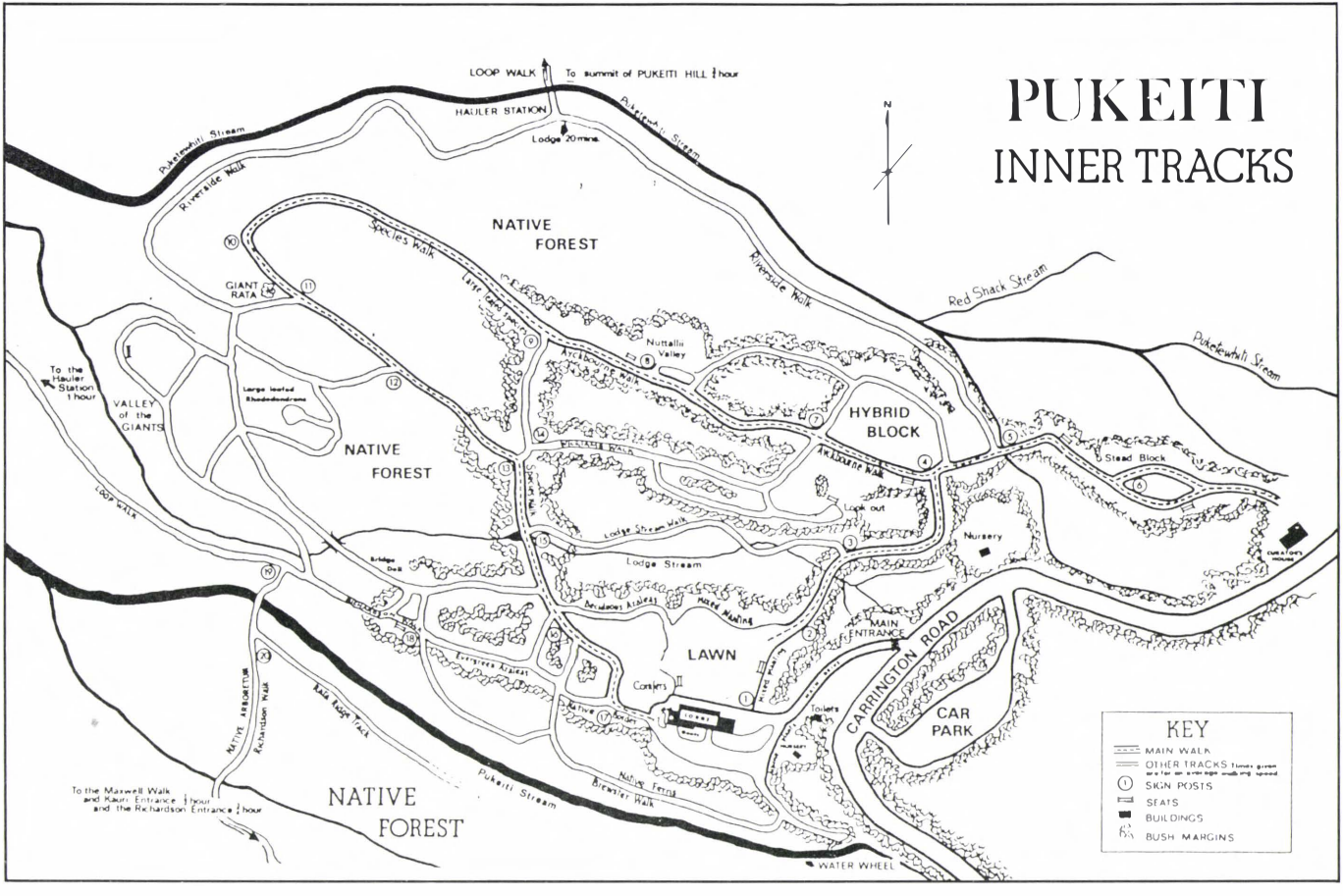
If it had not been for the amateurs and enthusiasts of the past, gardening and horticulture in general would have been in a much poorer state, and indeed, far less scope made available for those of us practising for a living this noble and worthwhile occupation.

One such story — and there are many — relates to the early beginnings of the Pukeiti Rhododendron Trust and their endeavours to find the perfect home for this "Queen" of all nature's flowers — the rhododendron. It began in 1951 when ten or twenty acres as a trial ground or demonstration area for growing rhododendrons was wanted, but it was not easy to find. The land had to be accessible, preferably well above sea-level, with good rainfall and well drained acid soil. The idea had been put forward by a few enthusiastic members of a rhododendron conference held at New Plymouth in late October. It had especially strong appeal for two conference members in particular.

Their story starts with their search early one morning in the high country bordering Mount Egmont — a volcano some 2518 metres high in the western part of the North Island, the whole of which is encircled by the Egmont National Park. The two enthusiasts had spent all day travelling the whole lower periphery regions of the Park — when their dwindling hopes were revived by a chance meeting with the local Member of Parliament. The two men in question were Russell Matthews of New Plymouth and Douglas Cook of Gisborne, and the Member of Parliament was Ernest Alderman.

Following his lead, next morning they travelled fourteen miles to a point between the Pouakai and Kaitake Ranges on the western flank of Egmont. There at the foot of an ancient volcanic hill came their first hint of success. An hour's climb took them to the summit, 1600 feet above the sea. The attractive approach and the sweeping outlook over bush and farmland to the coast beyond, from Cape Egmont to Kawhia, offered scope beyond their wildest hopes. Here was land, altitude, climate — everything. The name of the hill was Pukeiti, or "Little Hill". In the old days it had special significance to Maoris on the lowlands, as a portent in Kumara planting. Today, it has world-wide significance to rhododendron growers and lovers of natural beauty alike.

Douglas Cook's reaction was immediate: he bought the whole property of 153 acres, including the south-western slopes of the hill and the summit itself, all bush-clad. Together,


PUKEITI
INNER TRACKS
LOOP WALK
To summit of PUKEITI HILL ½ hour
HAULER STATION
Lodge 20 mins
Pukekiwiriki Stream
Riverside Walk
Pukekiwiriki Stream
N
NATIVE FOREST
Species Walk
Riverside Walk
Red Shack Stream
GIANT RATA
Nuttallii Valley
Arthurs Walk
Pukekiwiriki Stream
To the Hauler Station 1 hour
VALLEY of the GIANTS
Large leafed Rhododendrons
NATIVE FOREST
HYBRID BLOCK
Arthurs Walk
Stead Block
Loop Walk
Lodge Stream Walk
Look out
Nursery
Lodge Stream
Bridge Dam
Rhododendron Avenue
Mixed Planting
MAIN ENTRANCE
LAWN
CARRINGTON ROAD
Conifers
Native Arboretum
Richardson Walk
Kauri Lodge Track
Native Forest
Toilets
CAR PARK
To the Maxwell Walk and Kauri Entrance ½ hour and the Richardson Entrance ½ hour
NATIVE FOREST
Pukeiti Stream
Brewster Walk
WATER WHEEL
KEY
MAIN WALK
OTHER TRACKS
SIGN POSTS
SEATS
BUILDINGS
BUSH MARGINS

he and Russell Matthews enlisted 34 fellow members of the New Zealand Rhododendron Association and others enthused by the project. These 36 men and women became the foundation members of a new incorporated society, to be known as The Pukeiti Rhododendron Trust (Inc). Douglas Cook gave his newly acquired land to the Trust, provided twenty others guaranteed £50 each for five years. Twenty-four took up the challenge and became sustaining members of the new organisation. The inaugural meeting, with Douglas Cook in the Chair, elected a local executive, including G. W. Williams of Hawera, Russell Matthews, A. H. Goudie, G. W. Goodwin and Douglas Elliott of New Plymouth and A. L. Richardson and M. G. Maxwell. Mr Goudie was appointed Honorary Curator: £300 was voted for the purchase of plants overseas.

On Friday 2nd November 1951, a ribbon was cut at the gateway of the property by Douglas Cook. So began an astounding enterprise. Its aims were simple — to grow rhododendrons, to conserve the bush, to protect birds — but its scope infinitely wider than "a ten acre trial ground". The incredible accomplishments of succeeding years were made possible only by the dedication, leadership and drive, of a few key personalities, backed enthusiastically by a multitude of voluntary helpers. The area grew from 153 acres to 900 by the generosity of one man. The Lodge was built in 1954 with voluntary assistance, using timber cut from standing rimu trees given to the Trust. The glasshouse and water wheel were erected by volunteers. In 1962 a pathway was cut also by volunteers to allow power to be taken from the national grid — however, the water wheel has been retained for its novelty and historic significance — it also is still retained as a pumping system for water reticulation in the area.

The development continued — limited access tracks became miles of walkways, staff and buildings doubled, the original modest collection of rhododendrons and other species became one of world-wide renown.

Pukeiti has a comprehensive collection of rhododendron species, and whilst it is not a botanic garden in the true sense, the layout of plants in groups of the same series lends educational value. The casual visitor will see banks of colour on similar plants in one area and a few different flowers on another group just along a path. The expert will be able to observe the minute differences within a group of outwardly similar plants that make up separate species. Both will find beauty and interest in Pukeiti.

The collection of rhododendrons at Pukeiti is the most comprehensive in New Zealand and one of the major representations of the genus in the world. It is being added to all the time, with importations of plants and seeds from all over the world. The quarantine house and nursery provide a regular stock of material for planting. Not only rhododendrons are produced, but a large selection of trees, shrubs, alpines and herbaceous plants which go to make up the beauty of Pukeiti. There is no doubt in my mind that the New Zealand bush environment at Pukeiti provides the perfect foil for the extra rhododendrons and other exotic species. The untouched native bush back-cloth and the nearby grandeur of snow-capped Mount Egmont creates not only an unusual setting and ideal home for these specimens, but in the spring can be a breathtaking experience for the uninformed and enthusiast alike.

Pukeiti is a very good example in New Zealand, where voluntary work in the hands of amateurs has succeeded and prospered. It is, however, very gratifying also to see that the Trust has now placed the management of the grounds into the hands of paid professionals. This is certainly good for horticulture generally, and helps to widen the scope and potential of the New Zealand horticultural scene.

For those wishing to contact Pukeiti Rhododendron Trust, the address is:
The Secretary, 44 Currie Street, P.O. Box 385, New Plymouth.

NOTES FROM THE DISTRICT COUNCIL NEWSLETTERS

Wellington District

September Workshop

Our Programme sub-committee are organising a Workshop to be held on September 10th. The venue will be the Interpretive Centre at the top of the Cable Car. At this stage the plan is to have sessions on propagation in the morning and arboriculture in the afternoon. This sounds like an interesting day in the making — especially for students. More details about the finalised programme, costs, and booking in the next newsletter.

Recent Events

Dr Charles Nelson, botanist at the Dublin Botanic Garden, Glasnevin, visited Wellington in May as part of a 3-week tour of New Zealand. His visit to the capital proved to be a great success, despite the poor weather. On the final night of his stay, Dr Nelson gave an illustrated lecture to members of the Institute and the Wellington Botanical Society.

In his talk, Dr Nelson looked at the first introductions of N.Z. plants into Europe, especially Ireland. One of the first plants introduced was the flax *Phormium tenax* in 1798. Shortly afterwards the kowhai *Sophora tetraptera* was introduced and soon became a feature of the Botanic Garden at Glasnevin. Introductions continued through the 19th century. Most plants flourished in the mild, wet climate. During the early part of this century, Henry Travers sent many plants to the garden, including such rarities as *Myosotidium hortensia* and *Olearia semidentata*. Many fine cultivars of N.Z. natives were also raised in Ireland, the most famous probably being *Pittosporum tenuifolium 'Silver Queen'* at the Slieve Donard nursery.

Dr Nelson finished with a 'slide' tour of some of Ireland's famous gardens including Mount Stewart, Inacullen and Mount Usher. Some of the specimens of N.Z. plants shown were quite outstanding. *Pachystegia insignis* nearly 3 metres high, and with a distinct trunk, and a *Cordyline indivisa* with 9 trunks and measuring 3 metres by 3 metres, to name but two.

After his visit to the capital, Dr Nelson travelled to Christchurch where he gave the keynote address to the R.N.Z.I.H. Annual Conference. The address will be published in the 1989 Annual Journal.

Auckland District

From Joan Dingley

In a recent newsletter mention was made of an item appearing in the "Herald" from the 'Hundred Years Ago' column — "Threat to Acacias Alarming". It refers to a very dangerous pest on Acacia trees in Western Park and its spread to Lake Takapuna (Lake Pupuke) area. I wonder if this could not be an entomological rather than a mycological problem.

G. C. Western (1957) in "EXOTIC FOREST TREES IN NEW ZEALAND" notes that many species of Acacia were introduced about 1860 and were planted extensively for the production of tan bark. The early plantations were of *A.dealbata* (silver wattle); later *A.decurrens* (black wattle) was planted in the eighties and became the species grown for tan bark particularly in the Waikato. He then notes that by 1920 the gall forming rust fungi Uromycladium which was introduced on seedling trees from Australia had spread through-

out both Islands. This fungus proved serious and most tan bark plantations were felled and cleared in the 1930s.

Cunningham, when he recorded this species in 1926, gave little indication of when the fungus was introduced from across the Tasman. *A.decurrens* still grows locally and is usually heavily infected with the galls of Uromycladium; unfortunately it has spread to some Acacia species grown for ornament.

MAX GOODEY is in Sydney for the next month or so and whilst there intends to 'follow things in the Bot. Gards and collect seed of interesting things like a yellow sp. *Hibiscus, Tupidanthus calyptratus* and *Alpinia caerulea* with maroon backs to the leaves and spikes of 1cm round blue fruit. Peter Hind who administers seed distribution is most helpful and at last I will be able to send him something the garden wants viz. *Meryta sinclarii* and *Elingamita johnsoni*. There's an *Agathis robusta* nearby from which a man is giving me some seed he collected about Xmas. He says viability is good and he has had germination from 2 year old seed. It's tantalising for me to see *Ixora chinensis, Allamanda herndersoni, Holmskioldia* etc. blooming outside. We might get away with them in microclimates in Auckland. Street planting is a real schemozzel in the older parts like Paddington where London planes, Lombardy poplars and *Ficus hillii* are allowed to grow unchecked. The poplars sucker like mad and look grotty in autumn and winter and although shade is at a premium you can have too much of a good thing. The tiny 3 x 4m front lots often are overplanted with trees and shrubs hanging over into the street. It's not uncommon to have two *Arecastrum romanzoffianum*, one *Howea forseriana* , a *Ficus macrophylla* and alocasias all in a small patch. And the roots of the big trees play havoc with brick walls and asphalt pavements. The dwarf pomegranate fruits very freely here and there is a large *Arbutus unedo* full of fruit outside our house. The tibouchinas are splendid and fortunately set seed which I shall gather. There is a large one with long narrow hispid leaves, like those on *T. granuloso* though not so long and smothered in 9cm diam. bishop's purple fls and a much lower growing one, var. 'Jules' that George Rainey introduced last year. Haven't seen any Brunfelsias other than one they call *B. australis* which flowers rather sparsely but sets seed and is mildly fragrant. *Allamanda cathartica* var. Henderson flowers outside as does *Ixora chinensis*. Two native Pittosporums, rhombifolium and undulatum, look splendid covered in orange fruit but they are still grossly disfigured by scale insects, as happens with our *P. crassifolium* and the Japanese *P. tobira* which would otherwise be a good fragant flowered shrub.

For the bicentennial year they have planted along Phillip St in front of some old stone buildings *Crinum asiacticum* underplanted with *Trachelospermum jasminoides*. Though the plantings are too new to be effective, and along a wide median strip to South Dowling St. they have planted regular groups of *Doryanthes excelsa* many of which are sending up flowering stems and should be quite a sight. It is more manageable than *D. palmeri* but like it will probably send out a lot of suckers none of which will flower for several years.

The palms are something else again. Wonderful variety and all do much better than in N.Z. because of the extra warmth and good drainage. The Bangalow palm (*Archontophoenis cunninghamiana*) just looks more at home with fewer tatty leaves and somehow even the *Howea forsteriana* seems bigger.

The gardens are making big alterations in the way of building new glasshouses round the existing pyramidal tropical house and the surrounding area is a quagmire. I must try and inspect the plans to get an idea of what it will look like when finished. We are going to be taken by Peter Hind on a private trip to Mt Tomah garden 300m up in the foothills of the Blue Mts which has now been established about four years. That should give me a better idea of what would be likely to survive in Auckland.

TO COMPLETE SETS BACK TO 1982 FOR THE LIBRARY AT THE BOTANIC GARDENS, the following periodicals are needed:
R.H.S. 1983: JANUARY, FEBRUARY, MARCH, APRIL, JULY, AUGUST.
1984: MARCH, APRIL, JUNE, JULY.
N.Z. GARDENER: 1982: JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, OCTOBER, NOVEMBER.
1983: 1984: COMPLETE SETS REQUIRED — JANUARY to DECEMBER.
1985: JANUARY, FEBRUARY, APRIL, JULY, NOVEMBER.
1986: JANUARY, FEBRUARY, MARCH, APRIL, MAY, JUNE, JULY, SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER.
1987: JANUARY, FEBRUARY, MARCH, APRIL
N.Z. CAMELLIA BULLETIN: 1982: JULY, SEPTEMBER

If you can help please phone ROGER PRICE at the Information Centre, Botanic Gardens, 266.7158 (office hours).

In the March 1988 publication of NEWS from the Auckland War Memorial Museum there is an article titled 'THE GREAT JUNCUS HUNT". The original specimen of *Juncus dreqeanus* listed in the Flora of N.Z. was collected "from a vehicle park at a wartime U.S. army camp on the late Countess of Orford's property, Manurewa." Was this where the Botanic Gardens are now? If you are able to help please ring Brian Buchanan at 267.4726.

Taranaki District

Plant Profiles

Amongst the many perennials on display at the last meeting there was a X *Solidaster luteus*, (*Aster hybridus* var *luteus*), a hybrid between an Aster and a Solidago producing dense heads of small lemon flowers and reaching just over half a metre in height. Lasting well as a cut flower it is readily increased from divisions. It is hardy and of easiest culture.

There are nearly 300 wild Aster species and the genera is widely distributed over Europe, Asia and south Africa. Most Michaelmas Daisies are classifed as *Aster novi-belgii*, whilst those from N. America distinguished by woody stems covered with down are *Aster novae-angliae*.

The Golden Rods are also from N. America and are a feature of the open woodland. Solidago is derived from Solido meaning to join or draw together in allusion to reputed healing properties. There are a number of hybrid forms of differing heights and shades ideal in the herbaceous border.

Invasive Plants

The Department of Conservation this year instead of promoting planting of trees on Arbor Day is encouraging the saving of existing trees threatened by invasive plants — especially *Clematis vitalba*.

Overseas there are similar problems in Hawaii and Japan, the effect of *Leucaena leucocephala* is devastating, Madagascar by *Albizia spp* and in Africa by *Acacia spp*.

Taranaki Rhododendron Festival

Meetings have been held coordinated by Tourism Taranaki to promote interest in the concept. An organising committee has been set up, and from 29 October to 5 November 1988 many organisations including the Institute should be involved in this year's first Festival. If Dunedin can feature their displays so can Taranaki!

THE CHINESE GARDEN

Located at Hamilton Gardens

Introduction

The traditional Chinese Garden is one of the oldest and has been one of the most influential of art forms. No example has been developed in New Zealand which is not surprising since it appears few classic forms of Chinese Garden exist outside the Inner Kingdom itself.

So why has one of these very rare and delicate gardens been proposed in the Waikato at Hamilton Gardens?

Firstly because of the impetus provided by Hamilton's sister city links with the Chinese city of Wuxi.

The Waikato Chinese Association together with the Hamilton branch of the New Zealand China Friendship Society have taken up the challenge to develop the Chinese Garden in conjunction with Hamilton City, Wuxi and the Tourist and Publicity Department.

Secondly, Hamilton Gardens itself has attracted unprecedented public support for its unusual concept and magnificent 58 hectare riverside site. One aspect of this concept has been the proposal to develop a collection of eight smaller gardens, each representing an example of the major garden traditions or philosophies. One of these traditions is the Classic Chinese Garden.

The Garden's uniqueness to Australasia will make it a major feature of Hamilton Gardens adding another dimension that is not found in the traditional botanic garden. Because a Chinese Garden reflects many different aspects of traditional Chinese culture and beliefs it has the potential to become a valuable educational resource. It could also provide a focus and an appropriate setting for Chinese cultural activities such as performances and craft demonstrations.

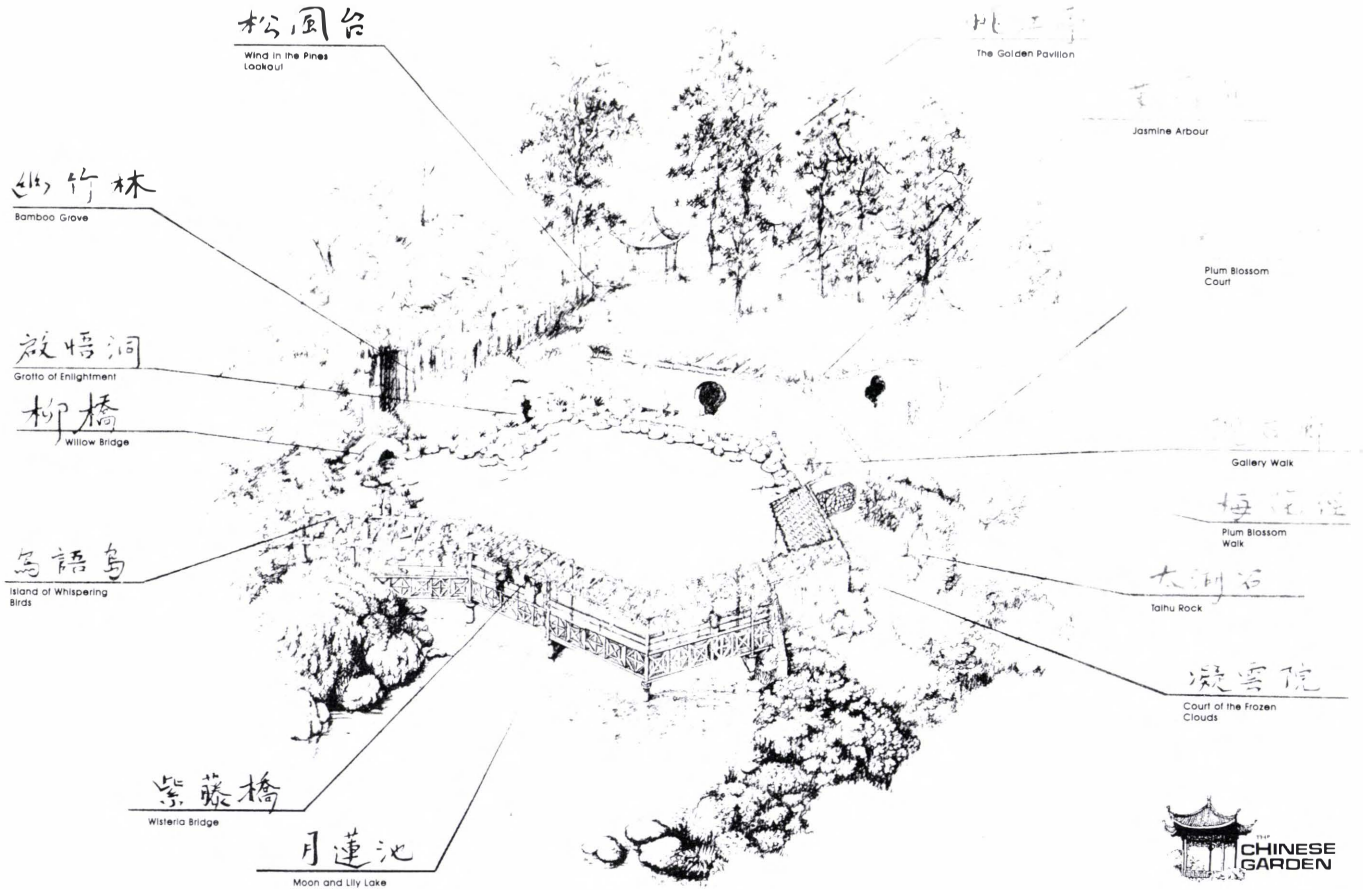
It has been said that a city should not be measured by its wealth, nor by its size but by the richness of its culture. The blossoming of this exotic Chinese Garden will enhance and add a new dimension to the riches of our region.

What Will The Chinese Garden Consist Of?

The sketch shows the general form of the Chinese Garden. But of course it only gives a superficial understanding because the Chinese Garden is rich in evocative symbolism and thought provoking artifice and allegory. This is a dimension and a purpose more often found in ancient gardens but strange and unfamiliar for those of us used to modern western gardens that are dominated by function and the display of plant varieties. This garden is a giant Chinese puzzle that will involve the viewer's imagination and allude to the fabulous landscapes of dreams and legends.

We enter the Chinese Garden through a simple 'Bamboo Gate' via a path to a very simple and delicate 'Plum Blossom Forecourt'. A 'Blossom Gate', 'Jasmine Arbour' and 'Moongate' lead on to the central court of the garden set around the 'Moon and Lily Lake.' Further progress is made via the 'Gallery Walk' that overlooks the 'Court of Frozen Clouds' then across the 'Wisteria Bridge' to the 'Island of Whispering Birds'. From these areas the viewer will glimpse the magnificent 'Golden Pavilion' that overlooks the garden. To reach this he or she must cross the 'Willow Bridge', discover the 'Grotto of Enlightment', pass through the dark 'Bamboo Grove' to the 'Wind in the Pines Lookout'.

The Chinese Garden is one of mystery and subtlety that will challenge the visitor with each return visit.


松風台
Wind in the Pines Lookout
The Golden Pavilion
Jasmine Arbour
竹林
Bamboo Grove
Plum Blossom Court
放悟洞
Grotto of Enlightment
柳橋
Willow Bridge
Gallery Walk
Plum Blossom Walk
鳥語島
Island of Whispering Birds
Taihu Rock
凝雲院
Court of the Frozen Clouds
紫藤橋
Wisteria Bridge
月蓮池
Moon and Lily Lake
CHINESE GARDEN

SPECIAL GENERAL MEETING

There will be a Special General Meeting of the RNZIH on Wednesday 31 August 1988 at 1.30pm in the No 1 Committee Room, City Council Chambers, Mercer St, Wellington.

The purpose of the meeting is to approve Constitution changes made necessary by decisions taken at the Annual General Meeting in May 1988, and also to approve a number of changes required regarding the distribution of the Annual Journal, and the appointment of the Chairman of the National Executive.

The proposed changes are set out below. If and when these changes are approved, they will be forwarded to the Registrar of Incorporated Societies for final ratification.

It is hoped that a reasonable number of RNZIH members will be able to attend the meeting on 31 August.

I will be happy to answer any further queries that members may have.

Dave Cameron
July 1988

ROYAL NEW ZEALAND INSTITUTE OF HORTICULTURE (INC.)

CONSTITUTION

(Proposed amendments to be considered by a Special General Meeting of RNZIH members 31 August 1988)

As adopted on 1 March 1975, and incorporating Amendments passed on 1 May 1976, 30 March 1978, 24 May 1980, and 5 November 1986.

**Amend last line to read*
30 March 1978, 24 May 1980, 5 November 1986 and November 1988.

MEMBERSHIP

3 (d) Fellows:

(iii) The number of Fellows of the Institute at any one time shall not exceed five hundred or such other number as the National Executive may from time to time decide upon.
Delete Clause (iii) above

(iv) Fellows shall be entitled to use after their names the words "Fellow of the Royal New Zealand Institute of Horticulture Inc." or the distinguishing letters "F.R.I.H."
Renumber Clause (iv) to read (iii).

New Clause (g) as follows:

(g) Student Members:
Persons registered as students with the RNZIH are entitled to become Student Members, subject to Rule 8(k). Student Members who do not sit an RNZIH examination for two consecutive years will cease to be Student Members and become Ordinary Members.

(g) Members
Amend (g) above to read (h)

(ii) All students registered for the examinations of the Institute shall be required to be-

come members of the Institute upon registration and to remain members until graduation. They shall have the rights and privileges of members subject to rule 8(a) herein. Certain students may, on the recommendation of the Examining Board, be granted exemption from membership by the National Executive.

Delete (ii) above

(iii) Any member whose annual subscription, as specified in Rule 8(a) herein has lapsed, may be liable for a rejoining fee on renewal of membership.

Renumber (iii) above to (ii)

EXECUTIVE AND OFFICERS

5 (a)

(v) Chairman who shall be nominated by the Executive and upon his or her election shall become a member of the Executive; he or she shall not be elected annually but shall hold office for a term not exceeding three years provided however that a retiring Chairman shall be eligible for re-election for a further term, but not exceeding in all the continuous period of six years. A former Chairman shall be eligible for election again provided there has been a lapse of at least one term since he or she last held office.

Delete (v) above and replace with

(v) Chairman who shall be a member of the Executive, elected annually by the Executive.

The Executive shall have power to fill a vacancy in the Executive and in the Offices of President, Vice-President and Chairman caused by death or resignation or other cause and such appointee shall hold office for the remainder of the term of office of the person whose place he or she is appointed to fill.

Amend first line to read:

. . . shall have power to fill by co-option, a vacancy . . .

(b) The Executive shall consist of the Chairman elected under clause 5(a) and eleven Members duly nominated and elected at the Annual General Meeting of Members for a term of three years. Election to the Executive shall be carried out by means of a postal vote by members.

Delete on first line:
"the Chairman elected under clause 5(a) and eleven" and replace with:
"twelve"

SUBSCRIPTIONS

8. (a) Fellows and Members shall pay an annual subscription of an amount which shall be fixed at a General Meeting of Members and, except for the official Journal, shall receive the periodic publications of the Institute.

Delete on first line:
"Fellows and"

Delete on second line:
"," after "and"

Delete on second line:
"except for the official Journal,"

(b) Societies, Associations, Companies, Corporations, Firms and other bodies shall pay annual subscriptions of amounts which shall be fixed at a General Meeting of Mem-

bers and shall receive the official Journal and periodic publications of the Institute.
Delete on third line:
"official Journal and"

(c) Associates of Honour shall receive the periodic publications of the Institute, except the official Journal, without payment of an annual subscription.
Delete on second line:
"except the official Journal,"

(d) Honorary Members shall not be required to pay an annual subscription and shall receive the periodic publications of the Institute except the official Journal.
Delete on second line:
"except the official Journal".

(k) Associate Members shall pay an annual subscription of approximately 65% of the amount which shall be fixed as the subscription for members at a General Meeting of members and except for the official Journal, shall receive the periodic publications of the Institute.
Insert after Associate Members on first line:
"and Student Members"

On third line delete:
"except for the official Journal,"

R.N.Z.I.H PUBLICATIONS

Members are reminded of the various publications that the Institute has available. Don't miss out on these valuable items:

1. "FLOWERS FOR SHOWS"
   A "must" for everyone involved in flower shows, whether as a judge or exhibitor.
   Cost $10.00 plus GST.
   Quantity discounts available on request.

2. ANNUAL JOURNALS
   Journals 1, 3, 4, 6, 7, 8, 11 $5 each + $1 (p & p).
   Journal 14 $8 + $1 (p & p).
   Journal 15 sold out.
3. "HORTICULTURE: THE CAREER FOR YOU?"
   This very valuable book for people contemplating a career in horticulture has just been revised. Copies have been sent free of charge to all secondary schools in New Zealand. Further copies are available from the Executive Officer at $5.50 each (including GST and postage).

Chilean Trees and Shrubs

Mr Daniel Bruhin — a frequent contributor to the Bulletin — is now living in Chile. He has seed of Chilean native Trees and Shrubs for sale. His address is: Daniel Bruhin
Casilla 975
Punta Arenas (XII)
Chile

EDITORIAL

Acer griseum — Paper bark Maple family, Aceraceae.

The 'assignment season' is here again with the long winter nights being conducive to working through T.C.I. assignments, as well as keeping warm.

Work in the garden during winter is somewhat restricted due to less hours of daylight. However, there are still plenty of tasks to be carried out, including pruning.

One specimen tree that is a valuable asset in any garden for winter display is the paper bark maple, *Acer griseum* (family: Aceraceae). This medium sized tree (with approximate mature dimensions 7m x 3m), has a distinctive habit of peeling flakes of brown papery bark which reveals beautiful smooth orange-red new bark beneath. A native of South West China, *A. griseum*, as well as displaying winter beauty, is equally attractive when in foliage, especially with its vivid autumn colour.

The R.N.Z.I.H. Annual Conference held in Christchurch was well received. Of specific interest to students was the proposal to review student membership of the Institute. More information regarding this is provided in the Executive Officer's report earlier in this bulletin. The guest speakers, field trips, workshops and discussions covered a wide range of horticultural topics and a lot of knowledge was gained.

Included in this bulletin are excerpts from a student's dissertation. This could well be continued in future editions and hence students with dissertations may be contacted for copies of their work.

Kind regards
Nick Owers

GREVILLEAS

Chris Evans

Part of a dissertation for subject 19 of the N.D.H. The full dissertation is titled 'Propagation of Grevilleas' and was presented by Chris Evans of Titirangi. We have only presented the introduction and conclusions here because of space limitations.

Grevilleas

Grevilleas belong to the Protea family, named after the Greek God, Proteus, who was remarkable for his ability to change his appearance and form. Grevilleas themselves were named in honour of Charles F. Greville, a Vice President of the Royal Society, President of the Royal Horticultural Society and a Patron of botanists. The most consistent feature of the Protea family is its inconsistency: variability and novel appearance are the norm. The largest group within the Protea family, Grevilleas make most other genera look staid and conservative.

There are approximately 270 known species, but many species have a multitude of forms — differing dramatically in flower colour, growth habit and climatic tolerance. They vary from the towering rain forest fringe dweller, the silky oak *Grevillea robusta*, through prickly desert shrub such as *Grevillea wickhamii* to lush, mountain groundcovers such as *Grevillea laurifolia*.

The vast majority of the 270 species are native to Australia, although a few occur in New Guinea, New Caledonia and the Celebes. Over half the Australian species are native to Western Australia, however the eastern species have dominated in the Nursery scene, due to their great tolerance of garden conditions.

Unlike modern roses and azaleas, Grevilleas require little care and are subject to very few pests and diseases.

Grevillea Groups

In general, most Grevilleas detest summer humidity, which encourages root fungus diseases such as pythium, phytophthora etc, to which they are prone. In humid areas Grevilleas occur naturally on sandstone belts, avoiding where-ever possible the moist clay soil types. In fact, the majority of Grevilleas come from areas where the soils are sandy or well drained & where fertility is rather poor. The exceptions to this rule are the Silky oak and a few other rainforest margin species and perhaps some of the highland species.

There are 3 groups of Grevilleas.

1. The SPIDER flowering group

Commonly smaller shrubs from 1 to 2 metres tall, dense with needle or narrow leaves. This group dislikes heat & humidity, being somewhat prone to root rot fungus and insect problems in warm humid areas.

Examples: G. *buxifolia*, G. *rosmarinifolia*, G. *juniperina*, G. *victoriae*. Frost hardiness is generally good.

2. The TOOTHBRUSH flowering group

This is the most variable group. Most commonly taller shrubs in the 1-5m range, although ground covers (e.g. G. *laurifolia*) are quite common. Leaves are often prickly and divided into various shaped lobes. A more widespread group, but still numerically

strong in the southern areas. More tolerant of heat & humidity. Resistance to frost is good. Of all the Grevilleas, this group is the most sensitive to fertiliser damage.

Examples: G. *hookeriana*, G. *asperifolia*, G. *thelmanniana*.

3. Tropical BRUSH flowering group

This group tends to have less prickly leaves, which are often finely divided. One could reasonably include the larger toothbrush species in this group (eg: G. *robusta*). Most members of this group grow from 3-20m tall, like warm weather and are more resistant to humidity. This group is very fast growing and more tolerant of rich soil. Many are frost tender.

Examples: G. *banksii*, G. *Honeycomb*, G. *pinnatifida*, G. *stricta*, G. *junicifolia*.

What is important to note is that the further a species or group is grown from its preferred area, the more it is open to fungal root rot and insect attack such as borers, psyllids and thrips. What this means is the further from home climate, the shorter the life span.

Leaf Types

Certainly no other genus of plants has the variations of leaf forms as Grevilleas. The leaf shapes are so variable and so unconventional that botanists have had great difficulty in describing them accurately. Many botanists' descriptions are long, clumsy and imprecise.

There are a number of species of Grevillea which have "ordinary" leaf shapes — G. *victoriae* having leaves which resemble those of a Camellia.

Many species have "needle" leaves, for instance G. *rosmarinifolia* and G. *juniperina*. When the leaves are examined closely, the sides of the leaf blade will be seen to curl under to form the narrow shape.

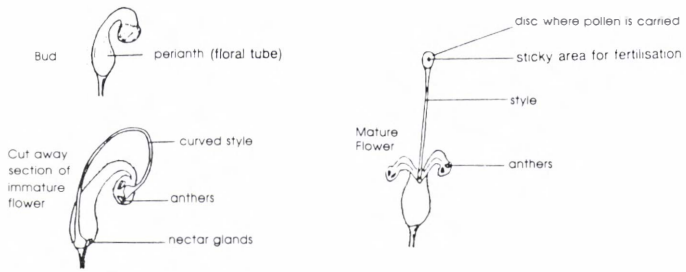
Rather more conspicuous lobes are present in some varieties such as G. *'Ivanhoe'*. These lobes are rather broad elongated sawteeth types.

The classic 'fishbone' leaves are seen in G. *x hookeriana*. They are said to resemble the back-bone and attached ribs of fish. These leaves have a narrow central area with very narrow and long lobes.

Beyond the simple lobing are the double lobed types. Lobes branch from the mid-rib of the leaf and these are sub-divided into secondary segments. A simple form of this twice-lobed leaf is seen on G. *'Robyn Gordon'* and a rather more intricate design is woven into a leaf of G. *robusta*.

The Flower, Birds and Pollination

The grevillea flower is rather odd, bearing little functional resemblance to a 'normal' flower. Designed principally for pollination by birds, a number of fascinating modifications have occurred.



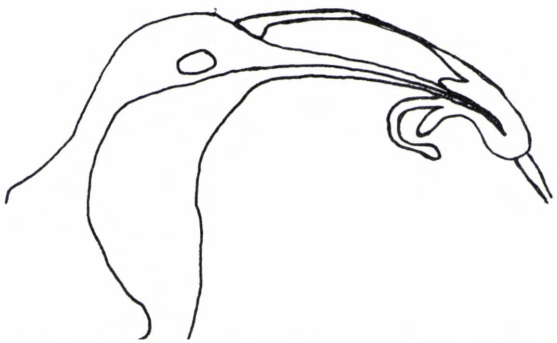
Development stages in the Grevillea flower

The flower petals are fused together to form a floral tube called a perianth. Kidney shaped when young the flower splits open when mature to release a long filament tipped with pollen. Logic demands that this must be the male stamen — but it isn't, in fact it is the female part, the style.

The stages in the development of the flower provide the answer to the riddle of its strange sexual behaviour. If you look at the diagram showing the 3 developmental stages, you will see that in the middle stage the style is looped and its tip is located near some oval structures at the top of the floral tube. These are the anthers.

Normally, anthers are borne at the tips of the stamens (e.g. bottlebrush), but not so with Grevilleas. Here the anthers squat inside the floral tube & co-operate to load the semi-erect style with their produce: the pollen.

So, when the female part (style) becomes erect it carries the male sexual produce (pollen) on its tip. Attracted by nectar deep in the floral tube, a bird inserts its beak into the flower and accidentally brushes the pollen onto its forehead. The bird then flies off to fertilise other Grevillea flowers with Pollen on its forehead.



Cut away section of a bird sipping nectar from a Grevillea. Note pollen being deposited on bird's forehead.

When the original pollen has been brushed off, a small central area on the disc, at the tip of the style becomes sticky and thus, sexually receptive. Pollination should occur when the next pollen carrying bird arrives.

The nectar glands, located inside the base of the floral tube, produce a rather watery nectar solution. This is the sort of nectar that birds like, more concentrated types being needed to attract insects. Most Grevilleas are bird pollinated, although some are pollinated by insects such as bees, flies or moths.

Birds have determined the flower colour of most Grevilleas. Their favourite colours in order of preference are red & pink, then orange, yellow, blue, violet, white and cream. Thus, in order to attract birds, grevillea flowers should mostly be coloured red, pink, orange or yellow — which they are.

The whiteish grevilleas (e.g. G. *biernata* & G. *linearifolia*) are mostly polinated by insects. Most insects can't see the colour red, but see the colour ultra violet — to which we are blind — particularly well. Insects are attracted to white flowers (which may appear a different colour to them), hence their role in pollinating white flowering Grevilleas.

Seeds

Certain species of Grevilleas are normally grown from seed e.g. G. *robusta*. Grevilleas set their seeds in boat shaped follicles which form within a few weeks of flowering. At ma-

turity, the seeds ripen and are shed immediately. Grevillea follicles open up along one side like a purse.

The grevillea follicle may contain one or two seeds, depending on the method of survival.

Collecting seeds is rather a frustrating business since the follicles may appear green and unripe one day and yet all the seeds may have been dispersed by the next morning.

Extreme cleanliness is essential for good seed germination. Soil borne diseases can destroy vast numbers of young seedlings. The same peat and pumice mix recommended for cutting production is ideal for striking seeds. The seeds buried under 2-5mm of mix. Seedlings can also sprout quite well in the open and glasshouse treatment is essential.

Asexual Reproduction

The majority of Grevilleas are grown from cuttings although a small number are grown from seed.

Plants grown from cuttings tend to have certain characteristics.

A) a lower, denser growth habit.

B) early flowering — some cutting grown plants can flower weeks after being successfully rooted.

C) a shallower, fibrous root system.

D) uniformity from plant to plant.

Conversely, seedling grown plants:

A) develop more of a trunk and grow taller.

B) need a maturing period before flowering.

C) have deeper roots, often a tap root system.

D) exhibit genetic variability.

Not only are cuttings more uniform in their general characteristics, but also they may be markedly superior to or different from average seedlings.

Existing hybrid varieties are always propagated by cutting. Many of them are sterile. Fertile hybrid produce extremely variable offspring from seed which cannot be guaranteed to perform a particular function in the garden.

Conclusion

From my findings and research I feel the best way to propagate Grevilleas (for those varieties not successful from seeds) is by asexual means i.e. Cuttings.

The best method being:

1) Heated beds.
2) Outside in a shade house.
3) Use of propagation mix 80-20 peat pumice sand.
4) Use of IBA .3%.
5) Tips and semi ripe (not too soft tips).
6) Size of cuttings 8cm — wounding on harder wood.
7) Autumn cuttings.

COMPOSTING — MAKING SOIL IMPROVER FROM RUBBISH

Part one of a two part article

Rubbish is one product our society makes very well. We make mountains and oceans of it. We dump it in holes and in the sea, bury it and burn it. But when we run out of holes, when the sea cannot take any more, and when we get sick of smoke in our eyes, what do we do then?

One answer given by those who are concerned about our soils and food production system is: "Compost it and return it to the soil". They are, of course, referring to the many organic materials that we throw away or burn — lawn clippings, leaves, weeds, sawdust, paper, kitchen scraps, seaweed, etc. The compost heap can convert this bulky "rubbish" into a soil improver and fertilizer.

Any organic materials thrown into a heap will eventually be reduced in size by small animals and rotted down by microorganisms already present on them or that come from the underlying soil. This sort of thing has been happening for millions of years in litters on forest floors and other places where organic materials accumulate.

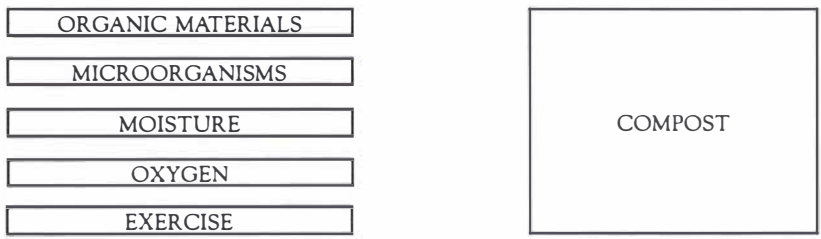
Composting is really just a method of speeding up the natural processes of rotting, but in the compost heap we can control the process to suit ourselves. Good technique ensures minimal losses of nutrients and hence their maximum return to the soil.

The Chinese, Japanese and other Asian peoples have been making compost for at least 4000 years, returning to their soils via compost heaps, sheds or pits every scrap of animal and vegetable "rubbish" and much mineral matter from canal bottoms. Their methods were made known to the rest of the world through a book called "Farmers of Forty Centuries", written in 1911 by Dr F. H. King, an American soil scientist. Sir Albert Howard, a British agronomist who worked in India during the first 40 years of this century, distilled the best from these composting methods. After many years of patiently studying the various possible techniques he devised the Indore composting process. Since 1931 it has been the basis of most home garden compost heaps.

Many later studies have added to our information about the composting process so that in home gardens and on an industrial scale composting has had much of the guess-work taken out of it. We know how to make a good product.

Ingredients

The essential ingredients of a compost heap are organic materials, microorganisms, moisture and oxygen (and a little soil).



Compost of high fertilizer value can only come from "high quality" rubbish. The most important aspect of quality is the carbon: nitrogen (C/N) ratio of the organic materials used. Microorganisms need both carbon and nitrogen to make protein. As they use about 30

parts by weight of carbon for each part of nitrogen used, we need to supply them with materials having a C/N ratio of about 30. Microbial activity is reduced at higher C/N ratios (low nitrogen supply) and valuable nitrogen may be lost as ammonia gas if the C/N ratio is lower than about 30. In practice, it has been found that the average C/N ratio of the materials in a compost heap should be slightly less than this — in the range 25 to 30 — for the heap to "work". The table will help you achieve somewhere near the optimum C/N ratio.

Material	C/N Ratio (Weight/ Weight)	% Moisture in material	gC/100g moist material	gN/100g moist material
Lawn clippings	20	85	6	0.3
Weeds	19	85	6	0.3
Leaves	60	40	24	0.4
Paper	170	10	36	0.2
Fruit wastes	35	80	8	0.2
Food wastes	15	80	8	0.5
Sawdust	450	15	34	0.08
Chicken droppings (no sawdust)	7	20	30	4.3
Chicken litter (typical)	10	30	25	2.5
Straw	100	10	36	0.4
Cattle droppings	12	60	20	1.7
Human urine				0.9 (per 100 ml)

Example of mixtures with C/N ratios between 25 and 30

Lawn clippings : sawdust, 12:1

$$\frac{C}{N} = \frac{(12 \times 6) + (1 \times 34)}{(12 \times 0.3) + (1 \times 0.08)} = 29$$

Lawn clippings : weeds : leaves, 2:3:1

$$\frac{C}{N} = \frac{(2 \times 6) + (3 \times 6) + (1 \times 24)}{(2 \times 0.3) + (3 \times 0.3) + (1 \times 0.4)} = 28$$

Leaves : sawdust : cattle droppings, 2:1:2.5

$$\frac{C}{N} = \frac{(2 \times 24) + (1 \times 34) + (2.5 \times 20)}{(2 \times 0.4) + (1 \times 0.08) + (2.5 \times 1.7)} = 26$$

Fruit wastes : lawn clippings, 2:1.5

$$\frac{C}{N} = \frac{(2 \times 8) + (1.5 \times 6)}{(2 \times 0.2) \times (1.6 \times 0.3)} = 29$$

Weeds : paper : chicken litter, 4:3:1

$$\frac{C}{N} = \frac{(4 \times 6) + (3 \times 36) + (1 \times 30)}{(4 \times 0.3) + (3 \times 0.2) + (1 \times 4.3)} = 27$$

Leaves : weeds : paper : chicken droppings : urine, 3:3:1:0.5:1

$$\frac{C}{N} = \frac{(3 \times 24) + (3 \times 6) + (1 \times 36) + (0.5 \times 30)}{(3 \times 0.4) + (3 \times 0.2) + (1 \times 0.2) + (0.5 \times 4.3) + (1 \times 0.9)} = 28$$

Note: The table gives average figures. It should be realised that a given type of organic material can vary considerably according to source. The above mixtures may need to be varied to suit local sources and conditions.

Further mixtures may be formulated according to the materials available. Provided the C/N ratio is right, it is not essential that animal manures are included. Urea can be used to supply extra nitrogen if high nitrogen organics are not available in sufficient quantities to compost large quantities of leaves or other low nitrogen materials. Two grams of urea contain 0.9g N (equivalent to 100 ml urine). Alternatively, ammonium sulphate (sulphate of ammonia) will supply 2.1g N in each 10 g used.

Microorganisms also need abundant supplies of the other nutrient elements, with phosphorus being particularly important. A carbon/phosphorus (C/P) ratio in the range 75 to 150 is needed. As leaves (especially gum leaves), woody plant residues and sometimes even lawn clippings have C/P ratios above 150 it is desirable to add extra phosphorus to most compost heaps so as to ensure rapid decomposition. Superphosphate can be used, but if you prefer a more natural source of phosphorus, use bone meal or rock phosphate. Use only light sprinklings as more than about two percent by weight can inhibit decomposition.

The other nutrients needed by microorganisms are usually present in sufficient amounts if a wide range of organic materials is used.

Grinding or chopping up the organic materials speeds decomposition by increasing the surface area available to microorganisms. In practice, fine grinding is unnecessary; chopping to pieces 5-10 cm long gives satisfactory results. A cheap chopper may be made by hooking a ¼ KW electric motor to the spinner side of an old twin-tub washing machine, suitably cut down and fitted with a bevelled chopper blade and small (10 cm x 16 cm) outlet hole. Commercial, shredders do a better job but they cost a lot more. Running a motor mower over the materials can also do a reasonable job.

Microorganisms

Some hundreds of species of microorganisms, mostly bacteria, fungi and actinomycetes (branching bacteria), are involved in decomposing organic materials. Most organic materials have a native population of microorganisms and others are added to a compost heap in the garden soil often mixed into or layered amongst the organic materials. These microorganisms start their work of decomposition as soon as moisture and oxygen concentrations are favourable. Many research studies have shown that special preparations of fungi, bacteria or "enzymes" are not needed for rapid decomposition; there are plenty of organisms in the materials commonly used to make compost. Adding more is like adding a pebble to a rockslide. The end results are the same with or without the pebble. Only where sawdust (or other relatively sterile materials) form a high proportion of the heap is inoculation not a waste of money. The claimed advantages of some commercial preparations are often due to the extra nitrogen and other nutrients they supply rather than to the microorganisms they contain. These nutrients can be bought much more cheaply in fertilizers. If in doubt, add a small amount of mature compost to each new heap.

Moisture

The moisture content of a compost heap is very important. Below about 40% moisture (40 g water in 100 g moist materials; i.e. 40 g water + 60 g dry matter), organic matter will not decompose rapidly. Over about 60% moisture not enough air can get into the heap and it tends to become anaerobic (no oxygen). It is best therefore to aim at 50 to 55% moisture. This is about the moisture content of a squeezed sponge. It feels damp, but not soggy. Repeatedly moisten the heap in hot, dry weather. But at other times cover it if it looks like getting too wet during rain.

Oxygen

Those microorganisms that need oxygen are called aerobes and those that do not are called anaerobes. Organic materials in heaps are decomposed most rapidly by aerobes. They need plenty of air, many cubic metres a day for a garden compost heap of reasonable size.

Inadequate aeration allows anaerobes to take over from aerobes inside the heap, leading to the production of foul odours, mostly gaseous chemicals containing sulphur. Good aeration is very important, so it is better to err on the side of frequent rather than infrequent turnings.

Changes inside the heap

Temperature

Heaps of moist organic materials heat up because the heat given off by microorganisms as they feed and multiply is kept in the heap by the insulating properties of the organic materials. Figure 1 shows how the temperature changes in a typical heap. In large heaps the top temperature may exceed 60°C, in small heaps perhaps no more than 55°C. This is because large heaps have a smaller surface area to volume ratio than small heaps, and so lose relatively less heat. Large heaps are therefore more efficient than small heaps in winter.

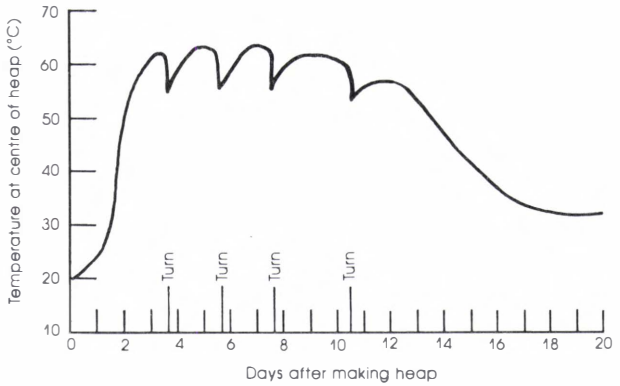


Figure 1. Changes in the temperature of a typical turned compost heap of the Berkeley method.

Scientists refer to the stages of the temperature cycle below 40°C as the mesophilic stage and the stage above 40°C as the thermophilic. Marked changes occur in the microbial population as the temperature moves past 40°C. The mesophilic organisms (those that like a middle temperature range as we human beings do) die out and are replaced by an upsurge in the population of thermophilic organisms (those that like high temperatures). Later, as the temperature drops, mesophilic organisms re-invade the centre of the heap from the cooler outer layers. Decomposition of organic materials is fastest in the thermophilic stage.

During turning for aeration, the interior temperature may drop 5 or 10°C, but it returns to the initial temperature in a few hours.

Thermophilic organisms die at temperatures over 60°C so the maximum temperature of a heap tends to be self regulating. The trouble is that this high temperature dying off increases the time needed to finish the composting process. Heap temperature should be monitored, and if it gets too high the heap should be made smaller.

pH

Initially, the pH of a compost heap is slightly acidic (Figure 2) because the cell sap of plants is acidic. Then the heap becomes even more acidic (lower pH) due to acids such as acetic, citric, tartaric, lactic, 2-ketogluconic, sulphuric, nitric, etc., produced by bacteria. During the thermophilic stage the heap becomes alkaline through ammonia formation and,

finally, near neutral or slightly alkaline as the ammonia is converted to protein and the natural buffering capacity of humus dominates the scene.

Tests at the University of California, Berkeley way back in 1953 showed that adding lime to a compost heap can cause serious losses of nitrogen. This happens mainly in the thermophilic stage of decomposition when the heap is alkaline anyway. Lime increases the alkalinity of the heap; this reduces the solubility of ammonia in the water of the heap, and so increases the proportion of ammonia in gaseous form. A greater proportion of the ammonia can then escape into the atmosphere.

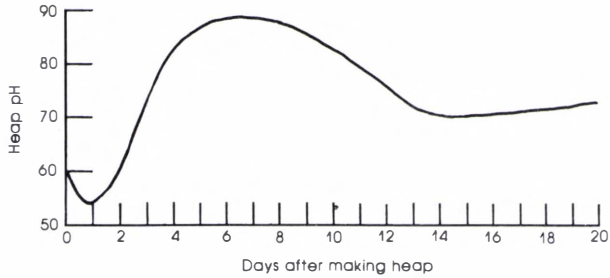


Figure 2. Compost heap of the Berkeley type. Minor changes during turning are not shown. Similar changes would occur in unturned heaps but the time scale would be extended.

Generally, therefore, it is best not to add lime, dolomite, ashes or other liming materials to compost heaps. If our soil is acid it is better to add a liming material direct to it rather than via a compost heap. Liming materials do improve the physical appearance and ease of handling of composting material, but soil accompanying weeds and added phosphatic material will have much the same effect. One is caught a bit between the devil and the deep blue sea here. A reasonable compromise would be to use little or no liming material except in heaps where woody materials, especially resinous woody materials, make up part of the heap.

So far this discussion has been about liming or not liming largish compost heaps that are well-aerated through frequent turning. The contents of compost bins may need to be treated differently. Because of limited air movement into bins, their contents are probably more often than not partially anaerobic. Compost produced in a partially anaerobic environment is generally more acid than that produced in a well-aerated heap. What happens is that parts of the heap don't get past the early stages of decomposition shown in Figure 2, so acids produced by bacteria accumulate. (This happens in extreme form during the production of silage by farmers. Green grass is piled into a pit and air is sealed out with a layer of plastic sheeting or soil. The grass is preserved, or pickled, through the production of acids, mainly lactic and acetic. The pH of silage is around 4.0 to 5.0. Peat and peat moss are also formed under anaerobic conditions and are acidic.)

Lime added to a partially anaerobic compost bin would modify the composting process and would give a less acidic compost. If our soil is alkaline we may prefer to have an acidic compost, but if our soil is acid the addition of a small amount of lime to a compost bin could be worthwhile.

To add lime or not to add lime is a question that we each need to answer after considering our own situation. We do not need to slavishly follow someone else's recommendation.

Chemical

Compost heaps are akin to complex chemical factories. Many changes take place in the

course of decomposition. Even before the microbes start their work, enzymes in plant cells have started to break up proteins into amino acids. Then the microorganisms grab all the soluble compounds — the sugars, amino acids, inorganic nitrogen (mainly ammonium nitrogen) and start breaking up the starches (into sugar), fats (into glycerol and organic acids), proteins (into amino acids) and cellulose (into sugars) and incorporating the bits into their own structures. At times more ammonia is produced from proteins than the microbes can handle and some may escape, but eventually they catch up. Plant nitrogen is converted to the protein of microorganisms and eventually some is converted into nitrate, a ready source of nitrogen for plants.

Lignin, a compound of the cell walls of plants, is somewhat resistant to microbial decomposition, but even it is eventually broken down. Microorganisms in the compost heap and later in the soil convert lignin and other plant components into the very large stable molecules that make up the black humus of soils. It is thought that these molecules are able to join soil particles together into aggregates and so improve soil structure, although other, less resistant parts of soil organic matter, roots and bacterial gums for example, also contribute. As these humus components are slowly broken down by other soil organisms, the various nutrient elements they contain are released to plant roots.

Much of the carbon of the original organic materials is "burnt" by microorganisms in their life processes and ends up as carbon dioxide gas. This loss causes a 30 to 60 percent decrease in dry weight of the heap and a volume reduction of around two-thirds.

Microbiological

During aerobic composting the microbial population is continually changing. In the first mesophilic stage, fungi and acid-producing bacteria multiply on readily available food-stuffs such as amino acids, sugars and starches. Their activity produces heat and eventually the thermophiles take over in the interior of the heap. The thermophilic bacteria decompose protein and non-cellulose carbohydrate components such as fats and the hemi-celluloses (similar to cellulose, but composed of mannose and galactose as well as glucose). Thermophilic actinomycetes appear to be more heat tolerant than many other bacteria and their numbers increase greatly during the thermophilic stage. Some seem able to decompose cellulose.

Thermophilic fungi occur in the 40 to 60°C range but die about 60°C. They decompose hemi-cellulose and cellulose and so are particularly important in the formation of compost.

As the availability of food decreases, the thermophilic organisms decrease their activity, heap temperature falls, and mesophilic organisms invade the interior from the outer layers that remained relatively cool during the thermophilic stage. It appears that at least some of these invaders can use cellulose and hemicellulose, but not as well as the thermophiles. They continue the decomposition process and no doubt also decompose the remains of many thermophilic microorganisms.

Microorganisms decompose plant materials mainly by means of enzymes they excrete. Enzymes are large, complex protein molecules that enable chemical reactions to take place without actually being used up themselves: they are catalysts. An example of an enzyme production system close to home is that of the saliva glands in our mouths. Saliva contains an enzyme called amylase that is able to break up starch into sugars.

In compost heaps, microorganisms probably excrete many hundreds of enzymes that enable them to break organic materials, including each other, into smaller bits that they can use as food. For example, many organisms excrete an enzyme called cellulase that can break up cellulose (a major component of cell walls, and of the paper of this page) into glucose. This can then be absorbed by the organism and "burnt" to provide energy for its life processes.

Pathogens

An important function of the compost heap is the destruction of pathogens and parasites of both plants and animals, and weed seeds.

Most are killed at temperatures of 55 to 60°C and so do not survive the thermophilic stage. In effect, their protein is coagulated in much the same way as we coagulate egg proteins during cooking. Others are killed by microorganisms. Composting at temperatures about 55°C for about 3 weeks gets rid of most pathogens. If some are known to be present initially, it is important to make sure that all materials spend some time in the hottest part of the heap. Thus the bacteria that produce wilts in tomatoes, the bacteria that blight beans, the fungi that cause rusts and eelworms that attack roots can all be killed in a hot compost heap. Burning need not be resorted to for diseased plants provided they get hot enough inside the heap.

In part two of this article, methods of making compost and uses for it are outlined.

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