

Trees in the service of man

Garden History

When the City of Wellington was being planned in London, in the instructions to the Superintendent of the NZ Company for the establishment of the colony in **1839**, he was directed to establish a city of some 1000 acres. Separating the urban from rural activities, a strip of land was to be set aside, which we now know as the Town Belt. In addition he was instructed to set aside land 'as a botanic reserve'.

Thirteen acres of land for the Wellington Botanic Garden were identified in a City Plan dated **1840**, the site of the current Main Garden. With many interested gardeners among the earliest colonists, a Wellington Horticultural Society was set up in **1841**, and by **1844** some £410 has been set aside for the future development of the Garden.

The declaration of martial law in **1846** following Maori attacks in the Hutt Valley, earthquakes in **1848** and **1855** and financial constraints resulted in little being achieved in the establishment of the Garden. It was not until **1869** that the Botanic Garden Act was passed and a Botanic Garden Board was appointed to manage it. During those intervening years squatters had moved on to the land, removed trees, grazed animals and had even built houses on it.

The Governors of the NZ Institute, which was the forerunner of the Royal Society of NZ, together with Dr James Hector, who later became Sir James Hector, as Manager, formed the Botanic Garden Board, and administered the Botanic Garden for the next 22 years. James Hector was a medical doctor, geologist and explorer. He was the Director of the Colonial Museum and Geological Survey, Manager of the NZ Institute, and later Chancellor of the University as well. He made an outstanding contribution to NZ science. Appointed by the new central Government set up in Wellington in **1865** as its 'scientific adviser', it is interesting to note that government consultants are nothing new !! He actively encouraged the Government to establish the Garden (**1869**) utilising the land previously identified, with the following three aims.

Firstly, as a trial ground for the Government to examine the economic potential of plants, especially for forestry.

Secondly, as a scientific reserve, for the collection and study of indigenous and exotic plants, and thirdly, as a place of recreation and enjoyment for the public.

Except for the nursery beds near the entrance the Garden was completely unformed, except for some tracks. William Bramley was the first Superintendent, and he immediately commenced fencing the Garden, cutting paths, and removing gorse and commencing planting. The original area was 13 acres, and in **1874** the Wesleyan Reserve of 58 acres was added to give a total area of 68 acres. (25.5 ha). Unlike the original 13 acres, this reserve still had areas of native forest remaining on it.

With what was to be great foresight, Dr Hector recognised that the early settlers had been removing forest so rapidly from the land to provide grazing for animals, that it might not be long before NZ began to run short of timber for building. The large scale removal of forest also meant that farmland was exposed to wind and that shelter belts were required, especially in the areas of tussock land in Otago and Canterbury, Wairarapa and Hawkes Bay. He was also aware in some areas trees were becoming scarce for firewood. With these requirements in mind the Botanic Garden Board imported timber and shelterbelt species of tree from around the world, especially from Europe, North America, India, China and Japan. The Government provided their funding. The Government also provided funding for trials of other species for their economic potential, for example, cork oak, sorghum, sugar beet, hops, mulberry, black walnut, pecans, hickory, plums and olives. By **1875** 127 different types of conifers had been planted, some 34 of which remain in the Garden today.

After the trees had been trialled in the Botanic Garden, those that showed potential were sent to all parts of NZ for further trials. One timber species proved to be extremely successful, ahead of all the others, in all parts of NZ, for its rapid growth and good timber, and that of course is the **Monterey Pine**, or *Pinus radiata*. The species that proved to be very successful as a shelter tree was the **Monterey cypress**, or *Cupressus macrocarpa*. Both of these trees come from the Monterey Peninsula in California, where with their stunted and windswept appearance they bear little resemblance to the massive pine and macrocarpa trees we see in NZ today.

Monterey Pine comes from three distinct unconnected areas of central coastal California, named from one locality, the Monterey Peninsula. It is now rare in its natural habitat because of fungal disease and the encroachment of towns and cities. In recent years genetically improved trees have been imported back into California from New Zealand, and these are now cross hybridising with the native stock, raising questions of the status of the native genotype in its natural habitat. The Garden trees, being from wild collected natural stock, are therefore important as a store of this natural genotype, and effort is required to preserve this important resource for future generations

JAMES HECTOR

James Hector was a pioneer explorer, geologist, and natural scientist, who founded many of New Zealand's scientific organisations.

Born 16 March 1834, Hector entered Edinburgh University as a medical student in 1852, medicine being the only avenue for scientific study then. He also attended lectures in geology, botany and zoology. In 1856 he graduated MD (Doctor of Medicine) with a thesis on the Antiquity of Man.

His abilities were recognised at an early stage, and in 1857 he was appointed surgeon and geologist on a Government expedition for the exploration of western Canada. It started in Detroit in June 1857, and ended at Vancouver Island in January 1860. Hector made an outstanding contribution to the success of the expedition. Working in rugged conditions, he established himself as a field geologist, natural historian and explorer. One of the accounts of the expedition notes that "Young and eager, the tough little Scot proved a heroic traveller who left a legendary reputation behind in western North America".

He did not limit himself to Canadian geology. He made observations on mammals, reptiles, insects and birds, and reported on the customs of the Indians and their language.

Hector left his mark on many geographic features. He is particularly remembered for the discovery of Kicking Horse Pass, high in the Rockies. One of his most important geological studies was here, which later became the route of the main Canadian Transcontinental Railway. It was this study that led to his general recognition. As the name implies, he was injured by a horse completing this work, and assumed by his companions to be dead. They were about to bury him when he regained consciousness and winked at them.

Based on his success with the expedition, Hector was appointed Geologist to the Province of Otago, New Zealand soon after the discovery of gold. From his arrival in April 1862, he carried out pioneer exploration and geological reconnaissance Otago, including the inaccessible mountainous area in the west. By September 1862 Hector had explored the eastern districts of Otago, visited Central Otago, and accumulated a collection of 500 specimens of rocks, fossils and minerals. During 1863 he extended his investigations to the West Coast, carrying out a double crossing between Milford Sound and Dunedin, a pioneering effort in exploration and geological reconnaissance.

The Otago Museum grew out of a suggestion, in the early 1860s, that colonial, gold-rich Otago should publicly exhibit a representative collection of its diverse rocks. When Provincial Geologist James Hector's collection of 5,000 rocks and minerals went on display at the trade-promoting New Zealand Exhibition in Dunedin in 1865, the Provincial Government of Otago decided to act on the suggestion, by then enlarged to envision a museum of natural history. A steering committee was formed but nothing emerged, largely because of a lack of funds and a suitable location.

In July 1868, the impetus for a museum was revived, and this time rooms were made available in the Post Office building in Dunedin's Exchange area. On 15 September that year the Otago Museum was opened to the public. The following year the University of Otago moved into the same building – the beginning of a long-standing link between the two institutions.

Hector believed that reconnaissance surveys should include all facets of science, and he assembled a small group of staff, who stayed with him for many years: William Skey to analyse rocks and minerals, John Buchanan as draftsman and botanical artist, and Richard Gore as clerk and meteorological observer.

His work in Otago brought Hector to the attention of the New Zealand Government, then considering the establishment of a colonial Geological Survey to establish the mineral resources of the country. Hector proposed that it should include a scientific museum and analytical laboratory. His ideas were largely accepted, and in 1865 he was appointed Director of the New Zealand Geological Survey and Colonial Museum. Skey, Buchanan and Gore accompanied him to Wellington.

The work of the Geological Survey followed a regular pattern. In the summer months, Hector worked strenuously in the field with assistants. For the rest of the year he was based in the Colonial Museum (close to the site of the present Parliament Buildings) writing reports, classifying specimens and arranging displays.

As the only scientist working for the Government, Hector became the official adviser on all matters of science and higher education. In addition to his designated duties, he became Chancellor of the University of New Zealand, and at different times was responsible for the Meteorological Department, the Colonial Observatory, the Wellington Time Ball Station and Botanical Gardens, the Patent Library, and for custody of the official Weights and Measures.

One of Hector's most enduring contributions was the development of the New Zealand Institute (now the Royal Society of New Zealand) as an independent scientific organisation. From its inception in 1867, Hector was its Manager and Editor for the next 36 years.

Hector published 45 scientific papers in the *Transactions of the New Zealand Institute* on geology, botany and zoology, and produced catalogues of material in the Colonial Museum and Library. He prepared a Handbook of New Zealand in 1879 (revised 1882, 1883, and 1886) that is the forerunner of the New Zealand Yearbook. In 1886 he published his "Outline of New Zealand Geology", a summary of the first 20 years of work of the New Zealand Geological Survey.

Hector also oversaw the production of a series of catalogues, manuals and handbooks by the Colonial Museum. Between 1871-81 these covered birds, fishes, echinoderms, mollusca, crustacea, beetles, flies, wasps, grasses and flax. These were pioneer works, in some cases not replaced by more authoritative works for many years. Hector's dolphin was named in honour of Hector who examined the first specimen

Hector was predominant in the New Zealand science scene for over 20 years, and received many honours. He was knighted in 1887. Inevitably he had disagreements with other scientists and politicians, to some of whom he appeared autocratic and conservative. From the late 1880s his position at the centre of an official scientific empire began to wane, and several organisations were removed from his control. From 1892 Hector was only Director of the Colonial Museum and Manager of the New Zealand Institute, with a greatly reduced staff and budget. He retired from Government service in poor health aged 69 in 1903.

After retirement, Hector returned to Canada as a guest of the Canadian Pacific Railway. Official recognition of his part in the Expedition 40 years earlier was marred by the sudden death of his son Douglas who had accompanied him. He returned to New Zealand alone, and died on 6 November 1907.

Although Hector's death was marked by obituaries in many overseas scientific publications, he received little recognition in New Zealand. To its shame, the New Zealand Institute took 16 years to publish an obituary (and even this appears to have been at the request of the Hector family). Almost 100 years after his death, Hector is now remembered with more respect for the enormous contribution he made to setting New Zealand science on a solid foundation.

James Hector Pinetum

The **James Hector Pinetum** was inaugurated on Arbor Day, 23 June 1992.

The first officially planted tree was a *Pinus sabiniana* planted by the Governor General Dame Catherine Tizard, aided by Peter Hector, great grandson of Sir James Hector. Other trees were planted by pupils of the Kelburn Normal School in the presence of Garden staff and Friends of the Botanic Garden.

The Pinetum was to form a link between the past and the present.

Streams

1. **Pipitea Stream** - enters the Garden opposite the potting sheds, travels to the Pond and then leaves it at the weir, passes under Stone Bridge, travels through Stone Bridge Gully to be piped away underground. This stream was once the water supply for the early settlers.

2. **Pukatea Stream** - drains the valley from the Glen and the upper part of the Garden and enters the south end of the Pond. It takes its name from the prevalence of the native tree, the Pukatea, in the Glen area.

3. The **Waipiro (Waipirau) Stream** runs through the valley stretching down from behind the Dell Lawn, below Anderson Park, through Sydney Street and issuing out into the grounds of Parliament.

The European name for this valley was **Honeyman's Gully** named after Thomas & Mary Honeyman who arrived on the 'Olympus'

The Pond - in the 1870s it was called the Lily Pond. Next it was named the Swan Pond and now it is the Duck Pond, home to ducks, and a joy to countless children. This area was extensively re-modelled in 1997 after two large macrocarpa trees were removed because of decay.

Tilia europaea

To the ancients the Lindens (**Linden Lime**) seem to have appealed rather by their **utility** than by their beauty. The genus contains some 30 species from most temperate parts of the Northern Hemisphere. Common lime is a hybrid, probably of *T. cordata* x *T. platyphyllos*. The limes in the Garden are often referred to as the 'Bramley limes' in recognition of the planting of William Bramley, the first gardener, in the 1870's.

Around the year 70 AD Pliny (Caius Plinius Secundus), alludes to the lightness of the wood of the Lime, as well as to the use of the inner bark for paper, when it was known as **liber** (so becoming extended to books, and giving us the word "library. In making **paper** the stems are harvested in spring or summer, the leaves are removed and the stems steamed until the fibres can be stripped. The outer bark is removed from the inner bark by peeling or scraping. The fibres are cooked for 2 hours with lye (water made alkaline by addition of vegetable ashes) and then beaten in a ball mill. The paper is beige in colour.

Its **wood** is not durable, soft, white, easily carved, but its light white colour, its lightness and fine grain means it is suitable for specialist uses. It is very suitable for carving domestic items and small non-durable items and is used for musical instruments. A charcoal made from the wood is used for drawing.

The **bark** in Germany is used in the manufacture of mats, shoes, baskets, ropes etc. It is also suitable for cloth.

Medicinal Uses: Lime flowers are a popular domestic remedy for a number of ailments, especially for the treatment of colds and other ailments where sweating is desirable.

Young leaves - eaten raw. Excellent in salads, they are mild and mucilaginous. Flowers - used as a vegetable.

A very acceptable **chocolate substitute** can be made from a paste of the ground-up flowers and immature fruit. Trials on marketing the product failed because the paste is very apt to decompose.

A **tea** made is made from the fresh or **dried Lime flowers**. Harvested commercially and often sold in health shops etc. Lime flowers are said to develop narcotic properties as they age and so they should only be harvested when freshly opened.

Sap - used as a drink or concentrated to make syrup and used as a sweetener. The sap of the Linden can be fermented into an agreeable **wine**. An edible manna (sweet juice from the bark) is obtained from the tree.

Cordyline australis

Cordyline group consists of fifteen evergreen trees and shrubs that are natives of New Zealand, Australia, South America, India, and Polynesia. Most of these plants are grown for their ornamental leaves. The scientific name is *Cordyline Australis*. Cordyline is from the Latin word "Kordyle" which means club because of the shape of the root. Australis means "Southern".

They usually form a single stem and several strong, ascending branches that are topped with a crown of leaves. Some kinds can grow to a height of 35 to 40 feet, but for growing in a home or greenhouse, small plants are preferred. Plants of the group, Cordyline, and those of the group, Dracaena, are often confused by gardeners. The coloured-leaved Dracaenas are nearly all varieties of *Cordyline terminalis*. The main botanical difference is that in Cordyline, the cells of the ovary contain many ovules and in Dracaena, only one. The flowers of Cordyline are also smaller than those of Dracaena. *C. australis* (Giant Dracena) is a tender, small to medium-sized tree usually producing a single trunk and several, ascending branches, each topped with a large, thick mass of long, sword-like leaves. In early summer, large panicles of small, white flowers are borne. In unsuitable climates, this tree can be successfully grown in a warm greenhouse or home. A variety of *C. australis*, *purpurea*, is a small to medium-sized tree with purple leaves. Sundance, another pretty variety, is a small tree having the midribs and base of its yellow leaves shaded with dark pink. *C. stricta* is suitable for growing in a cool greenhouse (min. temperature, 50° F), a sunny window, or outdoors in subtropical climates. This plant has a thin stem, eventually growing 6 to 10 feet high. It can be made into a handsome branched shrub by pruning. Its slender, green leaves are 18 to 30 inches long and 1½ inches wide. Old plants usually produce branched panicles of light blue flowers. *C. terminalis* has clusters of rosy to dark red leaves on top of a cane like stalk. They bear lavender flowers that are followed by red berries. *C. indivisa* has wide, leathery leaves, 3 to 4 feet long and 2 to 4 inches wide, with an orange coloured mid-rib and veins. Its variety, *cuprea*, has copper-red foliage.

The cabbage tree is one of the most distinctive trees in the New Zealand landscape, especially on farms. They grow all over the lower parts of the country, but prefer wet areas like swamps.

Sometimes it's called the palm lily but it is not a palm, not quite a lily, definitely not a cabbage, and not really a tree. European settlers used the young shoots from the heart of the tree boiled as a vegetable. They must have thought it tasted like cabbage, hence the name. They also brewed beer from the root. Sometimes hollow trunks were used as chimneys because they

don't catch fire.

It has lovely scented flowers in early summer, which turn into berries that birds love. As the plant gets old, the stems may die but new shoots grow from any part of the trunk. A huge fleshy taproot anchors the tree firmly to the ground.

Maori from different parts of Aotearoa have different names for the cabbage tree; Ti Rakau, Ti, Ti Kouka, Ti Pau, Titi. Ti are really important to the Maoris and in the old days were put to many uses including:

Fibre - Ti leaves are incredibly strong and don't get waterlogged easily, so were used for sandals, Kete (baskets), bird snares, sieves (e.g. to separate the stones from mashed up Hinau berries), thatch for rooves, rope and cord.

The whole leaves would be used for some of these applications. When used for making paper, the leaves are harvested in summer, they are scraped to remove the outer skin and are then soaked in water for 24 hours prior to cooking.

Food - Leaves (rau ti) - The tender young shoots were eaten raw, or roasted in the embers. They taste a bit like artichokes and were eaten with fatty foods.

The cooked tap roots (and raw ones of the dwarf cabbage tree) and the tender shoots of all cabbage trees were important foods of the early Maori. The core of the trunk of some species, including ti kouka was also sometimes eaten. The roots are sweetest in spring before the plant flowers. Only the root and trunk of the immature form of cabbage tree, less than two metres high, was used. The tender shoots were eaten throughout the year. Dried roots contain 5.8% fructose, and the stems 3.5%. If a tree was to be cut for food there was a special procedure carried out. The leaves were removed, and the tree was left to stand for some time. The outer bark of the trunk and taproot was then removed, and the core was left to dry in the sun, before being steamed in an earth oven for 24 to 48 hours. The sweet starchy meal was separated from the fibres by twisting and rubbing, or by chewing and spitting out the fibre. When rubbing was used, the meal was mixed with water to form a sweet paste.

Pith - Called Ti, this was dried in the sun and cooked to make a kind of porridge. Maori also used the inner roots of young trees as ti; making a kind of **porridge**. Dried and steamed until soft. Sweet and starchy, it is also used to make a **sweet drink**.

Root - A delicious sweet drink was also made from Ti. Sugar was extracted by cooking it in a special earth oven called an umu-ti. It can also be brewed into an intoxicating drink. Sometimes the sugar became chewy and was used like chewing gum.

Medicine - Ti was used as a cure for diarrhoea and colic. Leaf scrapings were used as a dressing for cuts. An infusion of the leaves was used to **treat** dysentery and diarrhoea, and cuts. The leaves rubbed to soften them, then they were scraped, and the scrapings were applied as an ointment to cuts, cracks in the skin, and sores. The young inner shoot and the top of the stem were boiled and eaten by nursing mothers, and were also given to children for colic.

After the birth of a baby, Maori bury the placenta under special cabbage trees called te whenua.

Fun - Kids used Ti leaves as toboggans.

Markers - Ti never really die so were planted to mark trails, boundaries, urupa (cemeteries) and births.

It was used by both Maori and early European settlers. European settlers used the **hollowed out trunks for chimneys** for huts, as the wood would not catch fire, although the dried leaves burn readily, giving off an intense heat.

The **root and stems are rich in fructose**, the yields compare favourably with sugar beet. A trial exploring the potential of the New Zealand species *Cordyline australis* (ti kouka) as a modern-day **annual crop for fructose production** (1994) was conducted. Plants of four wild provenances were grown at densities of 2 500, 10 000, and 40 000 plants/ha for 1 year after transplanting. Maximum fructose yields for the provenances evaluated were estimated to be 4 t/ha at densities of 80 000 plants/ha. There is scope to improve yield and harvest index by selection of variation present in wild populations. The traditional Maori practise of coppicing *C. australis* as a perennial stem crop may be a better option than growing the species as an annual crop. Consideration of fructose syrup taste, by-products, regional and ethnic associations, and speciality market options suggest that cropping of *C. australis* warrants further investigation.

Edible **shoots** - a **cabbage substitute**. The leaves are very fibrous even when young

Cabbage trees look great in a garden because their long, spikey leaves add texture to round-headed trees and shrubs. Also they're easy to grow, and don't get too big for town gardens.

Some people don't like cabbage trees near lawns because their dead leaves wrap around the blades of mowers. The stringy trunk also jams chainsaws and if you chop it at any height, lots of trunks soon sprout. Cabbage trees are almost indestructible and can survive a raging blaze. The leaves burn ultra hot and can be used for kindling.

In 1987, a mystery disease started to kill off cabbage trees in the North Island. The disease is called "sudden decline" and the cause is parasitic bacteria called phytoplasmas. But Ti in natural forest patches continue to do well

Ti kouka or **Cabbage Tree** grows widely throughout the country, and reaches 20 m high. N.Z. 15 spp. Natives of India, Australia, the Pacific, S. America Related to the agaves, it is amongst the largest members of that group of plants. Ti kouka is the most common of NZ's five cabbage trees

Rhopalostylis sapida

Maori name is **Nikau** (meaning *many leaves coming from the same stalk*). Also known as cabbage palm, palm cabbage. Nikau belongs to the same family as the coconut palm. The name ni-kau means *barren coconut palm*- ni is the polynesian word for coconut, and kau means barren

Found on low and montane (lower mountains) forests along the coast from North Cape to Banks Peninsula and to Hokitika. Also found on Chatham Islands.

The **Nikau Palm** is a very distinctive palm, with its stiff, upright leaf arrangement (e.g. feather duster like). Leaves to about 2m on plants in the sun, however, they can be considerably longer on plants growing in heavy shade. Grows to about

10m in height, and has a very pronounced bulge at the base of the crown shaft.

This is the **southernmost naturally occurring palm** in the world.

Because this is a temperate island dweller, it means it prefers a very mild climate, i.e. it can take light frost, and prefers cooler summers. It is very slow growing, taking up to 15 years to form a trunk *Rhopalostylis*, because the style (female flower part) is club shaped; *sapida* meaning savoury because the expanded central leaf bud was once used for food. However, taking this bud kills the plant.

The nikau belongs to the large, mainly tropical, **palm family** (Palmae) and is the southern most palms in the world. There are only three species of *Rhopalostylis*, one confined to New Zealand proper, one (*Rhopalostylis cheesemaniae*, named after the botanist Cheeseman) to the Kermadec Islands and the last species to Norfolk Island.

Older nikau have a smooth circular trunk, ringed with roughly evenly spaced scars from fallen leaves. It is very seldom that nikau trees are branched. The leaves show its palm origin and are up to 3 m long (there are offshore varieties that have leaves up to 5 m long). The leaf bases are large and encircle the trunk completely (which is why the leaf scars go right around the trunk). The numbers of leaf scars do not tell you how old the tree is.

The flowers develop under the outermost leaf bases, clearly visible as a bulge. When the leaf falls off the inflorescence (a specialised branching stem bearing flowers) is exposed. It is encased in two boat-shaped envelopes that quickly fall off. The spadex (a special sort of inflorescence because it is a fleshy branch) expands and first the male flowers open and later the female flowers (see ⁽¹⁾ for a good description). Insects are probably the main pollinators, but nectar eating birds, such as tuis, bellbirds and silvereyes, don't turn their noses (or should that be beaks) up at the thought of nikau nectar either. Flowers occur throughout the entire year but are most common in spring and summer in Auckland.

The small (usually 1 cm but up to 2 cm long) oval fruits consist of a thin flesh layer over a hard seed and take slightly less than one year to develop from flowers into fruits. They are red when ripe, and very popular with native pigeons and other birds (especially in spring or during egg laying because nikau seed are high in calcium) even though there isn't much flesh on the fruit. There usually is some ripe fruit throughout the year, but is very hard to find any ripe fruit in spring because the birds eat it as soon as it is ripe.

Uses: The old time Maori used nikau leaves as **thatching** for the roof and walls of the whare (house). A whare build with a manuka stick framework and nikau thatching is supposedly as strong and watertight as if made of iron. The leaves were also woven into **baskets and kits** Nikau leaves still make good thatching for bush shelters and the padding in a camp mattress.

The central, unexpanded, leaf bud (called rito) at the top of the tree was also very popular with Maori as **food**, either raw or cooked; unfortunately it does kill the tree (which is why early settlers called it **millionaire's salad**). Young flower buds were also eaten. The leaves were used to wrap kiore rats and other food prior to cooking in a hangi.

The pith (central core of the tree) was a slight laxative and was eaten by pregnant women to relax pelvic muscles, and the sap was drunk as a further aid to ease the labours in childbirth

Pseudotsuga menziesii

Douglas Fir or **Oregon Pine** is one of the leading timber trees of the world producing very fine quality timber. It is distinguished from true firs by its hanging cones, which have long protruding bracts. The cones of true firs grow upwards. Douglas Fir can reach a height of 60 m (200 feet) or more..

In North America the cedar was central to the Native American society, and **Douglas-Fir** became equally essential to the white pioneer society. It became the 'money tree', providing lumber for immediate needs, and could be shipped around the country for construction use. It became the fundamental resource of many pioneer towns and the basis of their economy. It occupied vast tracks along western North America occupying the greatest range of any commercial conifer, being found from northern Mexico to Southeast Alaska. There were extensive old growth groves of giant trees, some of which were 1000 years old. Most of the old trees have been felled, but vast areas have been planted in this fir in New Zealand, Australia, Chile, Argentina, Scotland and Germany. It produces the largest trees of the Pinaceae family.

Douglas-fir formed extensive stands. Its dominant position arose through its ability to withstand fire. Serious fires swept the stands regularly but at infrequent intervals. A thick spongy bark up to 300 mm thick on trunks and main roots and an ability to grow quickly were important. Its ability to naturally graft roots to adjoining trees provided additional recuperative capability, strengthening its ability to compete for growing space. While the wood breaks easily, the tree can rapidly repair itself becoming sculptured and twisted from dozens of indignities.

The tree can live for over 1000 years and trees aged up to 1400 years have been identified.

It has over half a hectare (1 ½ acres) of leaf area for photosynthesis.

On 20 year trees, some 50% of total tree mass is in the roots, although this can fall to 20% in old trees.

Mycorrhizal fungi are important in facilitating mineral and water uptake, some 2000 different beneficial fungi being identified on its roots.

It is the major timber tree in North America, and an important one in many other countries.

Cedrus – the 'true' cedars

A great number of Cupressaceae are also commonly referred to as cedars, therefore these are often known as the '**true cedars**'. With 4 species they are natives of the mountains of S and SE Mediterranean and the W Himalayas.

They are important timber trees, used in construction and in cabinetry.

They are widely planted as ornamentals in milder areas.

'*Cedros*' is the old Greek name for a **resinous tree**.

Cedrus atlantica

The **Atlas Cedar** reaches a height of 40 metres. It is native of Morocco and Algeria. It is regarded as a fast growing tree, and is widely cultivated for ornamental purposes. This species is cultivated for its timber in some parts of S. Europe

Its **wood is fragrant**, durable and used in building and furniture. It is prized for **joinery and veneer** and is also used in construction. It is also used for making **insect-repellent articles for storing textiles**

In Morocco the wood is steam distilled to obtain **oil** that has a long lasting balsamic odour, used for scenting soaps and for fixing odours. In India it is used for rubbing on inflated hides commonly used for crossing rivers, and as a remedy for ulcers and for mange in horses. In Nepal extracted oil is used to relieve rheumatic pain.

An essential oil obtained from the distilled branches is a good antiseptic and fungicide. An essential oil obtained from the distilled branches is used in perfumery, notably in jasmine-scented soaps. The essential oil also repels insects.

This species is more tolerant of atmospheric pollution than other members of the genus

***Cedrus atlantica* ‘Glauca’**, the Blue Atlas Cedar, is also planted in the garden.

Cedrus deodara

The **Himalayan or Deodar Cedar** reaches 50 m (250 feet) in the wild, but is now almost extinct over much of its former range. It is native of India and Pakistan.

It is an important **timber** tree in India, and is widely planted as an ornamental in Europe and the western USA. In India its bark has been used as a medicine for fevers, diarrhoea and dysentery.

In the Himalayas this tree is considered **sacred**, and plays an important role in religious ceremonies. Thin slices of this wood are burned with butter and other plants after chanting the ‘mantras’ on the occasion of births, marriages deaths and other occasions. Its bright yellow pollen grains are used for brightening metallic idols.

Cedrus libani

The **Cedar of Lebanon** is the national emblem of Lebanon, but only a few small groves survive there today because grazing animals prevent their regeneration. Larger populations survive in Turkey. Its natural range: N. Africa to W. Asia - Lebanon, Syria and Turkey.

Cedar wood is light and soft and has a **very pleasant aroma**. It was greatly esteemed in antiquity and it was transported from Lebanon to Egypt and Mesopotamia as far back as 3000 BC. Cedars provided the timber for temples, palaces, ships and royal coffins, because it is slow to decay. So quickly were the trees cut down in Lebanon that by 330 BC, Alexander the Great had to import the timber for his ships from Syria. It was widely used for ship building. As supplies ran out in one area the industry kept shifting around from North Africa around to Greece and Italy. From there it shifted to Britain and Northern Europe. The use of steel came at a time when the supply of Oaks started run out.

In 2750 BC a **coffin** from the Egyptian Saqqara Pyramid was made of **six layers of wood veneers, sandwiched and glued together like plywood**. Cypress, juniper, and cedar of Lebanon were used. In 1840 John Dresser (Stockbridge, Massachusetts) devised a hand powered veneer lathe. Thin sheets of wood are used for creating finished surfaces as well as in the manufacture of plywood, but they must be shaved or sawed from the original block. Dresser’s lathe pointed the way to mechanisation of this process, leading to the commercial manufacture of plywood

Trees very **long lived**, to 300 years or more. Several named varieties are selected for their ornamental value

An **oil** similar to turpentine is obtained from the wood. An essential oil from the wood is used in perfumes.

Wood - moderately hard, durable. Used for construction. The wood is extremely durable and retains its delightful fragrance for many years

Fagus sylvatica

The **English Beech** is a deciduous tree usually found in gardens and plantations. It can grow to 30m tall.

The Beech is **native to most of Europe**, and has been introduced to England and Ireland. Beech trees mature to a great size, 30-40m tall, with impressive spreading crowns, often branching almost horizontally. It has shiny grey bark, variegated with dark green and yellow mosses.

The **wood** varies in colour from white to pale brown. Its fibres are compact, but not very hard. When the wood is split transversely it presents brilliant satiny faces, like those of the oak, but very much smaller and not so numerous.

The use of beech has been long abandoned in carpentry works above ground, on account of its tendency to cleave if the timber is not felled in spring. It has a liability to be attacked by worms.

The timber is mainly used for **furniture making**. As the wood is brittle and short-grained, it is not well suited for purposes where strength and durability are required. One of the principal objections to it is that it is liable to be perforated by a small beetle. Its chief uses are for panels for carriages, carpenter's planes, stonemason's mallets wooden bowls, granary shovels, sieve rims, frames of saddles and horses' collars, cases for drums boot-lasts, sabots, and for chair-making, small articles in turnery, also for making charcoal for colour manufacturers, and gunpowder, salt boxes, spinning wheels, pestles and herring barrels. Sometimes it can be found stained red to imitate the appearance of mahogany, and black to look like ebony

On the Continent Beech is used for parquet flooring, wood pavement and bentwood furniture, and very extensively as **fuel for domestic heating, as its heating power surpasses that of most other timber**.

The **leaves** of beech are used in place of straw for **stuffing mattresses**; and its bark is used by the **tanner**.

Its **fruit** affords abundance of excellent oil, used for burning, lighting, as a lubricant, or for polishing wood

The **nuts** of Beech, called **'mast'**, are chiefly used in England as **food for park deer**. In other countries they are valued for feeding farm animals: in France for feeding swine and fattening domestic poultry, especially turkeys, and pigs which are turned into Beech woods to utilise the fallen mast. Beech mast has even been used as human food in time of distress or

famine. Horses, however, should not be fed on it.

Well-ripened mast yields from 17 to 20 per cent. of a non-drying oil - similar to hazel and Cotton-seed oils - and is used in European countries for **cooking**, as well as for **burning**, and in Silesia as a **substitute for butter**. This stores well without going rancid and is said to be **equal in delicacy to olive oil**. It is used as a dressing for salads and also for cooking. The cake left when the oil has been pressed out may be used as a cattle food

Seed - eaten raw or cooked. A pleasant sweet flavour, though rather small and fiddly. The seed can also be dried and ground into a powder and then used with cereal flours when making bread, cakes etc. The seed is rich in oil. The seed should not be eaten in large quantities because it contains a deleterious principle. The seed residue is poisonous.. The **roasted seed is used as a coffee substitute**

During the War an attempt was made in **Germany** to use Beech *leaves* as a **substitute for tobacco**, and a mixture was served to the army, but proved a failure.

Trees have two growth periods a year, each of about 3 weeks in duration. The first is in spring around the end of April, the second is in summer, around the end of July. Trees are often slow growing and also can be very slow to establish after transplanting. However, in good conditions they are capable of growing up to a metre in a year. Young trees are very shade tolerant, but are subject to frost damage to their flowers and young leaves and so are best grown in a woodland position that will protect them.

An **important food plant for many caterpillars**, it has 64 species of associated insects.

Trees have a heavy canopy and cast a dense shade, very few other species can grow in a dense beech wood and on suitable soils it becomes the dominant species. Very intolerant of coppicing, trees producing none or only very weak growth afterwards and this is soon smothered by other plants. Plants are very tolerant of light pruning however and if this is carried out in late summer the plants will retain their dead leaves over winter.

There are **many named forms selected for their ornamental value**. Those forms with purple leaves prefer a position in full sun whilst forms with yellow leaves prefer some shade

The **leaf buds** harvested in the winter and dried on the twigs are used as toothpicks.

The **wood** has often been used as a **source of creosote, tar, methyl alcohol, and acetic acid**

Young leaves - eaten raw. A very nice mild flavour, they go well in a mixed salad. However, the leaves quickly become tough so only the youngest should be used. New growth is usually produced for 2 periods of 3 weeks each year, one in spring and one in mid-summer.

Taxodium distichum

The generic name refers to *taxos* the yew and *eidos* meaning resembling, in reference to the similarity in the shape of the leaves of those trees.

The **Swamp Cypress** (sometimes called the **Bald Cypress**) is an **important timber tree** of the coastal swamps in the southeastern USA, and develops **unique "knees"**, which project from the root **system upwards above the water level**, but are absent when it grows in dry soil. These growths are thought to allow the tree to breathe with its root system submerged. The swamp cypress belongs to the same family as the giant sequoia and the Japanese cedar.

It is a **fast growing tree** in the wild reaching 38 m (120 feet), but it is smaller in cultivation. In winter the tree sheds not only its needles but also the short stalks to which they are attached. Before the leaves fall they turn a beautiful red-brown colour. It has lovely light green, feathery new foliage in the spring.

This is a **long lived tree**, one specimen assessed to be 1622 years old.

It is a **valuable timber tree** light, soft, not strong, moderately hard, easily worked, straight grained, very durable in damp soil, takes a good polish. The wood is not given to excessive warping or shrinking. The knees are frequently used for curved members of wooden boats.

Although this plant can be grown in wet soils and shallow water, it thrives in any soil and trees actually grow faster in normal unflooded soils. Established plants succeed in standing water up to 60cm deep - in such a situation the roots develop 'knees', curious cone-shaped structures that grow above the ground. Tolerates atmospheric pollution

The **bark** has been used to make **cordage**.

Acer saccharum

Sugar Maple sometimes called **Hard Maple** or **Rock Maple** is one of the largest and more important of the hardwoods. It comprises approximately 6 percent of the hardwood saw timber forests in the United States. Restricted to regions with cool, moist climates. Mature trees of Sugar Maple reach 300 to 400 years of age, 27 to 37 m in height

The Sugar Maple tree is the principal source of **maple sugar**. The trees are tapped early in the spring for the first flow of sap, which usually has the highest sugar content. The sap is collected and boiled or evaporated to syrup. The flow is best on a warm sunny day after a frost Further concentration by evaporation produces the maple sugar. This species is commercially exploited in America for its sap. Along with *A. saccharum* and the sub-species *A. s. nigrum* it is the major source of maple syrup. There are some named varieties. The sap can be tapped within 10 - 15 years from seed but it does not flow so well in areas with mild winters

Sugar maple sap averages about **2.5 percent sugar**; about 129 litres (34 gal) of sap are required to make 3.8 litres (1 gal) of syrup or 3.6 kg (8 lb) of sugar. **35 litres sap = 1 litre syrup OR 1 kg of sugar**. **Yields** of 40 - 100 litres sap per tree can be obtained

The pounded bark was also widely used as a **food** source in eastern and central areas of North America

Slow growing when young. Plants produce prodigious root growth but little top growth in first year from seed.

A very **ornamental tree** but a bad companion plant, inhibiting the growth of nearby plants.

The **leaves are packed around apples**, root crops etc to help preserve them.

Wood - close grained, tough, hard, and heavy. Used for furniture, ship building, etc. It is a good fuel.

Seed - boiled then roasted. The seed is about 6 mm long and is produced in small clusters.

Inner bark eaten cooked. It is dried, ground into a powder and then used as a thickening in soups etc or mixed with cereals when making bread

Acer

A genus of over **150 species** of deciduous trees although a few are evergreen, **with distinctive foliage**.

The characteristic seeds have a **bony seed vessel or nut with a thin membranous extension or wing that assists seed dispersal**.

Many produce rich **bright and varied autumnal foliage**.

Fraxinus - Ash

Related to the olives, it comprises some 65 species of deciduous trees and some shrubs scattered over the cool temperate parts of the Northern Hemisphere. There are a number of American ash species (not in Garden)

American White Ash inhabits eastern North America. The **wood** is economically important due to its strength, hardness, weight, and shock resistance. It is second only to hickory for use in the production of tool handles. Nearly all **wooden baseball bats** are made from white ash. The wood used in furniture, antique vehicle parts, railroad cars and ties, canoe paddles, snowshoes, boats, doors, and cabinets.

The **juice from the leaves** of white ash can be applied topically to **mosquito bites** for relief of swelling and itching. White ash has a specialised use as a prophylactic measure for **snakebite**. If one carries the crushed leaves in his/her pockets the odour has been "proved" **offensive to rattlesnakes**.

Fraxinus pennsylvanica the Green Ash is the most widely distributed of all American ashes. Green ash wood, which is heavy, hard, strong and yellowish with wide, white sapwood, has moderately high specific gravity and a low wood moisture content which make it a valued species for solid wood products as well as for pulp and paper requiring hardwood fibres. Crating, boxing, handle stock and rough lumber can be obtained from merchantable-size trees.

Properly established and managed plantations and natural stands produce high yields of fibre and quality solid-wood products. Green ash, a cultivated ornamental throughout its range, has often been planted for shade and landscape beautification in urban parks, recreation areas, and residential areas. Its leaves turn golden yellow in the autumn.

Fraxinus excelsior

This **Ash** is a native species in Ireland, growing in abundance in the West Cork countryside and in most other areas of Ireland. Magnificent large deciduous trees with distinctive black buds in spring. Can be coppiced. Age up to 200 years.

Before the use of iron and steel was universal, ash timber was in demand for many uses where metals are now used. Its wood is widely used for axe handles, oars etc where small diameters are required, being obtained from coppiced plantations.

Its timber is one of the **most important native timbers of the UK**, being used for carts, furniture, ladders, and table-tops. It is fine-grained, light, very tough and pale in colour. Used for hockey sticks, oars, paddles, rudders, billiard cues, cricket stumps, polo sticks and policemen's truncheons. Also used for veneer and furniture.

Burns fragrantly when freshly cut green or dried due to low water content even when green (30 - 35%) but seasoning (to 15% water) does improve efficiency. This is one of the most prized firewood

Liriodendron tulipifera

The **Tulip Tree** is known locally in its native North America as **Yellow Poplar** It is a tall, deciduous, long-lived, broadleaf tree. It is **related to the magnolias**. The genus consists of only 2 species, this one North American, the other Chinese.

Its **wood** is used for construction grade lumber and plywood. . It has straight grain fine grained, little shrinkage, and excellent gluing qualities, easily worked, durable, brittle, not strong but does not split. In the past is used for carriage bodies, shingles, saddle frames, and interior finish wood. It is currently used for cabinets, veneer, furniture, and pulp. It has only fair value as a fuel wood but good value as kindling. It is much used for **interior finishes, furniture, construction and plywood**

It has been **valued as an ornamental** since 1663. The tulip like flowers and leaves are aesthetically pleasing. The **flowers** are also **valuable nectar producers**. The flowers from a 20-year-old tree produce enough nectar to yield 4 pounds (1.8 kg) of honey. The flowers are tulip like in size and shape, and are fragrant but are difficult to see in the spring foliage unless viewed from above

It was used **medicinally** in the late 1800's

A gold-coloured **dye** is obtained from the bark.

Parts are used for a number of medicinal uses.

The **root is used as a lemon-like flavouring** in spruce beer, where it also serves to correct the bitterness of the beer. The bark of the root and branches have a pleasant rather pungent scent

Picea – the spruce

Close relative to the pines, Picea differ markedly even from them. A very uniform genus with about 35 species. Its natural range is restricted to subtropical high altitude temperate and boreal regions in the Northern Hemisphere.

The genus is of major economic importance for timber, the most important species being *sitchensis*. Some species are commonly used for Christmas trees.

The name comes from the Roman word for **pitch**, the name of a *pitchy pine*.

Picea orientalis

Known as the **Oriental Spruce** or **Caucasian Spruce**, it is native of the mountains around the eastern end on the Black Sea: E. Europe to W. Asia

A Fast Growing Evergreen found in pure stands or mixed with beech, pine and hornbeam, especially on shaded slopes, preferring deep protected ravines with adequate soil moisture at elevations of 300 - 2100m

Young trees are slow growing at first but from the age of about 5 - 6 years they can grow up to 1 metre a year and this can be maintained for the next 70 years or so. Growth virtually ceases by the time the tree is 90 - 100 years old. Increases in girth follow the same pattern as height increases

The bruised leaves have a **resinous aroma**

Tannin is obtained from the bark. Turpentine is obtained from the bark and branches.

Wood - soft, white, easily cleaves, light, durable, has a good resonance. Used for construction, furniture etc. It is also valued for its use in the pulp industry to make paper

Young **male catkins** – eaten raw or cooked. Used as flavouring.

Immature **female cones** - cooked. The central portion, when roasted, is sweet and syrupy.

Inner bark - dried, ground into a powder and then used as a thickener in soups etc or added to cereals when making bread. An emergency food, it is only used when all else fails.

Seed - eaten raw. Too small and fiddly to be worthwhile unless you are desperate.

A refreshing **tea**, rich in vitamin C, can be made from the young shoot tips

Vitex lucens

The **Puriri** is an attractive NZ tree, which flowers and fruits all year round, but especially in the winter. It is from the northern half of the North Island. Its nectar is popular with tui and bellbirds and its fruit with wood pigeon, tui, and kaka. It grows to 20 m (60 feet).

Its timber is said to be NZ's strongest and most durable, but is very hard to split. It has swirling grain which makes it hard to work, but it is used for wood turning and furniture. It is related to the important wood tree teak.

Maori used infusions of its leaves for bathing muscular aches and sprains, and for treating ulcers and sore throats.

Today a patented germicide is made from a compound in its leaves.

This is a genus of some 100 species of evergreen and deciduous trees and shrubs

Thuja plicata

The generic name **Thuja**, meaning sacrifice, is an allusion to the use of the resin for **incense**, although may be the old Greek name for the tree. The genus is **native** of Western_North America, China and Japan.

Western Red Cedar has been called '**the cornerstone of Northwest coast Indian culture**' and the large-scale use of its wood and bark delineates the cultural boundary of the Northwest coast peoples within its range. **Few cedar trees were actually felled before European contact.** Instead, fallen logs or boards split from standing trees were used. To split off cedar boards for house planks or half-logs for canoes, a series of wood or antler wedges were pounded into living trees along the grain.

The power of the red cedar tree was said to be so strong a person could receive strength by standing with his or her back to the tree.

Red cedar was used for a variety of ailments. It is called the '**tree of life**' by all Northwest coast peoples for its healing and spiritual powers. A Coast Salish myth says the Great Spirit created red cedar in honour of a man who was always helping others. *'When he dies and where he is buried, a cedar tree will grow and be useful to the people; the roots for baskets, the bark for clothing, the wood for shelter'*

*"Throughout the whole Northwest the **wood** most extensively used by the Indians is cedar. House **planks**, house **posts**, **roof boards**, and **canoes** are made exclusively of this wood. Boxes, including those with bent sides, and dugouts [canoes] are of cedar. Some Indians make the hearth of the fire drill of cedar, as well as the spindle for spinning mountain-goat wool. Others make the herring rake of cedar. The charcoal of cedar wood mixed with salmon eggs is used by to rub on canoe paddles, which are held in pitch wood smoke and then rubbed with green grass to produce a lasting shiny black.*

*"Equally as useful as the wood is the **bark** of the cedar tree, in fact there is **no single item so ubiquitous in the Indian household.** The shredding of bark is a constant bit of busy work for women, done with a deer-bone chopper. It is shredded fine enough to be used as padding for infants' cradles, as sanitary pads, as towels. A coarser grade is plaited into skirts and capes, later into complete dresses for women. Some tribes use cedar bark for clothing, others depend more on skins, a situation duplicated whenever a tribe is divided into a salt-water and an up-river group. Shredded bark is used for ceremonial headbands. In its unshredded state cedar bark is cut in strips of varying widths, the broader ones plaited to serve as dishes or as individual plates, while some also interweave cedar and maple to make larger platters. They also use cedar bark to line cooking pits. A small, coarse, twilled mat is used by several Puget Sound tribes for laying out boiled salmon. Canoe bailers are folded of large pieces of cedar bark and lashed with wild cherry bark. Wads of shredded cedar bark are used as tinder for fires and also carried in a slow torch on journeys. The narrower strips are woven into belts. The lining and headband of the rain hat were made of split cedar by number of tribes. Some string dried clams and smelts for storage on strips of cedar bark. For many purposes cedar bark is dyed with alder juice to give it a rich red-brown colour.*

*"The **limbs** of the cedar tree are stripped of their leaves, soaked in water, and twisted into rope. The heavier grades are used by the whale-hunting tribes for towing home dead whales. It has remarkable strength. Single limbs which have been worked to pliability are used to tie or sew the corners of wooden boxes and tie cross pieces in canoes. Some string pecten shells on a small cedar limb as a dance rattle. Cedar limbs are used for openwork baskets, and also for weaving with vine*

maple sticks for fish weirs, and for tying the poles of the summer house.

"The **roots** of the cedar tree are used widely, in both western and eastern Washington, for the coiled and imbricated basket. They are split fine and used for the foundation, then trimmed more carefully for the sewing element. The only part of this area where cedar is not used for basketry is on the Pacific, where spruce [*Picea sitchensis*] is substituted. In searching for roots for basketry, people were anxious to get those lying under rotten logs. Roots are also used for sewing the corners of wooden boxes.

"**Medicine**: Said to have wide medicinal properties by Indian tribes.

"There is a strong association between **cedar and death**. Men from one tribe, burying a corpse, chew cedar tips to avoid nausea. Cedars limbs, singed, were used as a broom to sweep off the walls of a house after the removal of the corpse. Cedar limbs burned at night and waved through the house were used to scare the ghost after death".

To the modern world, red cedar "is an important timber tree. Its soft but extremely durable wood is valued for home construction, production of shakes and shingles, and many other uses". Many cultivars are grown for ornament, and the species is managed for timber in Europe and New Zealand. Its wood is of exceptional beauty, richly textured with a palette of warm mellow tones. It contains natural oils that act as a preservative, and is dimensionally stable. It is also regarded as an easy timber to work.

Perfumes, insecticides medicinal preparations, veterinary soaps, shoe polishes and deodorants are made from **western red cedar leaf oil**. Extracts were also used in lead refining, boiler water additives and glue extenders. **Cedar Leaf Oil** is widely used in room sprays, talcs and insecticides, and in embalming fluids. It is also used in many cold remedy salves to help clear the nose and chest. The red cedar cellular structure creates interior air spaces that give it an **insulation value higher than most woods**, and much higher than brick or concrete. It also has excellent sound suppression qualities.

The **Western Red Cedar** is a **fast growing** It is long living, trees aged between **1200 to 1500 years** identified.

Its **softwood timber is durable and resistant to decay**, it is an important species in the manufacture of shingles, weatherboards, fence posts, and other outdoor objects, its timber lasting up to 100 years. It is also used in canoe and boat building. The totem poles carved by the Native Americans of the Pacific Northwest are made from the trunks of this tree.

Wood - aromatic, light, soft, straight-grained, not strong. This resistance to decay is probably due to the existence of powerful fungicides in the wood. **The wood from fallen trees remains sound for at least 100 years**. It is pale to dark red in colour. The wood was widely utilised by many native North American Indian tribes who used it for making a wide range of items including canoes, houses, totem poles, bowls, spoons, ladles and tools. It is currently used in making greenhouses.

A fibre obtained from the bark is used in **making paper**. The fibre is about 3.8mm long (this refers to the heartwood fibre, the inner bark fibre is probably longer).

Branches can be harvested at any time of the year. They are cut into useable pieces and presoaked in clear water prior to cooking. They are then cooked for six hours or more with lye. It is difficult to rinse it to clear water because it seems to be a dye material. The fibre is then hand pounded with mallets, or put through a blender or a ball mill for six hours. It is difficult to hydrate properly. The resulting paper is a rich deep brown/red.

The slender pliable branches are used as a **high quality rope**. They are gathered in spring, peeled and, if thick, are split into halves or quarters. They are then twisted and worked until soft and pliable and finally woven together to make the rope.

A green **dye** can be obtained from the leaves and twigs.

The inner bark can be used as **tinder**.

Inner bark used as **food** - fresh or dried, ground into a powder and then used as a thickening in soups etc or mixed with cereals when making bread.

A **pitch** obtained from the trunk has been used as a **chewing gum**

Quercus, The Oaks

The oak is a large genus of some 500 species of both deciduous and evergreen trees natives of a wide range of regions, many of considerable economic value. There are several large oak trees still remaining in the Botanic Garden today, including the common or **English Oak** (*Quercus robur*), the **Turkey Oak** (*Q. cerris*), the **Sessile** or **Durmast Oak** (*Q. petraea*), the **Pin Oak** (*Q. palustris*), and the **Scarlet Oak** (*Quercus coccinea*)

Oak trees were grown at the Botanic Garden and sent out to other parts of NZ.

A number of oaks were important sources of tannin for the leather industry.

Oaks were one of the most widely distributed sources of food in ancient times. Indigenous peoples had evolved various ways to remove the bitter components to make them palatable.

25 oak species were used in North America to provide a basic food source.

The seed contains bitter tannins, these can be leached out by thoroughly washing the seed in running water though many minerals will also be lost. Either the whole seed can be used or the seed can be dried and ground it into a powder. It can take several days or even weeks to properly leach whole seeds, one method was to wrap them in a cloth bag and place them in a stream. Leaching the powder is quicker. A simple taste test can tell when the tannin has been leached. The traditional method of preparing the seed was to bury it in boggy ground over winter

*Don't worry if your job is small
And your rewards are few,
Remember that the mighty oak,
Was once a nut like you.*

Quercus robur

The **English Oak** or common oak is the most famous of all oaks, and is one of Europe's most valuable timber trees. It is native of Britain and Ireland and most of Western Europe and Asia Minor.

Called **Pedunculate Oak, Common Oak, English Oak, Irish Dair**.

Large deciduous tree and probably the **commonest English tree**.

Height 30 - 40 m. Age 1000 year or more.

It is the **most famous of the oaks**. It is a majestic, slow-growing tree which eventually reaches a height of 35 m (110 feet). The Greeks held this oak sacred, and the Romans dedicated to the Jupiter. The Druids venerated it.

It is one of Europe's **most valuable timber trees**. It is used for building, for making furniture, and for wine barrels, and was once used for building ships. Unlike the cork oak, it is deciduous.

It was used in **ancient shipbuilding** especially around the Mediterranean, and this caused new sources to be sought when local supplies were largely exhausted. Much shipbuilding moved to the UK in more recent times because it had large sources of quality oak.

English oak is venerated in England because it grows to large sizes and produces strong wood. Open grown trees with large branches furnished bent "knees" and other framing for sailing ships. It was the source of beams, furniture and flooring for houses. Because the wood is impermeable to liquids it is used for tight cooperage and most Scotch or Irish whiskies are aged in English oak barrels.

Oaks have a **long history of medicinal use**. It has anit-inflammaroty, antiseptic, astringent, decongestant, haemostatic, and tonic properties. The bark is the portion most commonly used, although galls, seeds and seed cups are sometimes used.

The **seeds**, chopped and roasted are **nourishing but indigestible**, and can be used like almonds. **Tannin** can be extracted from the bark and is also found in the leaves.

Ginkgo biloba

The **Maidenhair Tree** is the only living tree from this group of Gymnosperms. Originally comprising some 18 species, they are about 225 million years old. There were common 150 million years ago during the ages of the dinosaurs. It was found through Asia, Europe, and North America. About 7 million years ago it disappeared from the fossil record in North America, and by about 2.5 millions years ago from Europe. It is mentioned in Chinese literature in the 11th Century.

Scientists thought it had **become extinct**, but a **German Engelbert Kaempfer discovered it in China in monasteries and in palace and temple gardens**, where **Buddhist monks had cultivated it since 1100 BC**. Seeds were first imported into Europe in 1700. It is now thought to be **extinct in the wild**; the populations that do exist are probably from dispersions of seed from cultivated populations.

Medical use dates back to 2800 BC in China. The earliest record of medical use state that aging members of the royal court were suffering senility. As the emperor looked out of his window, a voice whispered, "the tree you are looking at will restore the minds of your relatives and friends". He instructed his staff to pick some leaves and create a brew out of them. This tea was served to those affected several times a day. Within weeks they had regained of their lost memories. The seeds are more frequently used than leaves however.

It may be the oldest living seed plant. **Individual trees can live longer than 3000 years**. The plant contains a **high chemical content, providing it strong disease and pest resistance** facilitating its longevity. In the 1923 Tokyo earthquake and subsequent fire, many Ginkgo trees survived while others trees died. A temple was saved because of the many Ginkgos that surrounded it. The branches and leaves are thought to secrete a **sap that acts a fire retardant**.

t the end of the Second World War II Ginkgo trees **one kilometres from the epicentre of the atomic bomb blast** were the first trees to bud after the blast without major deformations, and the trees are still alive. .

There are male and female trees. **Male trees only are usually cultivated** as the female produces seeds which smell of vomit when they fall on the ground and decay.

It is widely grown as an ornamental (male trees). The seeds provide a food source when roasted. The leaves are used by the Chinese and Japanese as an herbal medicine to treat mental disease, skin and head sores and freckles. The Chinese still use extracts to tread asthma, stomach pain, skin diseases and anxiety. The powdered leaf is inhaled for ear nose and throat disorders. Boiled leaves are applied to chilblains, and the leaf is also used as a wound plaster. The tree is **widely cultivated for meeting the demands for medical preparations**.

Metrosideros genus

The genus contains some 60 species of trees shrubs and lianas. They are found in South Africa, Philippines, New Guinea NE Australia, New Caledonia, New Zealand, and some Polynesian islands. 11 species are found in NZ and of these 5 are trees, and the remainder lianas. All NZ species are endemic.

Metrosideros excelsa

At the time of European settlement the New Zealand **Pohutukawa** was confined to the coastal area of the North Island from the Three Kings Islands southwards to Poverty Bay and the east coast and around the mouth of the Urenui River on the west coast. It also grew around the shores of some of the Rotorua lakes. It has subsequently been extensively planted throughout the country.

It grows best **close to the sea** where its branches can overhang water. It likes to cling to steep banks with numerous roots extending from its lower branches, these aerial roots often seen even in cultivated plants on flat sites. Flowering in

December and January, it produces a spectacular display. It is attractive out of flower. There are now a number of varieties.

Its **wood is hard dense tough and durable, very strong** and was much used in **the early times in NZ for boat building**. Its curved roots and branches made it possible to construct boats angled stems and keel from a single piece of timber. Also used for bearings, machine beds etc

Plants can be used as a **hedge**, succeeding in exposed maritime positions.

Edible **nectar** is obtained from the flowers

Ulmus

Ulmus is the botanical name for the **Elm** Tree. The name derives from the Latin *Ulmus*, and is said to indicate an instrument of punishment, probably from its rods having been used to belabour slaves.

Radiocarbon dating conclusively indicates the *Ulmus* decline is remarkably synchronous over wide regions of Europe, at about 5000 radiocarbon years ago. The decline had such a widespread and sudden effect that it is believed not to have been caused primarily by the utilisation of *Ulmus* by pre-historic man. Climate change and epidemic disease may have contributed and had considerable effect

There are some **30 species** in the family of hardy mostly deciduous trees, mostly from temperate regions of the Northern Hemisphere. These trees are found in Europe, Asia, the Himalayas and northward, and North America, east of the Rocky Mountains and as far south as northern Mexico.

Elms may form small trees or bushes, or very large trees growing from 90 to 200 feet high.

They are widely used as **shade trees**. Unfortunately, these trees, especially the American and European species, are subject to a fatal disease called the **Dutch Elm Disease**. The Siberian and Chinese Elms are resistant. The symptoms are wilting and yellowing leaves on one or more branches.

U. americana, the American Elm, grows into a large tree from 100 to 120 feet high with a diameter of 4 to 6 feet.

There are many varieties of this Elm having yellowish leaves or different shapes.

The wood of this tree is hard and strong and fairly difficult to split. It is used in the manufacture of furniture, boxes, crates, barrels, and a variety of other uses.

U. fulva, the Slippery Elm, grows from 60 to 70 feet high. The wood of this tree is hard, strong and durable and is used for many of the same reasons that the American Elm is used. The bark of the slippery Elm has many medicinal uses. It has diuretic, emollient, demulcent and pectoral properties and is used for inflammation, ulcers, etc. The mucilaginous inner bark of the Slippery Elm is sometimes chewed and used medicinally for coughs and throat irritations. In some parts of the country it was used as a dressing for sores. It is somewhat nutritious and was used to an extent by the Indians for food.

Ulmus glabra

Wych Elm *is native of Britain*. Common in North and West of Britain and Ireland. The Wych elm has a **widespread distribution in northern Europe** occurring more frequently in north-western England than in the south, and is the only native elm to Ireland. Large deciduous tree. Height 40m. Age up to 500 years

Elm is present alongside oak in pollen diagrams up until 3000 BC from when it begins to decline. It has subsequently revived as a member of the native forest community although not in any great strength, although it does reproduce freely and with regularity from seed.

Known as **Wych Elm, Scots Elm, and Irish Leamhan**. The correct name for the *weeping elm* is *Ulmus glabra* 'Camperdownii' named after the place where it first originated, and the *horizontal growing form* takes the name of *Ulmus glabra* 'Pendula'

The **name 'Wych'** meaning is uncertain. It is probably a form of witch. Just as Hazel-rod is used by water finders who declare that its movement indicates the presence of hidden springs, so a wand of this tree may have furnished the witch finder with a witch hazel for the detection of witches.

In 1751 Pehr Kalm, a Linnean student and botanical explorer, noted that Native Americans treated eye diseases with a concoction of water in which witch hazel (*Hamamelis virginiana*) had been boiled. The common name for this plant, however, did not arise from that connection. In England, an elm (*Ulmus glabra*) **is called the witch hazel tree because its branches are used for dowsing (waster divining), also called witching**.

The **wood** also serves for the **manufacture of bows**. Once settlers learned that the American Indians used *Hamamelis* for making bows, they began to call it by the same common name as the English elm. Transferred along with the name were the associated traditions, so that the American plant called witch hazel is today the popular choice for dowsers in this country.

Wood - very **durable under water**, fairly hard, elastic, withstands abrasion and salt water. Used for water pipes, wheels, mallet heads, ships keels etc. The wood does not decay when immersed in water and has been to make chests, water pipes and troughs and for sea defences. It has also been used to make cribs and mangers, hubs of wheels, coffins and furniture.

The Wych Elm is **subject to 'Dutch Elm Disease'** (though less so than *U. procera*), a disease that has destroyed the greater part of all the elm trees growing in Britain. Mature trees killed back by the disease will often regrow from suckers, but these too will succumb when they get larger. There is no effective cure (1992) for the problem, but most E. Asian, though not Himalayan, species are resistant to the disease so the potential exists to develop new resistant hybrids with the native species.

The various species hybridise freely, the pollen stores well and can be kept for use with species that flower at different times.

A **very ornamental tree**, it is a **food plant for the caterpillars** of many lepidoptera species. A good tree for growing grapes into.

A fibre from the **inner bark** is used for mats and making ropes.

Leaves – eaten raw or cooked. They can be a little bit bitter, especially if not very young, and have a mucilaginous

texture. They make a nice addition to a mixed salad.

Immature fruits, used just after they are formed, eaten raw. An aromatic, unusual flavour, leaving the mouth feeling fresh and the breath smelling pleasant. They contain about 34.4% protein, 28.2% fat, 17% carbohydrate, 5% ash.

Inner bark – mucilaginous, often dried, ground into a powder and then used as a thickening in soups etc or mixed with cereals when making bread

Sophora genus

The **Kowhai** genus contains 50 species of trees and shrubs found in subtropical and temperate parts of North and South America, Asia, Australia and New Zealand. Two of the three NZ species are endemic. The third species is *S. prostrata*, the Prostrate Kowhai. All are known as 'Kowhai' without differentiation in common usage.

The Kowhai is **NZ's most beautiful tree**.

There is some **debate as to which Kowhai is the national flower of NZ**. *S. microphylla* is the more widespread, but *S. tetraptera* is more popular as a garden plant, and it is said (by Professor J. T. Salmon) that this should be regarded as the national flower.

Kowhai trees have **medicinal properties** and were used by the Maori people for this purpose. Poultices were made from the bark for wounds and tumours. An infusion from the bark and manuka was used to treat internal pains, bruises and broken limbs. The ashes of the tree were used for the treatment of ringworm

Sophora microphylla

This **Kowhai** species is smaller and more feathery looking than the following one, reaching a height of 10 m. This is the most naturally widespread of the species, also found in Chile and on Gough Island in the South Atlantic. It grows on river banks and forest margins in open places through the North and South Islands and the Chatham Islands. Two varieties are recognised *fulvida* and *longicarinata*.

The **flowers**, produced in great abundance in the spring, contain **large quantities of nectar** and are much visited by bellbirds and tuis, which are the pollinating agents.

Sophora tetraptera

In the North Island **Kowhai** found originally growing along stream sides and lowland forest margins from East Cape to the Ruahine Mountains, from sea level to 450 m asl. It forms a small spreading tree up to 12 m high and produces golden flowers as compared to the strong yellow of *Sophora microphylla*.

Betula

Birches are common trees and shrubs of **northern temperate and boreal zones of the Northern Hemisphere**.

The group is highly diversified, especially in the Old World. The species are well known for their free hybridisation, and specimens are therefore frequently difficult to identify. Birches occupy habitats in cool, moist regions, including peat lands, stream banks, and lakeshores, cool, damp woods, and moist slopes in cool coves. The wood of species that grow to a large size (including especially *B. alleghaniensis*) has many uses, including the manufacture of doors and windows, flooring, cabinetry, interior moulding, wood paneling, furniture, and plywood.

Species number around 35 throughout **Northern Hemisphere, North America, Asia**.

Birches are a difficult group taxonomically because of their **high vegetative variability and frequent hybridisation**. Many morphologic and cytologic studies have attempted to deal with variation within the genus or its subgroups. Species of *Betula* form a polyploid series, with chromosome numbers of $2n = 28, 56, 70, 84,$ and 112 , plus additional numbers in some hybrids.

For people in Estonia the Birch tree is considered **symbolic of their beliefs and country**. Legend tells of a man who was asleep under the Birch tree. A change in the weather was coming and a passing peasant woke the man to save him from getting wet and help him avoid the storm. The stranger thanked the peasant for his help, saying *When, far from thy country and experiencing homesickness, thou shalt see a crooked Birch, strike it and ask: "Is the crooked one at home?"* and went on his way. It is said that the peasant later as soldier in Finland, became homesick. The sudden appearance of a crooked birch surprised him, but remembering the words of the stranger, the soldier repeated: *Is the crooked one at home* \ The stranger re-appeared and called upon the spirits that were known to him to relieve the soldier's suffering. Instantly he was transported back to his home with a knapsack full of shining silver.

In Scandinavian this tree is **sacred** to Thor, the deity of agriculture and fertility, and a symbol of spring. A branch of birch on a house was thought to protect the family from the evil eye, lightning, gout and barrenness.

The **broomstick** on which the witch rode to the Sabbath was traditionally made of birch (also from heather or broom). Birching is the beating with a branch from a birch tree.

Betula pendula

Silver Birch a native of Britain

. A superb tree for **encouraging wildlife**, it has **229 associated insect species**

. A good plant to grow near the compost heap, aiding the fermentation process. It is also a good companion plant, its root action working to improve the soil

The **bark** is used to make drinking vessels, canoe skins, roofing tiles etc. It is waterproof, durable, tough and resinous. Only outer bark is removed, this does not kill the tree. It is most easily removed in late spring to early summer.

A pioneer species, it readily invades old fields, cleared or burnt-over land and creates conditions suitable for other woodland trees to become established. Since it is relatively short-lived and intolerant of shade, it is eventually out-competed by

these trees.

A **tar-oil** is obtained from the white bark in spring called 'Russian Leather' has been used as a perfume.. It has fungicidal properties and is also used as an insect repellent. It makes a good shoe polish. Also used medicinally. A decoction of the inner bark is used to preserve cordage, it contains up to 16% tannin.

A brown **dye** is obtained from the inner bark

Glue is made from the sap.

Cordage can be made from the fibres of the inner bark. This inner bark can also be separated into thin layers and used as a substitute for oiled paper. The young branches are very flexible and are used to make whisks, besoms etc. They are also used in thatching and to make wattles. The leaves are a good addition to the compost heap, improving fermentation.

Wood - soft, light, durable. It is used for a wide range of purposes including furniture, tool handles, toys and carving. The wood is also pulped and used for making paper

A high quality **charcoal** is obtained from the bark. It is used by artists, painters etc.

Inner bark - eaten cooked or dried and ground into a meal. It can be added as a thickener to soups etc or can be mixed with flour for making bread, biscuits etc. Inner bark is generally only seen as a famine food, used when other forms of starch are not available or are in short supply.

Sap - eaten raw or cooked with a sweet flavour. It is harvested in early spring, before the leaves unfurl, by tapping the trunk. It makes a pleasant drink. It is often concentrated into a **syrup** by boiling off the water. Between 4 and 7 litres can be drawn off a mature tree in a day and this will not kill the tree so long as the tap hole is filled up afterwards. However, prolonged or heavy tapping will kill the tree. The flow is best on sunny days following a frost.

Young leaves - eaten raw or cooked.

A **tea** is made from the leaves and another tea is made from the essential oil in the inner bark

Joy Fountain

Unveiled in 1946, Joy was 16 years in the making. The cost escalated from £120 to £520. Designed by Mr. Alex Fraser It is made from Hinuera stone.

Quercus palustris

The **Pin or Marsh Oak** is from eastern and central USA and is a smaller oak, swamp loving, it is quicker growing and has a graceful habit. It is known as Pin Oak, Swamp Oak, Water Oak, Swamp Spanish Oak, and Spanish Oak. Pin oak occurs primarily along major rivers and on glacial till plains in the north-central and eastern United States.

Pin oak does not self-prune, so the wood has many small knots that reduce its quality and utility. The hard, heavy wood is used locally for construction timbers, mine props, and fuel. Pin oak acorns are an important food for wildlife including white-tailed deer, squirrels, wild turkeys, woodpeckers, bluejays, and waterfowl. Acorns are an especially important food source for wood ducks and mallards during fall migration

Pin oak is widely planted as a **shade tree and ornamental**. It transplants well and tolerates urban stresses such as street salt, acid rain, and smoke. **Black ink** can be made from **twig galls** on pin oak, mixed with water, gum and iron sulphate. Pin oak can be harvested by clear cutting at 40-year intervals. Pin oak grows rapidly on alluvial soils.

It is a fast-growing, native, deciduous, monoecious tree. It is physiologically mature at 80 to 100 years.

Michelia doltsopa

. This species, known as the **Sweet Michelia**, was introduced from China in 1918, being native of China and Tibet, from the Himalayas. Showy flowers are wonderfully fragrant and long lasting.

: This group consists of about fifty species of tender, evergreen trees and shrubs belonging to the family, *Magnoliaceae*. These plants are natives of tropical and subtropical Southeast Asia.

M. doltsopa is a small to medium-sized shrub with tough leaves, 6 to 7 inches long, Their fragrant, numerous-petalled, white flowers are borne in the spring

There are also several species of Michelia that form large trees in their native tropical forests and whose wood is used for building purposes.

Ulmus procera

The **English Elm** Synonyms: *U. campestre. pro parte. U. glabra pubescens. U. surculosa.*

The English Elm is **not a native species of Britain**, and was most likely **introduced by the Romans as a crop tree for making wheel hubs and bridge parts. Native throughout Europe and W. Asia.**

The English Elm is susceptible to 'Dutch Elm Disease'.

A fibre from the **inner bark** is very tough. Tannin and a dyestuff also obtained from the inner bark It is used for making mats and ropes.

Wood - close-grained, free from knots, very durable under water, fairly hard, elastic, withstands abrasion and salt water, but does not take a high polish. It is used for water pipes, wheels, mallet heads, ships keels etc and is a good firewood. When constantly wet it is exceedingly durable and has been much used for the keels of vessels and in wet foundations, water works for piles, pumps and water pipes. Its toughness fits it for the naves of wheels, shells for tackle blocks and for many uses where it bears rough usage without splitting. It is coloured a ruddy brown, very fibrous, hard, flexible and of a dense appearance, subject to warp and tough and difficult to work. The wood is subject to attacks of worms and in carpentry above ground is only used in default of better timber. It is not likely to split and bears the driving of nails or bolts better than any other wood.

A food plant for the caterpillars of many lepidopterous species; there are 80 species of insects associated with this tree. A good tree for growing grapes into.

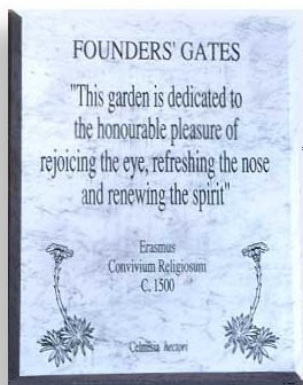
Leaves – eaten raw or cooked. They can be a little bit bitter, especially if not very young, and have a mucilaginous texture. They make a nice addition to a mixed salad.

Immature fruits, used just after they are formed - raw. An aromatic, unusual flavour, leaving the mouth feeling fresh and the breath smelling pleasant. They contain about 34.4% protein, 28.2% fat, 17% carbohydrate, 5% ash.

Inner bark - eaten cooked. A mucilaginous texture. It can be dried, ground into a powder and then used as a thickening in soups etc or mixed with cereals when making bread.

A tea is made from the leaves

Founders Entrance



The renovation and remodelling of the Main Garden begun by Glen was continued by MacKenzie after 1918. He removed the fences and other barriers that had been a characteristic of the Garden since the days of the Board. He also managed to replace the old wooden gates at the main entrance, a project that had been dribbling through the Council pipeline for some years. The existing gates had been put in place by the Board in 1878, and had done good service over the years. By 1905 they were rather worse for wear, and Glen suggested that as they looked "very much cut and hacked about it would be better if the face (of them) were covered with sheets of the small corrugated iron, then painted to correspond with the fence. The Reserves Committee adopted this suggestion, but if it was carried out it must have detracted from the quality of the gates as originally constructed. When, after 1913, the area around the main entrance was being cleared and replanted, the Reserves Committee decided to design a new set of entrance gates. These were to have brick piers similar to those at Newtown Park, and their construction was estimated to cost £36. Nothing more happened until November 1917. That month the Council received a complaint from the Wellington South Progressive Society that the entrance to the Botanic

Garden discredited the city. The Society demanded that it should be improved "at once". As a result of this the City Engineer was called upon to produce new plans of a character similar to those floated in 1914. When these arrived they must have been an optimistic flourish indeed, as their estimated price had risen to £505. Again the project sank into limbo until November 1920. By now MacKenzie was Director, and new gates had become part of his first large scale improvement to the Garden. Tenders were called, but again the estimate cullers won, and the gates fell victims to Council economising. When tenders were finally called for the brick piers of the new gates in 1924 MacKenzie was able to provide the Council with an incentive against having second thoughts again. In November when a set of iron gates owned by the Hospital Board were offered for sale he bought them. On March the 4th 1925 the tender of Messrs Hickmott and Sons was accepted, and the building of the brick piers went ahead. The new gates were the first step in providing the present brick frontage of the Botanic Garden.

Note the signs on the gate

Araucaria genus

A genus of some 19 species, native of South America (Chile, Argentina and Brazil) and Australasia. The name Araucaria is derived from "Araucanos", the name of a tribe in Chile that inhabited the region where the first Araucaria was discovered. The family includes the Norfolk Island Pine, the Monkey Puzzle or Chile Pine, the Hoop Pine, the Wollemi pine (*Wollemia nobilis*), the Kauri, and the Bunya Bunya Pine.

Some species grow to 1,000 years old. Because of their large size, many are important sources of timber, and the fruit of *A. bidwillii* is an important food source of aboriginal peoples and are now an Australian delicacy.

Many of the tropical species, which are difficult to locate in the wild, are threatened with extinction especially with the rapid disappearance of their habitats.

A British expert on the Araucariaceae family recently proposed that the Monkey Puzzles remind us of dinosaurs for a good reason—they evolved to look like them as a means of scaring away herbivores. Dead Araucariaceae look like the skeletons of herbivorous dinosaurs—giving any hopeful browsers a serious pang of doubt before they enter such a 'graveyard' for a feast. These dead trees were described as 'palaeo-pseudoscarecrows'. Some trunks in Monkey Puzzle forests resemble large reptilian feet, which might give herbivores the impression that carnivores were lurking in the forest. 'Dinosaurs may be extinct, but has anyone told the Araucarians?'

Araucariaceae appear in the fossil record in the northern hemisphere during the Triassic period—around 245 million years ago. As the Jurassic era dawned, more than 200 million years ago, the Araucariaceae family began to appear not just north of the equator but also in the Australian fossil record. This was a time when the continent was sitting at latitudes between 35 and 65 degrees south. The Antarctic coastline today sits at a latitude of 60 degrees south. Australia is now a nation of gum trees and wattles but back then eucalypts were not even a distant prospect on evolutions agenda. Instead the landscape of the continent was cloaked in unending forests of monkey-puzzles and other primitive conifers; there were no flowers and no grasses.

By the end of the Cretaceous, the epoch that came to a dramatic close 65 million years ago with the extinction of the dinosaurs, the Araucariaceae in Australia seemed to have hit their straps. An act of cosmic violence, however, was again to strike the planet. The fossil record suggests that the same impact that wiped out the dinosaurs also vaporised the Araucariaceae forests in the northern hemisphere. Since then the family has remained almost exclusively a southern hemisphere resident, with

just a few minor northern populations in South-East Asia. Scientists hypothesise that the bolide, or massive meteorite, which destroyed the dinosaurs had little impact on the southern conifers because it struck in June—the northern summer. The southern hemisphere Araucariaceae were not only further away from the impact zone but also, because it was their winter, were probably dormant anyway.

Araucaria heterophylla

The Norfolk Island Pine, endemic to Norfolk Island, is widely grown in coastal areas of Australia and NZ because it is both salt-spray and wind tolerant, and able to grow in sandy soil. It is also drought tolerant, and grows rapidly to 30 m (100 feet).

Captain Cook thought this tree would provide masts for the largest ships, but it was found later to be unsuitable for this purpose. Its timber is used for other purposes. It is the *Araucaria* most used as an ornamental.

This tree is said to have been common in NZ during the Jurassic period some 150-200 million years ago.

Magnolia

There are few sights more spectacular in a garden during spring, than a magnolia in flower. Magnolias are a diverse group of trees, growing to various sizes and producing flowers in a multitude of shapes and colours. Since the first trees were introduced to the western world over two hundred years ago, they have been intensely hybridised, resulting in numerous different cultivars being produced. In saying that though, they are still one of the most underrated and underused trees in the home garden.

Magnolias were named after the French botanist Pierre Magnol, by the Swedish botanist Carol Linnaeus. They are reputed to be one of the oldest types of angiosperm that are still growing in the world today. At one time, they may have had a wide distribution across the northern hemisphere, although this changed following the last ice age (Bryant, 1999). Today, magnolias are now confined to two main areas in the world - eastern North America, and southeast Asia. There are both deciduous and evergreen species found in both regions, with over 120 species having been discovered and identified. Magnolias are just one of several genera within the family Magnoliaceae, with the other notable ones being *Michelia*, *Manglietia* and *Liriodendron*.

Magnolias first arrived in Great Britain in 1689, when the English missionary John Bannister sent a sweet bay magnolia - *Magnolia virginiana* - back to the Bishop of London, from the United States (Gardiner, 2000). The first Asian magnolia did not arrive in the West until 1780, when Sir Joseph Banks returned from a journey to China with a *Magnolia denudata* (Gardiner, 2000). One of the first hybrids to be produced between two different magnolia species was *Magnolia x soulangeana*, through a cross of *Magnolia denudata* with *M. liliiflora* by the retired French soldier Etienne Soulange-Bodin in the 1820 (Barrett, 2002). In more recent times, New Zealand has managed to establish a reputation as one of the premier producers of new magnolia cultivars, particularly through the work of Os Blumhardt, Felix Jury and his son Mark Jury.

Among the best performers in terms of growth and floral display of the many New Zealand bred cultivars are *Magnolia* 'Star Wars' - an Os Blumhardt creation; as well as 'Iolanthe', 'Vulcan', and 'Black Tulip' - produced by the Jury family. Other good cultivars include *M. campbellii* subsp. *mollicomata* 'Lanarth', *M. stellata*, *M. x soulangeana*, *M. denudata*, *M. nitida* and *M. grandiflora*. Scattered throughout the camellia and magnolia collections there are also a number of *Michelias* which are both attractive and fragrant during the spring. These include *Michelia doltsopa*, *M. 'Touch of Pink'*, *M. 'Mixed Up Miss'* and *M. maudiae*. The other relative of the magnolia that is attractive, although not so fragrant when in flower, is *Manglietia insignis*. What we are attempting to achieve in the magnolia collection is to not only showcase as many different types of magnolias as possible, but to also allow comparisons as to which magnolias work best in certain situations. This in turn allows visitors to not only appreciate magnolias for their varied and vibrant colours when in flower, but hopefully encourages them to grow a magnolia in their own garden.

Magnolias, apart from being one of the most ancient angiosperms still growing in the world today, are one of the most attractive trees available for spring colour in the garden. They come in a variety of shapes, sizes and colours which, depending on your preferences, can suit almost any garden. Although not all varieties are available in New Zealand, there are a number that are, and well worth the investment in time and money. The magnolia collection at the Botanic Gardens displays a wide variety of both pure species and hybrids, from New Zealand as well as overseas. It exists not only for the enjoyment of visitors but to hopefully encourage them to go home and grow a magnolia in their own garden.

Shaun Rice Specialist Gardener Auckland Botanic Garden

A valuable genus of some 80 species of trees and shrubs natives of most parts of the world in the Northern Hemisphere. There are specimens of *M. campbellii* and the *alba* form in the Garden.

The *alba* in the Camellia garden was obtained from the Duncan and Davies nursery in New Plymouth by the then curator Mac. McMenzie. When it flowered he was disappointed to see that it was white and not the normal coloured variety he expected. On complaining to the nursery he was told that he had been lucky to get the 'rare' *alba* form, and it certainly is spectacular in flower.

The hybrid *soulangeana* group of hybrids was obtained by crossing *M. denudata* with *M. liliiflora*. Attractive in flower, there are equally attractive bare of the leaves in winter when their twisted branches are revealed.

Michelia is a [genus](#) of [flowering plants](#) belonging to the [Magnolia](#) family ([Magnoliaceae](#)). The genus includes about 50 [species](#) of [evergreen trees](#) and [shrubs](#), native to tropical and subtropical [south](#) and [southeast Asia](#) ([Indomalaya](#)), including southern [China](#).

Magnolia

Magnolia is a large [genus](#) of about 210 [flowering plant species](#) in the subclass [Magnolioideae](#) of the family [Magnoliaceae](#).

The natural range of *Magnolia* species is a [disjunct distribution](#), with a main center in east and southeast [Asia](#) and a secondary center in eastern [North America](#), [Central America](#), the [West Indies](#), and some species in [South America](#). Today many species of *Magnolia* and an ever-increasing number of hybrids can also be found as ornamentals in large parts of North America, Europe, Australia and New Zealand. The genus is named after [French](#) botanist [Pierre Magnol](#). Known as kepelan in Indonesia, this wood is used for making furniture and carved panels and never for statues.

Magnolia is an ancient genus. Having evolved before [bees](#) appeared, the flowers developed to encourage pollination by [beetles](#). As a result, the [carpels](#) of *Magnolia* flowers are tough, to avoid damage by eating and crawling beetles. [Fossilised](#) specimens of *M. acuminata* have been found dating to 20 million years ago, and of plants identifiably belonging to the Magnoliaceae dating to 95 million years ago. Another primitive aspect of Magnolias is their lack of distinct [sepals](#) or [petals](#). The term [tepal](#) has been coined to refer to the intermediate element that *Magnolia* has instead. Magnolias are used as food plants by the [larvae](#) of some [Lepidoptera](#) species, including [Giant Leopard Moth](#).

Magnolia grandiflora is the official [state flower](#) of both [Mississippi](#) and [Louisiana](#). The flower's abundance in Mississippi is reflected in its [nickname](#) of "Magnolia State". The magnolia is also the official [state tree](#) of Mississippi.

One of the oldest nicknames for [Houston, Texas](#), U.S.A. is "The Magnolia City" due to the abundance of magnolias growing along [Buffalo Bayou](#).

Origin of the name *Magnolia*

In 1703 [Charles Plumier](#) (1646-1704) described a flowering tree from the island of [Martinique](#) in his *Genera*. He gave the species, known locally as 'Talauma', the genus name *Magnolia*, after [Pierre Magnol](#). The English botanist [William Sherard](#), who studied botany in Paris under [Joseph Pitton de Tournefort](#), a pupil of Magnol, was most probably the first after Plumier to adopt the genus name *Magnolia*. He was at least responsible for the taxonomic part of [Johann Jacob Dillenius's](#) *Hortus Elthamensis* and of [Mark Catesby's](#) famous *Natural history of Carolina*. These were the first works after Plumier's *Genera* that used the name *Magnolia*, this time for some species of flowering trees from temperate North America.

[Carolus Linnaeus](#), who was familiar with Plumier's *Genera*, adopted the genus name *Magnolia* in 1735 in his first edition of *Systema naturae*, without a description but with a reference to Plumier's work. In 1753, he took up Plumier's *Magnolia* in the first edition of *Species plantarum*. Since Linnaeus never saw a herbarium specimen (if there ever was one) of Plumier's *Magnolia* and had only his description and a rather poor picture at hand, he must have taken it for the same plant which was described by Catesby in his 1730 *Natural History of Carolina*. He placed it in the [synonymy](#) of *Magnolia virginiana* variety *foetida*, the [taxon](#) now known as *Magnolia grandiflora*.

The species that Plumier originally named *Magnolia* was later described as *Annona dodecapetala* by [Lamarck](#), and has since been named *Magnolia plumieri* and *Talauma plumieri* (and still a number of other names) but is now known as *Magnolia dodecapetala*.

Early references and descriptions: Magnolias have long been known and used in China. References to their medicinal qualities go back to as early as 1083. After the Spanish conquest of Mexico, [Philip II](#) commissioned his court physician [Francisco Hernandez](#) in 1570 to undertake a scientific expedition. Hernandez made numerous descriptions of plants, accompanied by drawings, but publication was delayed and hampered by a series of accidents. Between 1629 and 1651 the material was re-edited by members of the [Accademia dei Lincei](#) and issued (1651) in three editions as *Nova plantarum historia Mexicana*.

This work contains a drawing of a plant under the vernacular name Eloxochitl, that is almost certainly *Magnolia macrophylla* subsp. *dealbata*. This must have been the first-ever description of a *Magnolia* that was seen in the Western World. It is unclear whether there are early descriptions made by English or French [missionaries](#) who were sent to [North America](#), but the first introduction of a *Magnolia* into Europe is well documented. It was the missionary and plant collector [John Banister](#) (1654-1693) who sent back *Laurus tulipifera, foliis subtus ex cinereo aut argenteo purpurascensibus* from [Virginia](#) in 1688, to [Henry Compton](#), the Bishop of London. This species is now known as *Magnolia virginiana* (Sweetbay magnolia). Thus a plant collector had shipped the first *Magnolia* from North America to Europe before Charles Plumier discovered his *Talauma* on Martinique and gave it the name *Magnolia*.

Nomenclature and classification When [Linnaeus](#) took up *Magnolia* in his *Species plantarum* (1753), he created a lemma of only one species: *Magnolia virginiana*. Under that species he described five varieties (*glauca*, *foetida*, *grisea*, *tripetala* and *acuminata*). In the tenth edition of *Systema naturae* (1759), he merged *grisea* with *glauca*, and raised the four remaining varieties to species status.

By the end of the 18th century, botanists and plant hunters exploring Asia began to name and describe the *Magnolia* species from China and Japan. The first Asiatic species to be described by western botanists were *Magnolia denudata* and *Magnolia liliiflora*, *Magnolia coco* and *Magnolia figo*. Soon after that, in 1794, [Carl Peter Thunberg](#) collected and described *Magnolia obovata* from Japan and at roughly the same time *Magnolia kobus* was also first collected.

With the number of species increasing, the genus was divided into the two subgenera *Magnolia* and *Yulania*. *Magnolia* contains the American evergreen species *Magnolia grandiflora*, which is of [horticultural](#) importance, especially in the [United States](#), and *Magnolia virginiana*, the type species. *Yulania* contains several [deciduous](#) Asiatic species, such as *Magnolia denudata* and *Magnolia kobus*, which have become horticulturally important in their own right and as parents in

hybrids. Classified in *Yulania*, is also the American deciduous *Magnolia acuminata* (Cucumber tree), which has recently attained greater status as the parent which is responsible for the yellow flower colour in many new hybrids.

Relations in the family Magnoliaceae have been puzzling taxonomists for a long time. Because the family is quite old and has survived many geological events (such as ice ages, mountain formation and continental drift), its distribution has become scattered. Some species or groups of species have been isolated for a long time, while others could stay in close contact. To create divisions in the family (or even within the genus *Magnolia*), solely based upon morphological characters, has proven to be a nearly impossible task.

By the end of the 20th century, [DNA sequencing](#) had become available as a method of large scale research on [phylogenetic relationships](#). Several studies, including studies on many species in the family Magnoliaceae, were carried out to investigate relationships. What these studies all revealed was that genus *Michelia* and *Magnolia* subgenus *Yulania* were far more closely allied to each other than either one of them was to *Magnolia* subgenus *Magnolia*. These phylogenetic studies were supported by morphological data.

As nomenclature is supposed to reflect relationships, the situation with the species names in *Michelia* and *Magnolia* subgenus *Yulania* was undesirable. Taxonomically there are three choices; 1: to join *Michelia* and *Yulania* species in a common genus, not being *Magnolia* (for which the name *Michelia* has priority); 2: to raise subgenus *Yulania* to generic rank, leaving *Michelia* names and subgenus *Magnolia* names untouched; or 3: to join *Michelia* with genus *Magnolia* into genus *Magnolia* s.l. (a big genus). *Magnolia* subgenus *Magnolia* can not be renamed because it contains *Magnolia virginiana*, the type species of the genus and of the family. Not many *Michelia* species have so far become horticulturally or economically important, apart for their wood. Both subgenus *Magnolia* and subgenus *Yulania* include species of major horticultural importance, and a change of name would be very undesirable for many people, especially in the horticultural branch. In Europe, *Magnolia* even is more or less a synonym for *Yulania*, since most of the cultivated species on this continent have *Magnolia (Yulania) denudata* as one of their parents. Most taxonomists who acknowledge close relations between *Yulania* and *Michelia* therefore support the third option and join *Michelia* with *Magnolia*.

The same goes, *mutatis mutandis*, for the (former) genera *Talauma* and *Dugandiodendron*, which are then placed in subgenus *Magnolia*, and genus *Manglietia*, which could be joined with subgenus *Magnolia* or may even earn the status of an extra subgenus. *Elmerrillia* seems to be closely related to *Michelia* and *Yulania*, in which case it will most likely be treated in the same way as *Michelia* is now. The precise nomenclatural status of small or monospecific genera like *Kmeria*, *Parakmeria*, *Pachylarnax*, *Manglietiastrum*, *Aromadendron*, *Woonyoungia*, *Alcimandra*, *Paramichelia* and *Tsoongiodendron* remains uncertain. Taxonomists who merge *Michelia* into *Magnolia* tend to merge these small genera into *Magnolia* s.l. as well. At present, western botanists tend toward a big *Magnolia* genus, whereas many Chinese botanists still recognize the different small genera.

Uses: In general, *Magnolia* is a genus which has attracted a lot of horticultural interest. [Hybridisation](#) has been immensely successful in combining the best aspects of different species to give plants which flower at an earlier age than the species themselves, as well as having more impressive flowers. One of the most popular garden magnolias is a hybrid, *M. x soulangeana* (Saucer magnolia; hybrid *M. liliiflora* x *M. denudata*).

Medicinal uses: The bark from *M. officinalis* has long been used in [traditional Chinese medicine](#), where it is known as *hou po*. In Japan, *kōboku*, *M. obovata* has been used in a similar manner. The aromatic bark contains [magnolol](#) and [honokiol](#), two [polyphenolic](#) compounds that have demonstrated anti-anxiety and anti-[angiogenic](#) properties. Magnolia bark also has been shown to reduce allergic and asthmatic reactions.

Magnolia has attracted the interest of the dental research community because magnolia bark extract inhibits many of the bacteria responsible for [caries](#) and [periodontal disease](#). [23][24] In addition, the constituent magnolol interferes with the action of [glucosyltransferase](#), an [enzyme](#) needed for the formation of bacterial plaque.

Danger of extinction: On [January 18, 2008](#), the [Botanic Gardens Conservation International](#) (representing [botanic gardens](#) in 120 countries) stated that "400 [medicinal plants](#) are at risk of extinction, from over-collection and deforestation, threatening the discovery of future cures for disease." These included [Yew trees](#) (the bark is used for cancer drugs, [paclitaxel](#)); [Hoodia](#) (from [Namibia](#), source of [weight loss](#) drugs); and half of all Magnolias (used as Chinese medicine for 5,000 years to fight cancer, [dementia](#) and heart disease); and [Autumn crocus](#) (for [gout](#)). The WHO estimates that as many as 80% of the world's population depend on traditional medicine for their primary health care needs.

Michelia

Michelia is a [genus](#) of [flowering plants](#) belonging to the *Magnolia* family ([Magnoliaceae](#)). The genus includes about 50 [species](#) of [evergreen trees](#) and [shrubs](#), native to tropical and subtropical [south](#) and [southeast Asia](#) ([Indomalaya](#)), including southern [China](#).

The Magnoliaceae are an ancient family; fossil plants identifiably belonging to the Magnoliaceae back date back 95 million years. A primitive aspect of the Magnolia family is that their large, cup-shaped [flowers](#) lack distinct [petals](#) or [sepals](#). The large non-specialized flower parts, resembling petals, are called [tepals](#).

The leaves, flowers, and form of *Michelia* resemble *Magnolia*, but the blossoms of *Michelia* generally form clusters among the leaves, rather than singly at the branch ends as *Magnolia* does.

Several of the larger species are locally important sources of [timber](#). Some species, including the Champak (*M. champaca*) and *M. doltsopa* are grown for their flowers, both on the tree and as cut flowers. Champak flowers are also used to produce an [essential oil](#) for perfume. A few species have been introduced to gardens or as street trees outside of the Indomalaya region, including *M. figo*, *M. doltsopa*, and *M. champaca*. The genus is named after the [Florentine botanist Pietro Antonio Micheli](#) (1679–1737).

Recent changes in classification: Morphological data[1] and molecular data[2][3] recently showed that the genus

Michelia is very closely related to subgenus *Yualania* of genus *Magnolia*. Many botanists now treat the genus *Michelia* accordingly. New combinations of names have been provided for. For further information see under genus [Magnolia](#).

Magnolia campbellii

Very tolerant of atmospheric pollution. A very ornamental plant. Native of E. Asia - Himalayas to S.W. China

Trees take at least 20 years from seed before they flower

Wood - very soft. Used in construction

Magnolia grandiflora

The **Southern Magnolia**, often called the **Evergreen Magnolia**, is native of SE USA at low altitudes (below 60 m ASL), growing in warm temperate to semitropical areas. It is regarded as one of the 'most splendid forest trees' and is a popular ornamental planted around the world. A number of varieties have been bred for ornamental purposes. 18-24 m tall they live 80 to 120 years and it grows well in urban areas as it withstands sulphur dioxide.

Its **wood** hard and fairly heavy, but weak and not durable, is marketed to make furniture, pallets, and veneer. White when first cut, it turns brown on exposure to air

Florists prize its leathery foliage. It has showy white flowers.

Its bark, wood, leaves and fruit yield a variety of **extracts with application as pharmaceuticals.**

The flowers are very large (up to 25 cm across) and have a delicious and very powerful scent. This is perhaps **the most strongly scented flower in the world.** They can be produced in trees as young as 10 years old

1737 The magnificent Southern magnolia, *Magnolia grandiflora* (**introduced** from Southeastern North America to Europe by 1730) flowered in August at the London home of Charles Wagner, First Lord of the Admiralty. Georg Ehret immortalised this event with a sumptuous and justifiably famous illustration. Ehret, an apprentice gardener, had learned his artistic skills from his father during his youth in Heidelberg, Germany.

Gazebo

Built in 1914 for the Carpenter's Union Float in the Labour Day procession it was bought for 20 pounds and placed in the Garden.

Palms

Palm is the common name for a family of woody flowering plants found in **tropical** regions of the world. The family is the only member of its order, called Palmae. It contains **about 2600 species**; many genera.

Palms occur in tropical habitats. They can be found in **lowland rain forests, high mountains, mangrove swamps and deserts.** Tropical Asia has up to 1400 species whereas Africa only has 120. About 950 species occur in the American tropics.

Palmae, the palm family is one of **the oldest and most diverse of the flowering plant families.** Palms have many botanical characteristics such as woody trunk, in many species, perennial growth, leaves, which are folded like a fan and the production of a single seed leaf, which, along with grasses, lilies and other families classifies them as monocotyledons.

Palms have a characteristic growth form: a single unbranched trunk topped with fanlike or feather like leaves. Flowers of palms are usually inconspicuous but can occasionally occur in great quantity. Some palms may have up to 250,000 flowers. Many have long tap roots, enabling them to survive and grow in under arid conditions

Palms are important sources of food. Two examples are **dates** (*Phoenix dactylifera*) and **coconuts** (*Cocos nucifera*). They produce a wide range of products essential for human existence, allowing humans to survive and prosper in many otherwise difficult areas,

1. Phoenix canariensis Canary Island Palm

There are **17 species** of Phoenix palms including this.

Its generic name is an ancient name, already quoted by Theophrastus, as the one by which the Greeks used to call plants belonging to this genus; it derives from **phoenix** = Phoenician, as the Phoenicians themselves were supposed to have spread these plants. Its specific name is composed by **dactylus** = date (from Greek *dactylos*) and **fero** = I bear, that is, date-bearing.

This is one of the most grown and appreciated **ornamental** trees of the world. Its native habitat, the Canary Islands, is renowned for its richness in climatic diversity and its endemic flora.

Phoenix apparently did not radiate, as did many other plants, but succeeded in colonising many different ecological niches. In each of these environments, it grows associated with different ecological communities and often shows an astonishing diversity of epiphytes on its fibrous trunks. The wild populations suffered a dramatic decrease during the early centuries of the Spanish colonisation of the islands, which started at the end of the 15th century. Today *P canariensis* is sparsely and un-evenly distributed on all the seven islands and the conservation status is different on each of them. The main threat seems to be hybridisation with *P dactylifera*.

During the Tertiary, when many tropical species that were occupying the Mediterranean area undertook a huge and slow migration to the south because of the cooler weather, the Canary Islands remained floristically as Northern Africa became a desert. A *Phoenix* has probably taken part in this migration, but we do not know if the *Phoenix* that migrated in the Tertiary was a *P canariensis* or a parent species that afterwards evolved into the modern Canary palm.

These islands have by far a more even climate than Northern Africa, with abundant humidity from mist and richer soils. This suggests speciation from an ancestor similar to *Phoenix dactylifera* (or perhaps *P sylvestris*), to the less xeromorphic *P. canariensis*.

The palms on the Canary Islands are found growing on a wide variety of soils, all of volcanic origin and usually fertile. *P canariensis* has an **extensive root system**, which allows these palms to explore the surrounding earth to find subterranean water even at long distances. In the Canary Islands, *Phoenix* trees that grow in subxeric areas show themselves to **be resistant to temporary swamping of the soil** caused by sudden rains. Other trees and shrubs, with typical root systems, that could act as competitor species do not get established in those sites as they cannot resist asphyxia caused by the waterlogged soil.

This is one of the most grown palm trees throughout the world. It tolerates cold and warmth, drought and floods, shade and sun, and salt spray as well as mountain climate.

Those *P canariensis* growing in humid environments, often host on their trunks many endemic epiphytic plants, those add ornamental value to their already beautiful stems. The Canary Islands palm has the most fibrous and stout trunk in its genus and the astonishing diversity of epiphytes that can be found growing within the fibres of these spongy trunks is most unusual for nontropical zones. All these plants show mechanisms to withstand summer drought

Close relatives of the above are -

2. Phoenix dactylifera The date palm

Phoenix is the ancient Greek name given to the **Date Palm**, *Phoenix dactylifera*.

Its generic name is an ancient name, already quoted by Theophrastus, as the one by which the Greeks used to call plants belonging to this genus; it derives from *phoenix* = Phoenician, as the Phoenicians themselves were supposed to have spread these plants. Its specific name is composed by *dactylus* = date (from Greek *dactylos*) and *fero* = I bear, that is, date-bearing.

The date palm, its archaeology

Earliest finds: 5000-6000 BC, from Iran, Egypt, Pakistan: probably wild

Earliest cultivated find: 4000 BC from Eridu, Lower Mesopotamia (Bronze Age)

Mentioned in Akkadian and Sumerian cuneiform sources: 2500 BC and later

Origin and Diversity *Phoenix dactylifera* well known since ancient times, was regarded by the Egyptians as being a **fertility symbol**, it was represented on coins and monuments by the Carthaginians and used as an ornament in **triumph pageants by the Greeks and Romans**. In the **Christian tradition, its leaves have symbolised peace** and reminded of Jesus' entry to Jerusalem.

Botanical description - Imposing palm with a very slender trunk, up to 30 m tall, conspicuously covered with the remains of sheaths from fallen leaves. Its leaves, 20-30 forming a loose crown shaft, are up to 6 m long..

Its flowers, unisexual on dioecious plants, are small, whitish, fragrant. The fruits, commonly known as dates, are oblong berries, dark-orange when ripe, up to 50 cm long in the cultivated varieties, their flesh is sugary or starchy, it contains one woody seed.

Area of origin and cultural areas - The date palm, **native to North Africa** is also cultivated in Arabia and as far as the Persian Gulf, where it features as the characteristic vegetation of oases. Also the Canary Islands, in the northern Mediterranean and in the south of the United States.

A Bit of History Over 3,000 years ago the **Phoenicians** were the dominant seafaring nation of the Mediterranean. From their base in the east in which is roughly modern Lebanon, they explored westwards, establishing colonies and trading posts, the most important being the ancient city of Carthage on the coast of North Africa. The Phoenicians extended their influence farther west as far as the Pillars of Hercules (the Straits of Gibraltar) and beyond, using their trading posts as stations where boats could take on food and water and be repaired. One such trading post in the western part of the Mediterranean was south of modern Valencia in southern Spain at the site of the modern city of Elche (Elx in the Catalan language and Illice in Latin).

Since time immemorial, dates (*Phoenix dactylifera*) have been an **important food crop**, especially in the Middle East and North Africa. Not only are dates used locally, but they are also **an ideal item of food for provisioning long journeys**, and, indeed, wherever one travels in the drier tropics and subtropics, one can expect to **find scattered groves of dates that, presumably, originate from discarded stones**. However, in Elche the Phoenicians found a climate ideal for growing dates. Here they deliberately planted and cultivated the date for provisioning their trading ships.

The power of the Phoenicians waxed and waned, and other powers became dominant in the Mediterranean region. By AD 670, Elche was already under the influence of Islam and the Arabs. During the period of Arabic control that ended towards the end of the Middle Ages, dates in Elche were cultivated in proper plantation plots, in a way similar to that common in the Middle East and North Africa. These plots were square and separated by irrigation ditches, dates being planted along the edges. The centre of the plots were used for the cultivation of other crops such as pomegranates, also introduced by the Phoenicians. The plots were irrigated with ground water, which, in the Elche area, is quite saline. By the early 16th Century it is thought that there were some 1,300,000 date palms in the plantations of Elche. The life expectancy of a date palm in cultivation is about two to three hundred years. By the end of the 19th Century, the huge number of palms had been reduced by approximately one half, largely due to lack of replacement of dead palms.

In the 20th Century, industrialisation slowly started in Elche, and as the city grew, dates were cleared to make room for factories, houses and roads. More recently dates have been dug up and replanted as ornamentals

Cultivation - It is sensitive to the cold, it thrives on any kinds of soil, provided that they are fertile and well drained. In mild climate regions it is grown outdoors where it must be exposed to the sun; it is grown chiefly as an ornamental plant on account of its slender habit and foliage. In order for its fruits mature, high temperatures (40°C) and copious water.

It propagates by suckers or seedlings in spring.

Uses - Dates, due to their high sugar content, represent the basic, fundamental food for North Africa, Arabia and Persia's peoples, where hundreds of varieties are grown for commercial purposes.

The date palm, its botany. Tall evergreen, unbranched palm; can grow to 30 m.

The trunk is surrounded from the ground upward in spiral pattern with the base of earlier formed leaves (leaf scars).

Leaves are large (4-6 m). The end of the leaf fronds are needle sharp.

Dioecious: female and male individuals. Flowers are borne in bunches at the top of the tree. Only the female trees produce fruit, but one male tree can produce enough pollen to pollinate 40-50 female trees.

The fruit of the date has one seed, which can vary in size, shape, colour and quality of flesh. Unripe dates are green in colour, maturing to yellow, then reddish-brown when fully ripe.

A single large bunch may contain more than a thousand dates, and can weigh between 6 to 8 kg.

Each tree produces between five and ten bunches. A mature female tree can produce upwards of 30 to 80 kg (average 150) pounds of fruit annually.

Date palms begin to bear fruit at 3 to 5 years, and are fully mature at 12 years. It lives 200-300 years.

The date palm, its distribution and ecology. Requires high temperatures and low air humidity for fruit setting and ripening (35 C is optimum temperature for pollen germination); also requires water supply (irrigation, high water table) ("**growing with its head in fire and its feet in water**").

Grown in a nearly rainless belt between 15 and 35 N Lat in Sahara and southern fringe of the Near East, Arabia Peninsula, southern Iraq, Jordan,

The date palm, its uses Every part of the tree has its uses. The *wood* and *leaves* provide **timber** and **fabric** for houses and fences.

The *leaves* are used for making **ropes, cord, baskets, crates** and **furniture**. Bases of the leaves and the fruit stalks are used as fuel.

The *fruit* yields **food products** such as **date vinegar, date chutney or sweet pickle, and date paste** for bakery products and additional **flavouring** for oranges, bananas and almonds. Even the tree's *terminal buds* (heart of palm) make tasty additions to **vegetable salads**.

The date palm is often the **only available staple food for the inhabitants of desert** and arid lands, and as such it is **vital to millions throughout North Africa and the Middle East**. According to the World Food and Agricultural Organisation, there are 90 million date palms in the world and each tree can grow for more than 100 years. 64 million of these trees are grown in Arab countries, which produce 2 million tons of dates between them each year.

Trees **start producing after 4-5 years** and **reach full production after 10-12 years**. It lives 200-300 years.

Date-producing Arab countries are Algeria, Bahrain, Egypt, Iraq, Libya, Morocco, Oman, Saudi Arabia, Sudan, Syria, Tunisia, the UAE, and Yemen. Between them **Algeria, Egypt, Libya, Morocco, and Saudi Arabia produce 600** different kinds of dates, which accounts for 60% of the world's production. In Saudi Arabia, Madinah's date market (Souq Al Tumor) contains about 150 varieties, the most popular of which is Anbara, the most expensive.

Dry or bread dates: self-curing on tree. **Soft dates:** require harvest at appropriate time and sun-drying to increase sugar content and prevent spoilage. The latter are packaged traditionally in palm leaves and widely traded (caravans, ships)

The date palm is also highly prized as an **ornamental** tree, as it is ideally situated in streets, avenues and driveways. Optimum planting conditions dictate that trees should be set 6-8m apart and then well soaked with water. The date palm can tolerate a high

Iraq is the top commercial producer and exporter of dates, closely followed by Saudi Arabia, Egypt and Algeria.

Fronds used on Palm Sunday, commemorating the entry of Jesus in Jerusalem (Lion's Gate or east entrance to Jerusalem, through which Jesus is supposed to have entered the city)

Dates have always been considered beneficial to mothers. When Mary gave birth to the Prophet Jesus under a palm tree, she heard a voice telling her:

"Shake the trunk of the palm tree towards thee: it will drop fresh, ripe dates upon thee. Eat, then, and drink, and let thine eye be gladdened!"

Introduced into Spain by Moors

Introduced by Spanish into Americas; long-term plantations only on coastal area of Peru and Baja California (dry climates)

The date palm, its nutritional benefits The sugar content of ripe dates is about 80%; the remainder consists of protein, fat and mineral products including copper, sulphur, iron, magnesium and fluorine acid. Dates are high in fibre and an excellent source of potassium.

Five dates (approx. 45 grams) contain about 115 calories, nearly all from carbohydrates.

Bedouin Arabs, who eat them on a regular basis, show an extremely low incidence rate of cancer and heart disease.

3. *Cocos nucifera*; The Coconut palm

The **coconut** was first **domesticated and originated** in the region between south East Asia and Australasia (known as Malesia), where over half of the palm species come from. Its early history, like many plants, is full on uncertainty and conjecture.

The **ancestral coconut** may have originated in **western Gondwanaland** at the time it split up into the present continents. This raises the possibility that the wild type coconut may have existed on the fringes of the Pacific and Indian oceans since the earliest time. In that case the coconut palm could be considered indigenous over a very large area, including the coast and islands of East Africa

Evidence of the introduction of the coconut to East Africa by **Hindu merchant-seafarers** sometime in the 7th to 1st century B.C, it can equally well be explained simply as the opening up of trade between the two regions where coconuts may have already existed..

Malaysian sea-rovers are also thought to have introduced the coconut to Madagascar in the first century A.D. and from there reached the coast of mainland East Africa. The words for coconut in Madagascar also occur in the Far East and the Pacific.

The early presence of coconuts on uninhabited islands like the Seychelles and Mauritius strongly suggested **natural dispersal**. Coconuts could have floated to East Africa. Subsequently the common tall varieties in East Africa are late germinating, with wild type characteristics similar to the coconuts on the Indian subcontinent, while the common tall varieties in peninsular Malaysia are early germinating, domesticated types. Therefore natural dissemination and the human-aided may be consecutive events rather than competing theories.

There have been sixty other species under the genus *Cocos*, but the coconut palm stands by itself and is monotypic - meaning that within the genus *Cocos* only one species, *nucifera*, is recognised. Consequently, every coconut palm in the world is taxonomically the same species, which probably makes it most abundant single food tree in existence.

The coconut was first mentioned in 545 AD by an Egyptian Monk named Cosmos Indicopleustes. He visited western India and Ceylon. In his "Topographia Christiana", Cosmos describes the coconut as the "great nut of India." The Mahavasma, an ancient chronological history of Ceylon, describes the planting of coconuts in that country in 589 AD.

In 1280 Marco Polo, described coconut growing in Sumatra, as well as in Madras and Malabar in India, calling it *nux indica*, the Indian nut. The first detailed description of the coconut palm in western literature was provided by the Italian explorer Lodovico, di Varthema in his "Itinerario" of 1510, in which he referred to it *astenga*.

The first written reference to the coconut palm in East Africa is in the "Periplus of the Erythraean Sea," written about A.D. 60. When the Portuguese first sailed to East Africa and India they found Arab boats sewn with coconut fibre (coir) and carrying coconuts as cargo. Although the reference to coconuts in the Periplus has been taken as evidence of the introduction of the coconut to East Africa by Hindu merchant-seafarers sometime in the 7th to 1st century B.C, it can equally well be explained simply as the opening up of trade between the two regions where coconuts already existed..

Two thousand years ago or more, the coconut palm not only served to **identify seashore locations with fresh ground water**, but in those places it literally acted as a **natural desalination plant**. The sweet, uncontaminated drinking water from the immature nut was then, and is still now, an important use of this plant to the local community. This applies to offshore islands and to favourable parts of the African and Indian coast. It is not suggested that the early coconuts were present in large numbers or spread over extensive lengths of coastline and were certainly not found naturally anywhere in the hinterland.

While the earliest history of the coconut in east Africa remains uncertain, there is no doubt that its establishment was not a single event but a continuous affair extending over many centuries. Although the Indian influence appears to have waned somewhat after the times of the Periplus, trade relations between India and East Africa continued to exist until well after the arrival of the Portuguese.

Early Arab History The Arab and Persian colonisation of East Africa is of even greater importance. It was a long and gradual process which began in remote antiquity and continued more or less steadily for many centuries with at certain times more massive waves of immigration due to political or religious persecution at home. There is little doubt that many of these traders and settlers brought coconuts independently. According to the Arab traveller Ibn Battuta, great quantities of cowries and coconut products were exported from these islands. Both the Maldives and the Laccadives were the scene of remarkable shipbuilding activity. The ships, including hulls, masts, ropes, stitches and even sails, were built entirely of the various products of the coconut. The Arabs and Persians from the Gulf used to import coconut products from these islands or go there to have their ships built on the spot. There is evidence that the Maldives were first settled by Singhalese Buddhists who planted coconuts and dug wells

Uses of coconut

Cocos nucifera is one of the most valuable plants to man. It is a primary source of food, drink, and shelter. In Sanskrit the coconut palm is called "kalpa vriksha", which is defined as **"the tree which provides all the necessities of life."**

Coconut is one of the ten most useful trees in the world, providing food for millions of people, especially in the tropics. **At any one time a coconut palm has 12 different crops of nuts on it**, from opening flower to ripe nut.

At the top of the tree is the **growing point**, a bundle of tightly packed, yellow-white, cabbage-like leaves, which, if damaged, causes entire tree to die, but if tree can be spared, this heart makes a tasty treat, a **'millionaire's salad'**. **Unopened flowers** are often used to **fashion shoes, caps, even a kind of pressed helmet for soldiers**. **Opened flowers** provide a good **honey** for bees.

A clump of unopened flowers may be bound tightly together, bent over and its tip bruised. Soon it begins to 'weep' a steady dripping of sweet juice, up to a gallon per day. The cloudy brown liquid is easily boiled down to syrup, called coconut molasses, then crystallised into a rich dark sugar, almost exactly like maple sugar. Sometimes it is mixed with grated coconut for candy. Left standing, it ferments quickly into a beer with alcohol content up to 8%, called 'toddy' in India and Sri Lanka; 'tuba' in Philippines and Mexico; and 'tuwak' in Indonesia. After a few weeks, it becomes a vinegar. 'Arrack' is the product after distilling fermented 'toddy' and is a common spirituous liquor consumed in the East. Boiled toddy, known as jaggery, with lime makes good cement.

Nut has a **husk**, which is a mass of packed fibres called **coir**, which can be woven into strong twine or **rope**, and is used for **padding mattresses**, upholstery and life-preservers. Fibre **resistant to sea water** and is used for cables and **rigging on ships**, for making **mats, rugs, bags, brooms, brushes**, and olive oil filters in Italy and Greece; also used for fires and mosquito smudges.

If **nut** is allowed to **germinate**, cavity fills with a spongy mass called '**bread**' which is eaten raw or toasted in shell over fire. Sprouting seeds may be eaten like celery. **Shell** is hard and fine-grained, and may be **carved** into all kinds of objects, as **drinking cups, dippers, scoops, smoking pipe bowls**, and collecting cups for rubber latex. **Charcoal** used for cooking **fires, air filters, in gas masks, submarines, and cigarette tips**. Shells burned as **fuel** for copra kilns or house fires. **Coconut shell flour** used in industry as **filler** in plastics. **Coconut water** is produced by a 5 month old nut, about 2 cups of crystal clear, cool sweet (invert sugars and sucrose) liquid, so **pure and sterile** that during World War II, it was used in emergencies instead of sterile glucose solution, and put directly into a patient's veins. Also contains growth substances, minerals, and vitamins. Boiled toddy, known as jaggery, with lime makes a good cement. **Nut meat of immature coconuts** is like a custard in flavour and consistency, and is eaten or scraped and squeezed through cloth to yield a '**cream**' or 'milk' used on various foods. Cooked with rice to make Panama's famous 'arroz con coco'; also cooked with taro leaves or game, and used in coffee as cream. Dried, desiccated, and shredded it is used in cakes, pies, candies, and in curries and sweets.

When **nuts are cut open and dried**, meat becomes **copra**, which is processed for oil, rich in glycerine and used to make soaps, shampoos, shaving creams, toothpaste lotions, lubricants, hydraulic fluid, paints, synthetic rubber, plastics, margarine, and in ice cream. In India, the Hindus make a vegetarian butter called 'ghee' from coconut oil; also used in infant formulas. When **copra is heated**, the **clear oil** separates out easily, and is made this way for home use in producing countries. Used in lamps. Cake residue used as cattle fodder, as it is rich in proteins and sugar; should not give more than 4-5 lbs/animal/day, as butter from milk will have a tallow flavour. As cake is deficient in calcium, it should be fed together with calcium rich foods.

Trunk wood used for **building** sheds and other semi-permanent buildings. Outer **wood is close-grained, hard, and heavy**, and when well seasoned, has an **attractive dark coloured grain** adaptable for carving, especially ornamentals under the name of 'porcupine wood'. Coconut logs should not be used for fences, as decayed wood makes favourable breeding places for beetles. Logs are used to make rafts. Sections of stem, after scooping out pith, are used as flumes or gutters for carrying water. Pith of stem contains starch which may be extracted and used as flour. Pitch from top of tree is sometimes pickled in coconut vinegar.

Coconut leaves made into thin strips are woven into **clothing, furnishings**, screens, and walls of temporary buildings. Stiff midribs make cooking skewers, arrows, brooms, brushes, and for fish traps. Leaf fiber used in India to make mats, slippers, and bags. Used to make short-lived torches.

Coconut roots provide a **dye, a mouthwash, a medicine for dysentery**, and frayed out make **tooth brushes**; scorched, used as coffee substitute. **Coconut palm** is useful as an **ornamental**; its only drawback being the heavy nuts which may cause injury to man, beast, or rooftop when they hit in falling

Under good climatic conditions, a fully productive palm produces 12-16 bunches of coconuts per year, each bunch with 8-10 nuts, or 60-100 nuts/tree. Bunches ripen in about 1 year, and should yield 25 kg or more copra

Picea sitchensis

The **Sitka Spruce** is native of the Northwest coast of North America from Kodiak Island Alaska to California, never more than 200 km from the coast. It is a rapidly growing tree to 80 metres tall and is **one of the world's tallest and fastest growing spruces**, often adding 1 metre (three feet) to its height a year. It grows in humid, foggy areas of coastal forest. It likes a good summer rainfall.

A **long-lived** tree, with specimens 700 - 800 years old

Its sharp needles are believed to give this tree **special protection against evil thoughts (although not from chainsaws)**.

'**Pound for pound it is stronger than steel**'. It has the **highest strength to weight ratio of any tree**. The wood is elastic, soft, light, straight grained and is sought where these characteristics are required, e.g. in rowing shells, and aircraft (Howard Hughes 'Spruce Goose' was substantially made from timber of this tree), guitar faces, ladders, and turbine blades for wind energy generators. Aircraft quality planks only represent a small percentage of total timber yield, however. It is preferred for **acoustic uses** such as piano sounding boards. Despite these desirable timber characteristics, it is widely used as a **pulpwood** tree. The wood is a **good fuel**, knotted bits of wood would keep the fire burning all night

Various peoples have eaten the inner bark or the young shoots.

The roots, peeled, split and dried, were used to make **water tight** hats and baskets. The roots were used by several native North American Indian tribes to make tightly woven baskets that would hold water.

The limbs and roots can be pounded, shredded and used to make ropes.

A **pitch** is obtained from the tree and is used for **caulking boats, waterproofing** boxes etc. The rendered pitch has been used as a glue. The pitch can be melted then used as a protective varnish-like coat on wood.

A **gum** obtained from the bark is hardened in cold water and then **used for chewing**. It should be aged for 3 days or more before using it. The best gum is obtained from the southern side of the tree. In 1848, in Bangor, Maine, John Curtis produced the **first commercial spruce gum** - a chewing gum made of resin from spruce trees. By 1852 the Curtises had built a large chewing gum factory in Portland. As supplies of spruce gum diminished, manufacturers tried other chewables, such as paraffin, eventually turning to the latex from the chicle tree (*Manilkara zapota*.) Chicle became the basis of the American Chicle Company, and for their product, Chicklets.

Sitka spruce was **widely employed medicinally by several native North American Indians** but is little used in modern herbalism. The pitch was chewed as a **medicine** for various skin irritations

Young shoots - raw. Young male catkins - raw or cooked. Used as a flavouring. Immature female cones - cooked. The central portion, when roasted, is sweet and syrupy.

Inner bark - raw or cooked. It can be dried, ground into a powder and then used as a thickener in soups etc or added to cereals when making bread. The inner bark was usually harvested in the spring, though it was also sometimes taken in the summer. An emergency food, it is only used when all else fails.

Seed - raw. The seed is rich in fats and has a pleasant slightly resinous flavour but is too small and fiddly to be worthwhile unless you are desperate.

A refreshing **tea**, rich in vitamin C, can be made from the young shoot tips.

Cryptomeria japonica

The **Japanese Cedar**, or **Sugi**, belongs to the same family as the giant redwood, and comes from China and Japan. Old trees in Japan are up to 46 m (150 feet) high, with massive trunks.

This tree is widely grown as an ornamental, with many selected forms. In Japan it is **widely grown for its timber**, but it is also venerated in historic avenues and groves, and is **widely planted around temples**.

The leaves are very aromatic and are used as incense sticks.

A fairly **wind-tolerant** tree, it can be used in shelterbelt plantings.

Wood - light, fragrant, fine grained. Used in house building, ship making, boxes etc. The wood can be used as a substitute for Deal (sawn pine or fir wood, in UK 200 mm 9 inch wide nor more than 75 mm 3 inch thick and at least 6 foot long. In USA 11 inch wide; 2 ½ inch thick and 12 feet long)

Old wood that has been buried in the soil turns a dark green and is then much esteemed

An **oil and/or a resin** from the plant is used in the treatment of gonorrhoea

***Agathis* – the genus**

The genus contains some **21 species**. It is found from Peninsular **Malaysia to New Zealand**, including the **Philippines, New Guinea, Melanesia and Australia**. Each species has **limited distribution** within the total range. All species except *australis* are found in the tropics. Most species **form the largest trees in their respective forests**.

All species are highly sought after as a source of **attractive, straight grained easily worked timber**. Due to its relative scarcity and premium value it has now been largely logged out and current production is almost wholly derived from plantations. **Amber**, the preserved (fossilised) gum of trees, has been found from various species of *Agathis*.

The inner bark exudes a translucent or white resin called **Manila Copal**. This resin was formerly required for the production of many varnishes and of linoleum. The market has now been replaced by synthetic substitutes.

Most species are now listed as vulnerable or endangered and in decline.

Agathis australis

Kauri is probably the most famous of our native trees and one of the largest in the world. Tane Mahuta, the famous tree in Waipoua Forest, is over 50 m (160 feet) high and has been calculated to be over 2,100 years old. Even larger trees, over 60 m (180 feet) high and 7 m (22 feet) in diameter are known. Today only **about 142 hectares (355 acres) of kauri forest remain**, and the trees average about 30 m (100 feet) in height

Kauri **timber** is light and very durable, straight grained and free of knots, and easily worked. It has had many building uses in the past but today is a scarce resource.

Maori used kauri for the **construction of war canoes**.

Kauri trees also produced **gum**, known internationally as Manila copal. This material was a valuable constituent of varnishes and when mixed with linseed, was used widely in the manufacture of linoleum. It is still used for specialised uses such as varnishes for labels on food cans, for colour prints, and as an ingredient in the paint used to paint lines on roads. Production of gum reached a peak in 1905 and ceased in 1950. Subfossil fragments of gum are sometimes gathered and polished with lovely results.

Cinnamomum camphora

The **Camphor Laurel** is a source of commercial camphor and its **aromatic wood is used traditionally in China** to make storage chests. However it is more widely grown as an ornamental, as a shade tree in parks and gardens, and as a street tree. The leaves are aromatic when crushed.

This genus includes *C. zeylanicum*, from the bark of which we obtain **cinnamon**.

Native of China and Japan, and grows quickly and is from the same family as tawa and taraire.

The roots are said to release a compound that inhibits the growth of other plants under its canopy. In parts of Australia it is regarded as a weed.

The **essential oil 'camphor'** is obtained from the leaves and twigs. It is extracted commercially by passing a current of steam through the wood chips, 30 kilos of wood yielding 1 kilo of camphor. Camphor is used medicinally, in perfumes, as an insecticide and also to make celluloid and as a wood preservative. It can also be put in shoes to cure perspiring feet (probably by acting as a deodorant rather than preventing perspiration).

The **wood** has been burnt as a fumigant during epidemics. It is **beautifully grained. Used for furniture** etc

Medicinal Uses: Camphor has a long history of herbal use in the Orient with a wide range of uses.

Young shoots and leaves - eaten cooked. Some caution is suggested because there is a report that the plant is poisonous in large quantities. The old leaves are dried and used as a spice. The plant is poisonous in large quantities

Acmena smithii

The Lilly Pilly is a native to Queensland, Australia. Usually found in subtropical rainforest areas, or in dry rainforest areas near streams. Lilly Pilly belongs to the Myrtaceae family, a family that dominates the Australian vegetation, with about 1700 species, and includes Eucalyptus, Malaleuca, Callistemon, Leptospermum, and Kunzea.

Acmena is a small genus **related to guavas**, it used to be included in the genus Eugenia. Its species come from Australia and Malaysia. The name *Acmena* comes from the Greek for '*plentiful*'.

Small (1 cm) pink-white **berry** with a very mild, watery taste. The fruit is occasionally made into jams, jellies, or drinks, but the tree is usually planted for ornamental purposes, or to attract birds

The Lilly Pilly is **one of the most popular plants in Australia today**, particularly for **hedging and topiary**.

Evergreen rainforest plants with glossy green leaves. Many varieties have flushes of colourful new growth, ranging from brilliant pink to a red-brown. In spring to early summer most Lilly Pillies have fluffy white or greenish flowers followed by long lasting red, purple or whitish berries. There are many, many species and cultivars on the market. Of these, a few are misnamed, while some perform better than others in gardens.

"Yet what could be more beautiful and more satisfactory than the Lilly Pilly?"

Who in the world ever gave it such a name!

The light of recognition so often comes into the eyes of those who greet the botanic name Eugenia with a blank expression, that one reluctantly adopts this appellative."

"Letters to Garden Lovers", Australian Home Beautiful, April 1938.

Ilex aquifolium

Holly is a large genus of some 200 species of evergreen and deciduous shrubs and trees from temperate and tropical regions of the world. The original or **ancient name** for holly was '**Holm**' incorporated in the UK in the names of many places and homes, a trend sometimes continued in NZ.

The name holly is derived from the Norse word '*hulfre*'. The normally prickly leaves of holly were considered to afford protection against enemies; the red of its berries provided extra protection. It was but a small step to link the spiny leaves with the crown of thorns and the red berries with drops of Christ's blood.

Holly is associated with the death and rebirth symbolism of winter in both pagan and Christian lore. In Arthurian legend, Gawain (representing the Oak King of summer) fought the Green Knight, who was armed with a holly club to represent winter. It is one of the three timbers used in the construction of chariot wheel shafts. It was used in spear shafts also. The qualities of a spear shaft are balance and directness, as the spear must be hefted to be thrown. The holly indicates directed balance and vigour to fight if the cause is just. Holly may be used in spells having to do with sleep or rest, and to ease the passage of death. In the language of flowers holly stands for foresight and ivy for fidelity and marriage.

Common holly has been cultivated mostly for **shelter** for hundreds of years in Europe, with many forms.

The Main Garden includes a number of **holly** plants, including the **holly hedge** by the sunken/fragrant garden. That hedge is one, if not the, **oldest planted feature** remaining in the garden, planted to protect the nursery, essential if the original objectives of the Garden were to be achieved.

In ancient times, the bark of the holly was used in the preparation of a viscid substance called '**birdlime**' that was pasted on twigs and held the feet of small birds, enabling them to be captured.

Wood - strong, hard and dense, has an exceedingly fine grain, polishes well, although it must be well dried and seasoned or else it warps badly. Dried black was often used to replace ebony. It is beautifully white except at the centre of very old trees, and is highly regarded by cabinet makers though it must be well seasoned. The heartwood of mature trees is used for printing blocks, engravings, turnery etc. The wood makes a good fuel, burning well even when green

The plant is poisonous, but only in very large doses

Most parts of the tree were in the past **used in medicine**, the leaves, and the berries (as a purgative or as an emetic). With its berries showing at the time of the northern Christmas, it is always associated with that time of the year.

The leaves have been used as a tea substitute. The roasted fruit has been used as a coffee substitute. Some caution is advised here, since the fruit can be purgative and emetic

Knightsia excelsa

The **Rewarewa** or **NZ Honeysuckle**, is in fact not a honeysuckle, but is a member of the protea family. It is a tall tree growing to 30 m (100 feet)

Found in lowland to montane forest in North Island and on the northern tip of South Island

Three species are known, two from New Caledonia and one from NZ.

Its dark, **handsomely variegated flecked wood** has been used for a number of decorative purposes in the past, for tables and desks, but is now used more sparingly for woodturning and veneers. Highly valued for superior woodwork, inlay

It is **useless for firewood**, and the early settlers called it "bucket of water tree".

The flowers are very rich in **nectar**; this can be extracted and used as food. It contains about 45% sugars. The Maori used to collect its nectar to eat, and now bees produce a dark rich-flavoured honey from it. Tui, bellbird, and silver-eye eat its nectar. A very good bee plant

Tecomanthe speciosa

Attention was drawn to the Three Kings Islands in 1946 when a single plant of an unidentified climber was found on a rock in Tasman Stream on Great Island. Comparison with other climbing plants showed that it belonged to the genus

Tecomanthe of the Bignonia family and in 1948 Dr Oliver described it as a new species, *T. speciosa*.

The endangered status of this species can hardly be disputed for no further plants have been found in the wild. Although many are in cultivation, especially in New Zealand, **all have their source ultimately in that one plant in Tasman Valley.**

Cuttings were brought back to the mainland in 1951 by Dr Baylis and were planted out at the Mount Albert Research Center of DSIR in Auckland the following year. Two years later plants flowered but no seed set. Attempts at hand pollination in 1955 and 1956 resulted in fertilisation and viable seeds that were subsequently germinated. Since then numerous plants have been grown both from seed and cuttings.

Tecomanthe is a handsome plant with large pinnate, glossy leaves and trusses of greenish bell-like flowers. It grows vigorously outside in northern parts of New Zealand and in the south is found in favourable sites. There are several specimens in the Garden, including one growing on the outside of the lift tower of the Treehouse.

Kunzea ericoides

This is one of 20 species of evergreen shrubs and small trees all natives of NZ and Australia.

Kanuka can be an important pioneer after the destruction of forest by fire, forming a low dense forest, which is gradually replaced by taller forest species.

Its leaves are not prickly like manuka, and its flowers, unlike manuka, are in clusters, and are smaller.

Kanuka has a wide range of **medicinal properties**. Pounded seed capsules were used to treat running sores.

Essential oils from this family are effective against *Staphylococcus aureus*.

Kanuka also contains **leptospermone**, which is an insecticide and an effective remedy against intestinal worms.

Kanuka leaves were used to make refreshing tea from the young shoot tips.

Its **timber** is used for outdoor use, and its **inner bark is a durable and waterproof roofing material**. It is also good firewood, producing good heat and a pleasant fragrance, which has led to its destruction in many places.

Kanuka occurs in most of the forest remnants, especially in the drier area above the Rose Garden. The mature trees probably predate European settlement of the area.

Known also as *Leptospermum ericoides*

Phyllocladus trichomanoides

Tanekaha, the **Celery Pine** is a tall graceful tree growing to 20 m tall. Found in lowland forests up to 800 m altitude from North Cape down to Wanganui and in northern Marlborough and western Nelson. It is a hardy tree. Its foliage looks like a celery leaf, hence its common name

Its close grained wood is yellowish white and is one of the most elastic timbers known in the world. Strong, durable and readily worked to a smooth finish, the wood has been used for making fishing rods, and even bridge building.

Taxus baccata

There are some 6-7 species in the **Yew** genus scattered over the Northern Hemisphere throughout Britain and Ireland. Native to most of Europe, Asia Minor and North Africa, all considered by some to be just geographical variants of the common yew.

A very long lived tree, one report suggests that **a tree in Perthshire UK is 1500 years old**, making it **the oldest plant in Britain**. Another report says trees can be **up to 4000 years old**. It is slow growing and usually takes about 20 years to reach a height of 4.5 metres.

The tree was named **taxus** in Latin, from the Greek **toxon** (a bow) because of the ancient reputation of its wood used for that purpose. Its name in the form of **taxicum** came to designate all poisons – **‘toxic’** as all parts of the tree except red aril are poisonous to man and animals although deer browse young seedlings. Birds eat the arils and spread the seed.

The Irish yew ***Taxus baccata ‘Fastigiata’*** is found in almost every churchyard in Ireland.

In early times, the darkly glorious yew was probably the **only evergreen tree in Britain**. Both Druids with their belief in reincarnation, and later Christians with their teaching of the resurrection, regarded it as a natural emblem of everlasting life, a symbol of life after death and a protection against evil. Its capacity for great age enriched its symbolic value. The early Irish regarded it as one of the most ancient beings on earth. Yew is the last on a list of oldest things in a passage from the fourteenth century Book of Lismore: "Three lifetimes of the yew for the world from its beginning to its end."

It was planted in graveyards to prevent witchcraft and restrain the spirits of the buried dead

If a girl placed a sprig of yew under her pillow, from a previously un-visited graveyard, she would dream of her future husband. To dream of a yew foretold the death of some old person, which stood to benefit the dreamer.

Because its foliage is poisonous and weapons were made from it, Shakespeare referred to it as "double fatal" (Richard II)

In Macbeth it is included in witches brew

“Gall of goat, and slips of yew

Slivered’d* in the moon's eclipse”

* *Slivered'd* refers to branches broken in the wind which were supposed to still harbour the storm's evil spirits.

The Yew tree is the symbolic tree of the Fraser clan (Scotland). The Highlanders believed it brought them good luck and kept evil spirits at bay.

Very tolerant of trimming, some yew hedges have been maintained closely clipped for over 400 years. It also makes an excellent hedge and used in **topiary**

Wood - heavy, hard, durable, elastic, takes a good polish but requires long seasoning. Can fetch very high prices when of right quality for **veneer**. The Yew has been **long prized for its wood, both for decorative cabinet making** and for its **durability**. It was the **wood of choice for making bows**. It is also used for tool handles and makes a good firewood.. The **wood is burnt as incense**

A highly **toxic plant** that has occasionally been used medicinally, mainly in the treatment of chest complaints.

Fruit - eaten raw. Very sweet and gelatinous, most people find it delicious though some find it sickly. A number of people who like the flavour do not like the texture that is often described as being 'snotty'.

A decoction of the leaves is used as an **insecticide**.

The Medieval English Longbow

by Robert E. Kaiser, M.A.

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From the thirteenth until the sixteenth century, the national weapon of English army was the longbow. It was this weapon that conquered Wales and Scotland, gave the English their victories in the Hundred Years War, and permitted England to replace France as the foremost military power in Medieval Europe. The longbow was the machine gun of the Middle Ages: accurate, deadly, possessed of a long-range and rapid rate of fire, the flight of its missiles was likened to a storm. Cheap and simple enough for the yeoman to own and master, it made him superior to a knight on the field of battle. Yet, important as this weapon was, most of our present day beliefs concerning it are based upon myth.

There are many statistics available on the longbow, but few agree. The term longbow implies a weapon of greater length than the 4 foot bow used on the continent. Geoffrey Trease, author of *The Condottieri*, maintains the longbow used by the 14th century mercenary troops of Sir John Hawkwood "was as tall as themselves or a fraction taller". This would make the bow approximately five feet long, since the average height of the medieval yeoman soldier was five feet to five feet two inches. The Royal Antiquaries Society of Great Britain maintains the weapon was "of five or six feet" in length. Major Richard G. Bartelot, Assistant Historical Secretary of the Royal Artillery Institution says "the bow was of yew, five feet long, with a three foot arrow". Finally, Gaston Foebus, Count of Foix, wrote in 1388, that a longbow should be yew or boxwood, seventy inches between the points of attachment for the cord..." These quotes demonstrate that the weapon was considerably longer than its continental counterpart, but still leaves the length in question.



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Another characteristic of the English weapon was its superior strength. An early 14th century English inquiry into the murder of Simon de Skelington records the instrument of death as an arrow shot from a five foot seven inch bow. "The wound measured three inches long by two inches wide and six inches deep". This was the powerful weapon used by Edward III and his son, the Black Prince, in the Hundred Years War.

The two current authorities both agree the weapon was much stronger than our present day bows. Count M. Mildmay Stayner, Recorder of the British Long Bow Society, estimates the bows of the Medieval period drew between 90 and 110 pounds, maximum. Mr. W.F. Paterson, Chairman of the Society of Archer-Antiquaries, believes the weapon had a supreme draw weight of only 80 to 90 pounds.

A bow of the strength described by Stayner and Paterson would project a war arrow a long distance. But here again, no one is sure how far: Stayner believes the war arrow had an effective range of 180 yards; Paterson maintains a slightly further distance of 200 yards; and Bartelot estimates a useful range of 249 yards. Captain George Burnet, Secretary to the Royal Scottish Archers, notes that the members of the Queen's Body Guard for Scotland, who still shoot, use six foot long self yew bows of 55 to 60 pounds draw weight. The range of these modern bows is 180-200 yards shooting light target shafts.

The longbow, because of its rapidity of fire, was a medieval machine gun. It has been calculated that a bowman of the Hundred Years War period, when military archery was at its zenith, could shoot 10 to 12 arrows a minute. The closest weapon

in range and strength to the longbow was the crossbow. But, as the battle of Crecy (1346) showed, even the superior Genoese composite crossbow - made of wood, horn, sinew and glue - was no match for the English weapon.

After firearms were introduced into continental warfare, Sir John Smythe, soldier of fortune, and Queen Elizabeth's ambassador to the Spanish Court of Philip II, noted that "archers are able to discharge four or five arrows apiece before the harquebusiers shall be ready to discharge one bullet.

The reason for present day confusion and controversy over the longbow is the limited number of surviving artefacts. There are no longbows in existence from the Early Middle Ages. There are, however, five surviving Renaissance weapons.

All of these bows are similar. They are nearly six feet long; made of wood; shaped in order to use both the centre and sap wood; are symmetrically tapered; and appear to have a very stiff draw weight. What is more, all five weapons are self bows. This means that they are made from a single stave of wood. Horace Ford, Champion Archer of England from 1850 to 1859, and an authority on English archery, maintained:

"The self bow of a single stave is the real old English weapon - the one with which the mighty deeds that rendered this country renowned in by-gone times were performed."

The first of the five surviving bows, by tradition, dates from the Battle of Flodden (1513). Burnet verifies that the artifact hangs on the wall of Archers Hall, headquarters of Royal Scottish Archers, in Edinburgh.

About the turn of the twentieth century, Colonel Fergusson of Huntly Burn presented it to Mr. Peter Muir of the Royal Scottish Archers. Fergusson claimed the artefact from the rafters of a house near Flodden Field where it had been for generations.

The Flodden Bow is a self yew weapon, 'probably of English yew', approximately six feet long, and "rather roughly made". The estimated strength of the weapon is between 80 and 90 pounds. Burnet's description can be deceiving. The rough appearance of the weapon does not imply it was poorly made.

Most yew, even the kind that makes the finest bows, is quite irregular in appearance. The sapwood of the stave, following the longitudinal line of the trunk, rises and falls and tilts upwards or down in places. It has 'pins' (tiny black knots) too, as a rule."

It is ironic that a weapon should survive from this battle. "Flodden is a landmark in the history of archery, as the last battle on English soil to be fought with the longbow as the principle weapon..." Modern authors maintain that the victory of Flodden was due to archery. Indeed Longman and Walrond in their book, *Archery*, maintain that a 1515 statute endorsing the use of, and practice with the bow was a result of the victory. These authorities are probably correct, but not for the reasons they believe. The sole contemporary account of the battle notes "that a few of thaim (the Scots) wer slaine with arrows, how be it the billes (spears with hooks on the head) did beat and hew thaim downe..." It is apparent that the law was passed because of the poor showing of the archers.

The most interesting and least known Renaissance longbow comes from the armoury of the church in the village of Mendlesham in Suffolk, England. Records show it was there in the reign of Queen Elizabeth; however, Paterson believes it may date back to the time of Henry VIII.

Unfortunately, the Mendlesham Bow is broken. It is a self bow of 53 inches length. Paterson believes: "Assuming that the mid-point of the bow is about one inch above the centre of the grip, this would suggest a bow length of about 68-69 inches - if the remnant is an upper limb - or about 71 inches if it is the lower limb. I am inclined to suggest the former as the more likely choice."

The surviving limb tip is shaped to take a horn nock for the bow string loop. That would make the total length of the bow a little over six feet tall. Measurements suggest a draw-weight of 80 pounds at 28 inches.

The Mendlesham Bow, a typical longbow, is also unique for two reasons. First, although it is shaped to use the properties of the yew centre and sap wood; the bow's "cross-section approximated more closely to a rectangle with the corners rounded, than the reputed traditional 'D'-form" found in the other four artefacts. Second, the longitudinal taper of the bow limb is not straight but whip ended. This would better distribute the stress as the bow is drawn and force it to bend in an ellipse instead of an arc.

Like the two previous artefacts, the Hedgeley Moor Bow is also something of a mystery. It is reputed to have been used at the Battle of Hedgeley Moor (1464), during the War of the Roses. The weapon was presented to Alnwick Castle by John Wilkinson, whose family lived on the Castle estate from the time of the battle. "It is 65.5 inches in length, 3.5 inches at its greatest girth, with greatest width of 1.5 inches. The wood is probably yew..."

There are no nocks, but the ends have been notched to take a string. "At mid-point where the handle is, there are two deep cuts which look remarkably of the shape of a bodkin head (sic) would make if it were overdrawn." Draw weight is estimated at 50 pounds.

The remaining two Renaissance longbows, like the Mendlesham artefact, come from the reign of Henry VIII. Unlike the Flodden and Hedgeley Moor Bows, we are sure of the age and use of these artifacts. They were recovered in 1836 by John Deane from H.M.S. *Mary Rose*. The *Mary Rose*, flag ship of the British fleet, sank off Portsmouth while engaging an invading

French squadron on Sunday, 19th July, 1545.

These two bows are on display in the Armouries in the Tower of London. Inventory records show that they are made of yew wood, "of rounded section, tapered at tips to take the nocks, now missing". The largest of the bows is 75 inches long. The smaller stave is 72.75 inches long. Both bows are 4.5 inches at "greatest girth" and weigh 1 pound, 10 ounces. They are symmetrical weapons, utilising the same 'D'-shape as the Flodden Bow.

Both weapons are unfinished looking, but as pointed out previously, this is a characteristic of yew wood. Ford, in his study of the Mary Rose bows, notes that they are self bows, made from "foreign yew" and had an estimated draw weight of 65 to 70 pounds.

The variation in length between the Mary Rose, the Flodden, and the Mendlesham bows; as opposed to the Hedgeley Moor artefact, lies in the fact that the individual archer had his personal bow made to measure. The Mary Rose weapons were arsenal issues meant to suit the tallest men in service. Shorter men would cut their weapons down to suit their height and arm length. This point is supported by Roger Ascham's treatise on Archery, *Toxophilus*, published in 1545.

During the Middle Ages, the yeoman archer was illiterate, while the scholars of the day, by virtue of their noble birth, had little knowledge of archery. Ascham was both a scholar and an ardent archer. As tutor to Elizabeth I, he had considerable influence on the royal family and was favoured by Henry VIII for his writing on this subject. Commenting on the selection and adjustment of a longbow, Ascham writes: "Take your bow in to the field, shote in hym, synke hym wyth deade heauye shaftes...whe(n) you haue thus shot in hym, and perceyued good shootynge woode in hym, you must have hym agayne to a good cunnynge, and trustie woorkeman, whyche shall cut hym shorter, and pyke him and dresse hym fyttter."

All five weapons are remarkably similar and may be said to be typical longbows. They are approximately six feet tall, made of the sap and centrewood of the yew tree, are rough looking, and stiff weapons pulling between 65 and 90 pounds. Given this draw weight, a maximum effective range of approximately 200 yards with a heavy war missile is not unreasonable, especially considering the performance of the present day Scottish Archers.

The making of longbows changed little from the Medieval period until the turn of the twentieth century. They still were wooden self bows utilising the centre and sapwood of the stave. The best bows continued to be made of yew wood; and all bows were made by hand thus, each was unique.

According to Ford, yew was the only wood for a self bow, and the best yew came from Spain and Italy. The foreign wood is "straighther, finer in grain, freer from pins, stiffer and denser in quality, and requires less bulk in proportion to the strength of the bow". Stayner adds that the best wood is grown in the poor soil of the mountains; this produced the desired light grained wood. Ascham described the best yew for bow staves as coloured: "...lyke virgin wax or golde, having a fine longe grayne, even from the one ende of the bowe, to the other... the short grayne are for a most part very brittle."

Staves were cut only in winter, when the sap was down.⁴¹ Stayner notes that the yew wood trade was tied to the wine trade. To insure an adequate supply of bows, "at one time, all wine imports (from Southern France) had to have longbow staves in the cargo as well."

Why was yew such a superior wood for bow making? The natural properties of yew are much like a modern thermostat: by skillfully cutting and shaping the stave in a 'D'-section, a layer of sapwood was left along the flattened back of the bow.

"When a bow is drawn, the inside face of the arc undergoes compression while the outer surface is stretched. The heartwood of yew is able to withstand compression and its sapwood is elastic by nature, and both tend to return to their original straightness when the bow is loosed."

Bows were not made all at once. Cut down in winter, they were roughed out and left to cure for a year or two. After the bow was "seasoned", it was worked in slow stages into the finished product. Often these steps occurred at intervals of a year for three or four years.

Once the bow was made, it would provide long service with minimum maintenance. Smythe tells us that archers of the Hundred Years War used to rub a mixture of "wax, resin, and fine tallow" into the bow to protect it from "all weather of heat, frost, and wet". Ascham says that the archers also had bow cases, not of leather, but of canvas or wool to protect their bows from the elements.

Bow strings were of two materials: in the sixteenth century, strings were made of "good hempe...(but, earlier, strings were made of)...fine Flaxe or Sylk". A waterproof glue was used to preserve the Renaissance bow string and it was reinforced by a whipping of fine thread. The strings were attached to nocks made of bone or horn.

The English Medieval war arrow, like the longbow, is a controversial subject. Known as the clothyard shaft, it was efficient, cheap, capable of being mass-produced, and "made in greater numbers than any other type of arrow in history". But few sources agree to its length: estimates range from 27 to 36 inches.

A close examination of the sources tend to point to approximately 27 inches as the correct figure. The clothyard was not a standard yard. The term comes from the reign of Edward III, when he introduced Flemish weavers into England. The weavers brought their own system of measurement with them. Known as the "clothyard", "clothier's yard", "ell", or "Flemish

yard", it was 27 4/10 inches long. The late John E. Morris, the acknowledged authority on the military organisation and tactics of Edward I, supports this conclusion by noting that a draw length of 36 inches from a 65 pound or strong bow is biomechanically impossible.

The final and most conclusive argument for a war arrow length of a "Flemish yard" is the sole surviving Medieval war arrow. The artefact, now in the Library of Westminster Abbey, was found in one of the turrets of the Chapter House in 1878. The exact age of the arrow is unknown; but, due to the construction of the war head, it was probably made during the second half of the Hundred Years War. Dr. Howard M. Nixon, Abbey Librarian, notes the head belongs to type 16 in the London Museum Catalogue:

"This is a typical medieval war head, with small barbs to prevent the arrow from being easily withdrawn. It seems likely that the wood is either ash or birch."

This type of war head was devised to negate the protection offered by the combination mail and plate armour, which came into wide use after the Battle of Poitiers (1356). (Froissart tells us that the archers of the Black Prince shot (broadhead) "bearded" arrows). The Chapter House Arrow is 30.5 inches long. The diameter of the shaft varies from 1.07 centimetres at the war head to a maximum of 1.14 centimetres at a distance of 30.5 centimetres from head. The diameter reduces to 0.756 centimetres at the nock. The total weight is 1.5 ounces. This arrow is a 27 inch shaft (approximately) mounted to a 4 inch or 5 inch socketed war head.

The Medieval arrow, like its present day descendant, consisted of three parts: the stele (shaft), the arrow head, and the fletching (feathers). Ascham notes that different types of arrows had different lengths of fletching. A war missile would have large feathers. Target and small game arrows had smaller. But, not just any feathers were acceptable: Medieval archers preferred the pinion (flight) feathers of the bird's wing. The most commonly used feathers were from the grey goose: "These were tough, durable, cheap and in plentiful supply". There were three feathers to a shaft, fixed by "binding, adhesion, or a combination of both". Consistent with present day practice, the cock feather was coloured differently from the other two feathers. Ascham wrote:

"...surelye it standeth with good reason to have the cocke feather black or greye, as it were to gyue a man warning to noche right." In order to preserve the stele, it was coated with a moisture repellent copper solution called *virido greco*.

As for the stele of the arrow, Ascham lists fourteen different woods which were used in his day. They include brazil, birch, oak, and ash. But as far as he is concerned, ash was the best for war arrows since it was "both swifter and heuier, is more fit for sheaafe arrows."

The arrow nock, the place for the bowstring to attach, was also composed of many types. Depending upon the arrow and corresponding width of the bowstring, the nock could be small, shallow, wide, deep, or any combination of these. Some arrows even had a double nock. In terms of a war arrow, the best nock was deep and long to insure that the string did not slip during the draw.

The last of the three parts of an arrow is the head. Medieval arrow heads were of three main types: the 'y'-shaped forked hunting head, the leaf shaped broadhead, and the bodkin head. The famed bodkin point, unlike the broadhead, was reserved strictly for war. It was a four-sided spike developed to penetrate plate armour. Stayner notes that the 6 inch socketed heads were often waxed to aid penetration.

The origin of the English longbow is lost in the mist of time. The currently accepted theory was set at the turn of the twentieth century by Morris in his superb study, *The Welsh Wars of Edward I*. Morris maintained the weapon was of Welsh descent and was introduced into England's military arsenal around the turn of the fourteenth century. Sir Charles Oman, in his classic, *A History of the Art of Warfare in the Middle Ages*, took Morris' idea and perpetuated it.

Morris is undoubtedly correct in his assumption that the longbow was foreign to both the Saxons and the Normans. The Bayeux tapestry shows only one Saxon Bowman with a short bow. The rest of Harold's forces use the shield and battle axe. The Norman archers from Louviers and Evreux who, according to tradition, won William's victory for him, also used the short wooden bow.

Morris based his conclusion that Southern Wales was the home of the longbow from the historical writings of the late twelfth century cleric Silvester Giraldus Cambrensis. Cambrensis, youngest son of William de Barri, was in his lifetime: Archdeacon of Brecknock, servant of King Henry II and his son, Richard the Lion-Hearted, and co-adjutor in administration with the Bishop of Ely of Richard's realm during the Third Crusade. But the one accomplishment Cambrensis is best remembered for is his chronicle, *The Itinerary of Wales*.

In his chronicle, Cambrensis describes the archery of the Southern Welsh. He notes that a tribe called the *Venta* were "more accustomed to war, more famous for valour, and more expert in archery, than those of any other part of Wales". The *Venta* were a stubborn people, unlike the Normans who followed the codes of chivalry, their "mode of fighting consists in chasing the enemy or in retreating.". They were guerrilla fighters, and the bow was perfectly suited for them.

Morris, reading about the Norman-*Venta* encounters, misinterpreted a key passage of *The Itinerary of Wales*: "Especially we get from Gerald (Gerald de Barri or Giraldus Cambrensis) a valuable picture of the archers of Gwent, with their 'bows made of wild elm, unpolished, rude and uncouth, not only calculated to shoot an arrow to a great distance, but also to

inflict very severe wounds in a close fight'."

The correct translation of this passage according to Foster and Hoare, *The Historical Works of Giraldus Cambrensis*, should be: "Yet the bows used by these people (the Venta) are not made of horn, ivory, or yew, but of wild elm; unpolished, rude and uncouth, but stout; not calculated to shoot an arrow to a great distance, but to inflict very severe wounds in a close fight."

Therefore, the twelfth century Welsh weapon could not be a longbow. It did not have the range of a longbow, nor does Cumbrances mention any extraordinary length. The bow of Cumbrances' England was the short Norman bow. Surely an astute observer such as the Archdeacon would not have failed to notice the most obvious difference between a continental and a longbow.

It is now apparent that the longbow was already in England during the time of Edward I. Edward simply adopted the longbow because it was superior in range and equally as powerful as the Welsh bow. But as Morris and Oman pointed out, the catalysis for the use of the longbow was found in Wales.

There is good evidence to show that the longbow was introduced into England from the Scandinavian Countries, the question that remains is when. The best answer is probably sometime during the many Danish invasions before the 1066 landing of William the Conqueror. E.G. Heath, author of *The Grey Goose Wing* and *A history of Target Archery*, notes that several well-preserved longbows were recovered from Saxon burial galleys found at Nydam Moor in Denmark in 1863. "These bows have been scientifically dated between 200 and 400 A.D..." Dr. Elizabeth Munksgaard, Assistant Keeper of the Prehistoric Department, verified that the Migration Period, Nydam Find artefacts are in the National Museum of Denmark. There are seven Nydam bows which closely resemble the Flodden, Mary Rose, Hedgeley Moor and Mendlesham artefacts. The Nydam bows are self wooden bows, of 5 feet 7 inches to 6 feet long, 'D'-shaped, and one of the bows has a nock of horn. These bows differ from the Renaissance English weapons in only two ways: they have ornamental carvings and have a binding of thread and pitch.

Dr. Adali Lieshf, curator of the Viking Ship Room, Museum of National Antiquities, University of Oslo, recently discovered a Viking longbow. The bow was found in a cremation grave on the farm Torshov in Gjerdrum, Akerhus. All the wood has deteriorated, but the iron bands which reinforced the wooden stave remains. Lieshf described the artifact this way: "There are, however, some unpublished fragments of iron, by me identified as parts of a long bow made of wood reinforced with and riveted to iron bands with pointed ends somewhat longer than the wooden part."

A final argument supporting the Scandinavian origins of the longbow comes from Dr. Lynn White, Jr., noted medievalist, who writes that in old Irish there are two words for bow: one is for a short bow, and its root is Celtic; the other is for a longbow, and its root is Norse. Given this information, it is apparent that the yew wood longbow is a very old weapon. It can be traced from pre-Migration People to Danish Vikings to English Medieval yeoman soldiers.

The Medieval English longbow was a superb weapon. Incredibly powerful, rapid, and deadly, it was a socially levelling force. With it the yeoman was superior to the knight, and the Kingdom of England was the master of Western Europe. Yet, important as it was, the longbow was an everyday object. Because it was so common, few longbows survive.

When myth is separated from reality, and the few remaining artefacts are examined, what information is available paints a far different picture than the currently accepted image. The weapon was of Scandinavian, not Welsh origin. It was known to pre-Migration Celts and Vikings; made of yew wood, not ash, boxwood or elm; approximately 6 feet long, shot an arrow roughly 27 inches in length, and had an effective range of circa 200 yards.